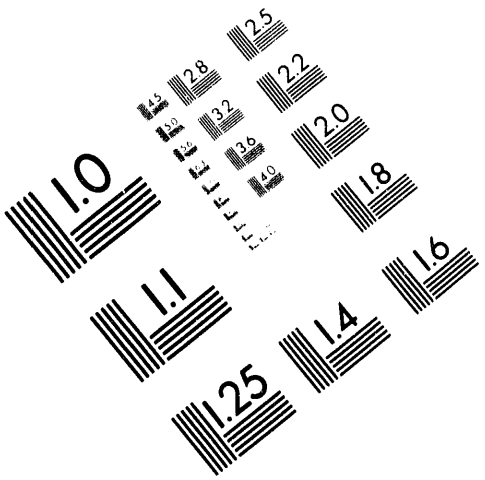



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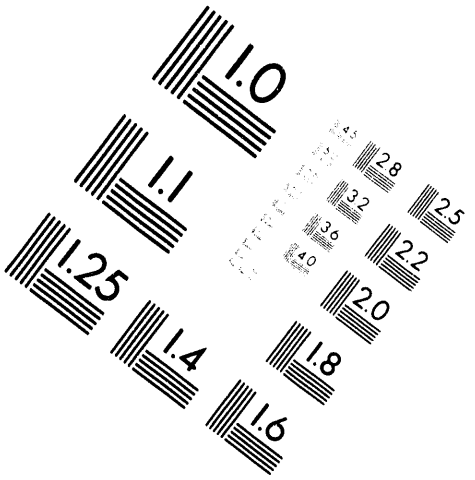

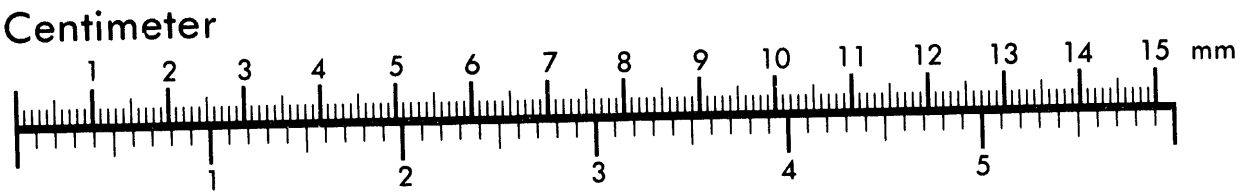

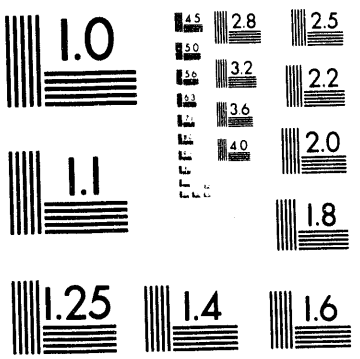

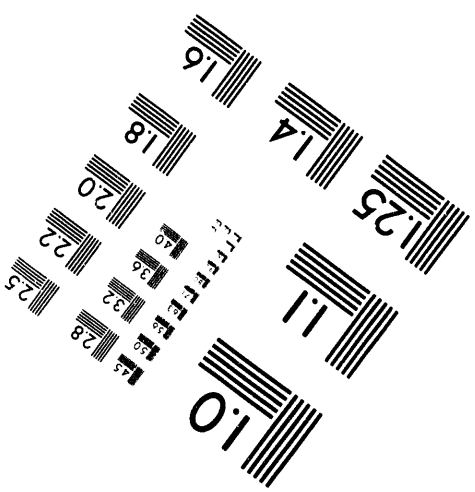

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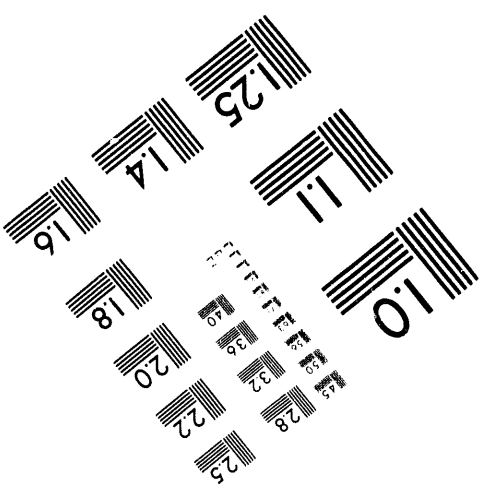

1 of 8

DOE/EW/50625--T18-Vol.4

Vol.4

Medical University of South Carolina
Environmental Hazards Assessment Program
Annual Report
Grant DE-FG01-92EW50625
July 1, 1993 - June 30, 1994
Deliverables

5.1.1 Immunological Consequences of Beryllium Exposure

33. Abstract- "Human Recombinant Alpha-HW Glycoprotein-Fetuin-pp63 is an Inhibitor of the Insulin Receptor Tyrosine Kinase (submitted August, 1994)

5.1.2 Assessment of Genetic Risks to Environmental Diseases

34. Proposal and approval of animal use
35. Perfusion Procedures- Mouse and Rat
36. Assay protocols for measuring palmitoyl CoA oxidase and carnitine acetyltransferase have been developed.
37. An assay protocol for measuring DNA synthesis in rat and mouse hepatocyte cultures and in HepG2/Hep3B cells have been developed

5.2.1 Low Dose-Rate Radiation Health Effects

38. Paper presented at SPECTRUM '94 (Nuclear Hazardous Waste Management International Topical Meeting Aug. 14-18, 1994, Atlanta.) Three presentations at Soc. Risk Analysis, Dec. 1993

5.2.2 Environmental Risk Perception in Defined Populations

39. Abstracts and posters: Perceived Risks in Geographic Areas Proximal to the Nuclear Production Facility
40. Abstracts and posters: The Influence of Printed Media on Perceived Risk
41 One technical report to be the basis of two future manuscripts
42 Poster-"Symposium on Health Research and Needs to Ensure Environmental Justice," February 1994, Arlington, Virginia, sponsored by NIEHS

5.3 Information Support and Access Systems

43. Needs Assessment Report

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Medical University of South Carolina
Environmental Hazards Assessment Program
Annual Report
Grant DE-FG01-92EW50625
July 1, 1993 - June 30, 1994
Deliverables

5.4.1 Environmental Medicine & Risk Communication: Curriculum and a professional Support Network- Department of Family Medicine

44. Database Survey Report
45. Roster of SCSFPRP/EMCC members including two additional faculty who volunteered for the committee and dates of the site meetings
46. Report - Environmental & Occupational Medicine Curriculum Survey/Statewide Family Practice Residency Program
47. Report - Environmental & Occupational Medicine Patient Chart Review/Statewide Family Practice Residency Program
48. Report - Environmental & Occupational Medicine Survey of Family Medicine Residents/Statewide Family Practice Residency Program
49. Environmental & Occupational Medicine Curriculum Matrix/Statewide Family Practice Residency Program
50. Module 1- Environmental and Occupational Medicine History for Family Physicians

51 Module 2- Communicating Environmental and Occupational Risk to Patients: A Guide for the Family Physician

52 Module 3- Environmental and Occupational Medicine Resources for the Family Physicians

Human Recombinant Alpha2-HS Glycoprotein-Fetuin-pp63 is an Inhibitor of the Insulin Receptor Tyrosine Kinase.

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Abstract

Human Alpha2-HS glycoprotein (AHSG), a glycoprotein present in normal human plasma, was expressed in insect cells using the recombinant baculovirus system. The protein was purified from the cell supernatant and incubated with solubilized insulin receptors. Recombinant AHSG inhibited the tyrosine kinase activity of the insulin receptor in a dose-dependent fashion at concentrations in the range of those of the circulating protein. AHSG did not interfere with the binding of insulin to its receptor. These results suggest that human AHSG represents a natural inhibitor of the insulin receptor tyrosine kinase, and that its biological role is similar to that of its homologue in rats, pp63 (Auberger et al, Cell, 1989, 58, 631-640).

Key words: Alpha2-HS glycoprotein, fetuin, pp63, recombinant baculovirus, insulin receptors, tyrosine kinase.

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1- Introduction

Alpha2-HS glycoprotein (AHSG) is a protein synthesized in liver cells and found in normal human plasma at a concentration of 0.6 mg/mL [1]. First identifed separately by Heremans [2] and Schmid and Burgi [3], it was renamed alpha2-HS glycoprotein by Schultze [4] to include the initials of its discoverers. A number of biological properties have been attributed to AHSG but, until recently, no clear-cut biological role had emerged for this protein.

AHSG, when isolated from normal pooled human plasma, has been shown to consist of two peptides, one of 282 amino acids (aa) and the other of 27 aa, to which 2 N-glycans and 3 O-glycans [5, 6] are attached. The two aa chains are united by a single disulfide bridge. In contrast, these two chains are coded by a single cDNA which also encodes a connecting peptide through a common open reading frame [7, 8], and it is not clear whether the cleavage of this connecting peptide, leading to the 2-chain structure, is arising intracellularly, extracellularly, or maybe as a result of protein purification.
Among the several properties which have been reported for AHSG, its involvement in the immune response and in bone metabolism have been best documented [9]. In addition, AHSG is a negative acute-phase protein [10, 11], and, following infection, inflammation, trauma and malignancy, its plasma concentration is significantly decreased.

The homologue of AHSG in cattle is fetuin [12], to which some of the biological properties of fetal calf serum (FCS) have been attributed [13]. In addition, the homologue of AHSG in rats is pp63, a phosphorylated glycoprotein which has been shown to be a natural inhibitor of insulin receptor tyrosine kinase (IR TK) activity [14]. As the two proteins have significantly diverged between man and rat (they share 61% homology at the aa level), it appeared important to show whether the properties of rat pp63 could be extended to its human homologue. Because of the inherent fragility of this protein, its relatively low levels in human plasma and the difficulty of its purification, we expressed its cDNA in insect cells using recombinant baculovirus technology.

2- Materials and methods.

2-1. Isolation of a human cDNA for AHSG.

A human liver cDNA expression library constructed in λgt11 was screened with specific antibodies to AHSG [8]. By checking approx. 50,000 recombinants, we isolated five clones which all began at position 99 of the A-chain. Rescreening of a different library with the partial clone as probe resulted in the isolation of a cDNA with an apparent size of ~ 1.5 kb. Following its subcloning in p-Bluescript (Stratagene, La Jolla, Ca.), determination of the sequence of this cDNA indicated that it had the entire coding sequence for the protein, including its leader peptide [7].

2-2. Construction of a recombinant baculovirus transfer vector (PVL 1392-AHSG).

The transfer plasmid PVL 1392 was obtained from InVitrogen (San Diego, Ca.). The AHSG insert was cut from p-Bluescript with EcoRV and BalI and blunt-end subcloned into the SmaI site of the transfer plasmid. Screening of the recombinants for orientation was performed by digestion with appropriate restriction endonucleases. The sequence integrity was determined by dideoxy sequencing.

2-3. Isolation of the recombinant baculovirus.

The Sf9 Spodoptera Frugiperda ovarian insect line was obtained from InVitrogen and maintained at 27°C in Graces medium supplemented with 10% FCS at a density of $3X10^6$/flask. Two mg of PVL 1392-AHSG DNA were co-transfected with 1 mg of Autographa Californica Nuclear Polyhedrosis Virus (ACMNPV, InVitrogen) and recombinants were detected by dot-blot hybridization using the AHSG cDNA labeled by random priming. Positive wells were further purified to a single recombinant virus by limiting dilution. The final isolate was positive up to a 10^{-7} dilution.

2-4. Expression in insect cells and purification of AHSG .

The virus titer was determined by plaque assay, and the optimal production of the AHSG protein was found to be at 7 days. A volume of 2.5 mL of baculovirus (titer $9X10^8$ pfu/mL) was added to 10^6 cells in a T75 culture flask (total volume 32.5 mL). The medium was replaced by the Graces medium without FCS before adding the virus. The cells were incubated at 27°C and the supernatant was harvested at day 7. AHSG was separated from other proteins produced by insect cells by a one-step affinity chromatography on Procion Red immobilized on Sepharose [15]. The purified extracts were stored at -80°C until assayed.

2-5. Insulin receptor preparations.

The effect of AHSG on IR TK activity was tested on two receptor preparations.

Human insulin receptors (HIR) were isolated from rat embryo fibroblasts [(Rat-1 cells, stably transfected with the complete HIR (-exon 11) coding sequence under SV 40 early promoter control (Gift from Dr. D.A. McClain) [16]. The cells were cultured as described [17] in F12/DMEM (50:50) supplemented with 10% FCS and 0.25 µM methotrexate, on 100 mm culture dishes; confluent cells were placed into media without FCS and methotrexate 18 hours before receptor preparation. Cells were washed in ice-cold PBS, scraped into PBS and pelleted by brief centrifugation. Pellets were solubilized in homogenization buffer (50 mM HEPES pH 7.4, 5 mM EDTA, 1% Triton X-100) and protease inhibitors [18] at 4°C for 30 min. and centrifuged at 100,000 x g for 90 min. Supernatants were applied to wheat germ agglutinin (WGA)-agarose columns and the receptors eluted with 50 mM HEPES, pH 7.4, 0.1% Triton-X100, 0.3 M N-acetylglucosamine [18] .

Rat insulin receptors were prepared from hindlimb muscles of male Wistar rats (~150 g) as previously described [18] . Rats were anesthetized with Methofane, the muscles rapidly dissected, frozen in liquid N_2 and powdered in a mortar. Receptors were solubilized and purified by WGA affinity chromatography as described above.

Receptors were stored at -80°C until assay. The insulin binding activity of WGA eluates was measured by equilibrium insulin binding, using A14[^{125}I]insulin (Eli Lilly Research Laboratories, Indianapolis, Ind., Spec. Act. 100-140 µCi/µg) without or with non labeled insulin, as described [17,18] . Non-specific binding in the presence of 1 µM insulin was subtracted as background.

2-6. Measurement of the IR TK activity.

TK activity was assayed against the synthetic substrate poly glu-tyr (4:1) (Sigma, Saint-Louis, Mo), under conditions modified from previous publications [17-19] . In a typical assay, WGA eluates (~25 fmol insulin binding activity) were preincubated for 60 min at 24°C with or without insulin (2 or 100 nM) in the presence of 1 mM $MnCl_2$, 10 mM $MgCl_2$, 0.1 mM sodium vanadate and 0.025 % bovine serum albumin (total volume 65 µL), to which was added either 10 µL assay buffer, or 10 µL of purified insect cell supernatant, from cells infected with wild type baculovirus, or infected with the virus containing the AHSG transcript. Poly glu-tyr (4:1) was added after the 60 min preincubation (final conc. 0.2 mg/mL); after 5 min the reaction was initiated by adding 25 µM γ[^{32}P]ATP and after labeling for 5 min at 24°C the reaction was stopped by adding 50 mM unlabeled ATP. Aliquots were spotted onto Whatman 3-MM filter papers, placed into a solution of ice-cold 10% trichloro acetic acid and 10 mM $Na_4P_2O_7$, washed with three changes of the solution, dried and ^{32}P quantitated by scintillation spectrophotometry. Samples without poly glu-tyr were assayed in parallel and subtracted from samples with added substrate.

Since preliminary experiments demonstrated that all affinity purified insect supernatants contained a low MW component with inhibitory activity, Procion Red column eluates (0.5 mL) were concentrated 20-fold in Ultrafree-MC centrifugal filtration units (MW cutoff 10,000) and reconstituted at least three times with assay buffer. The protein concentration in the recombinant extract was then measured and the sample diluted appropriately for the assay. Since the purified media extracts from the cells infected with the wild type virus contained no detectable protein, in some experiments they were supplemented before assay with α1-acid glycoprotein (orosomucoid, ORM), a glycoprotein of similar MW as AHSG, purified as described [20] . We assume that the low MW inhibitor in the eluates from Procion Red affinity chromatography was dimethyl sulfoxide (3%) which is known to inhibit insulin binding [21] and was included during purification of insect cell media as a solvent for phenyl methyl sulfonyl fluoride (PMSF).

2-7. Miscellaneous.

Proteins were quantified according to Bradford [22] using Biorad (Richmond, Ca.) products, and AHSG concentration was determined by Laurell-rocket technique [23] using a specific antiserum to AHSG (Behringwerke GMBH, Marburg, Germany). Dot-blots were performed on nitrocellulose membranes using a dot-blot apparatus (Biorad). Nucleotide probes were labeled by random priming [24] using a kit from Stratagene (La Jolla, Ca.). Nucleotides were sequenced by the dideoxy method [25] using the Sequanase kit from USB (Cleveland, Ohio). Protein characterization after blotting of SDS-polyacrylamide gels was performed by the two antibody technique as previously described [26]. The immobilized Procion Red was obtained from Pharmacia (Red Sepharose CL 6B, Piscataway, N.J.).

3- Results

3-1. Production and purification of the recombinant protein.

The isolation of a high-titer recombinant virus was performed by limiting dilution, and six rounds of purification were necessary to obtain a high-titer virus preparation. The supernatant of infected cells was purified using affinity chromatography on immobilized Procion Red. The protein isolated was apparently homogeneous on the basis of its behavior on SDS-polyacrylamide gel electrophoresis and it had retained its antigenic properties (fig. 1). The yield was over 30%.

3-2. Determination of the TK activity of the IR.

Results of experiments, which were carried out within one week after the insect cells supernatants were purified by affinity chromatography, are shown in Fig. 2A. Data are normalized to the maximally stimulated TK activity (100 nM insulin) of HIR assayed concurrently in phosphorylation buffer. Solubilized, recombinant HIR showed insulin dose-dependent marked stimulation of TK activity. In Fig. 2A, basal TK activity comprised 15-30% of the maximally stimulated activity, while in Fig. 2B, it comprised less than 5% of maximal activity (data not shown). IR TK was not affected by adding various concentrations of the affinity-purified, spin-filtered control supernatant from insect cells transfected with wild type baculovirus. Addition of a glycoprotein, ORM, to control supernatants was also ineffective. In contrast, the supernatants from insect cells, transfected with baculovirus expressing the AHSG transcript, were inhibitory. AHSG-containing supernatants were purified, concentrated by spin-filtration and diluted with assay buffer exactly as the controls, from which they differed only in that they contained AHSG. At low concentrations (3 and 17 µg/mL) AHSG caused minimal, if any, inhibition (-7% and -11% vs respective maximally stimulated controls). However, at a concentration of 83 µg/mL (1.65 µM) AHSG inhibited maximal IR TK activity by 69% and at a dose of 166 µg/mL (3.3 µM) by 87% (Fig. 2A). Basal IR TK activity was only mildly inhibited by AHSG, i.e. by 27% at the highest dose tested (not shown). After two months of storage at -80°C, the extracts were reassayed, using either HIR or rat muscle derived IR (Fig. 2B).While AHSG still inhibited the insulin stimulated kinase activity, its potency had declined; at the highest dose tested (166 µg/mL) the inhibition was ~50%. The inhibitory activity of AHSG on the TK activity of human and rat insulin receptors was similar (Fig. 2B). Neither the control extracts (with or without added ORM) nor the extracts containing recombinant AHSG affected insulin binding to HIR (data not shown). This is consistent with previous observations on pp63 [14] . The inhibitory activity of the AHSG preparation was tested again after 7 months of storage at -80°C, against the HIR. Its activity had declined further; 166 µg/mL inhibited by 22% and 332 µg/mL by 34% (data not shown).

4- Discussion

Although several effects have been reported for AHSG, its precise biological role was unclear since its discovery, and AHSG belonged to the group of plasma proteins in search of a function [27]. The demonstration of an effect of the rat homologue of AHSG as a modulator of the IR TK [14]

suggested a major biological function for this plasma protein. Indeed, only one such regulatory protein of kinase activities has been reported to date, the Mullerian inhibiting substance of Josso, which represents a natural inhibitor of the EGF receptor kinase.[28]. It was therefore important to determine whether AHSG, the human homologue of pp63, possessed similar biological effects.

Attempts in our laboratory to affect IR TK activity using AHSG isolated from human plasma from different sources and purified with various techniques, or from supernatants of cell culture of Hep3B, a cell line which is known to produce AHSG [29], had remained unsuccessful. In the meantime, the identity of pp63 with rat AHSG had been questioned [30, 31] Soon after, another laboratory confirmed that rat pp63 was the homologue of AHSG and indeed inhibited the IR TK, but failed to reproduce this effect when using purified human AHSG [32].

The present experiments demonstrate that the human protein produced in insect cells using a recombinant baculovirus inhibits the insulin receptor in the same fashion as the rat protein. Although there is only 61% identity at the aa level, all the 14 cysteine residues are conserved in the rat and human proteins [33]. The discrepancies found in the literature may reflect the fact that AHSG is a very fragile protein, difficult to purify without denaturation, and whose activity toward the IR, in our hands, decreased substantially with time. During the completion of this project, an other laboratory has been able to demonstrate the same activity for AHSG using material purified from human plasma by a two-step purification protocol involving affinity chromatography with immobilized anti-AHSG antibodies [34].

Appreciation of the biological consequences of the effect of AHSG on the insulin receptor needs further experiments. The inhibition of the IR TK activity has been reported [34] to inhibit phosphorylation of its substrate, IRS-1 [35], and its association with the p-85 subunit of phosphatidyl inositol-3 kinase. Nevertheless, in rats as well as in humans, this inhibition apparently only affects the mitogenic pathway and not the metabolic pathway of the cells tested [14, 34]. Another point which needs clarification is the mechanism of action of AHSG. It has been suggested that the protein is able to exert its effect on intact cells in rats [14], and more recently, in humans [34], indicating that this inhibitory effect is not limited to the liver, the major site of AHSG synthesis, but may, potentially, affect all cells expressing insulin receptors. It is therefore likely that AHSG binds to a cell surface domain of the receptor, either on the A chain or on the extracellular portion of the B chain.

The possible clinical implications of this new role for this protein are unknown. AHSG is heterogeneous at the DNA and protein levels due to considerable genetic polymorphism [8, 26, 36]. In this respect, it is tempting to speculate that some of the genetic variants of this protein might affect signal transduction, i.e. insulin sensitivity, differently. Further studies will be necessary to answer these questions.

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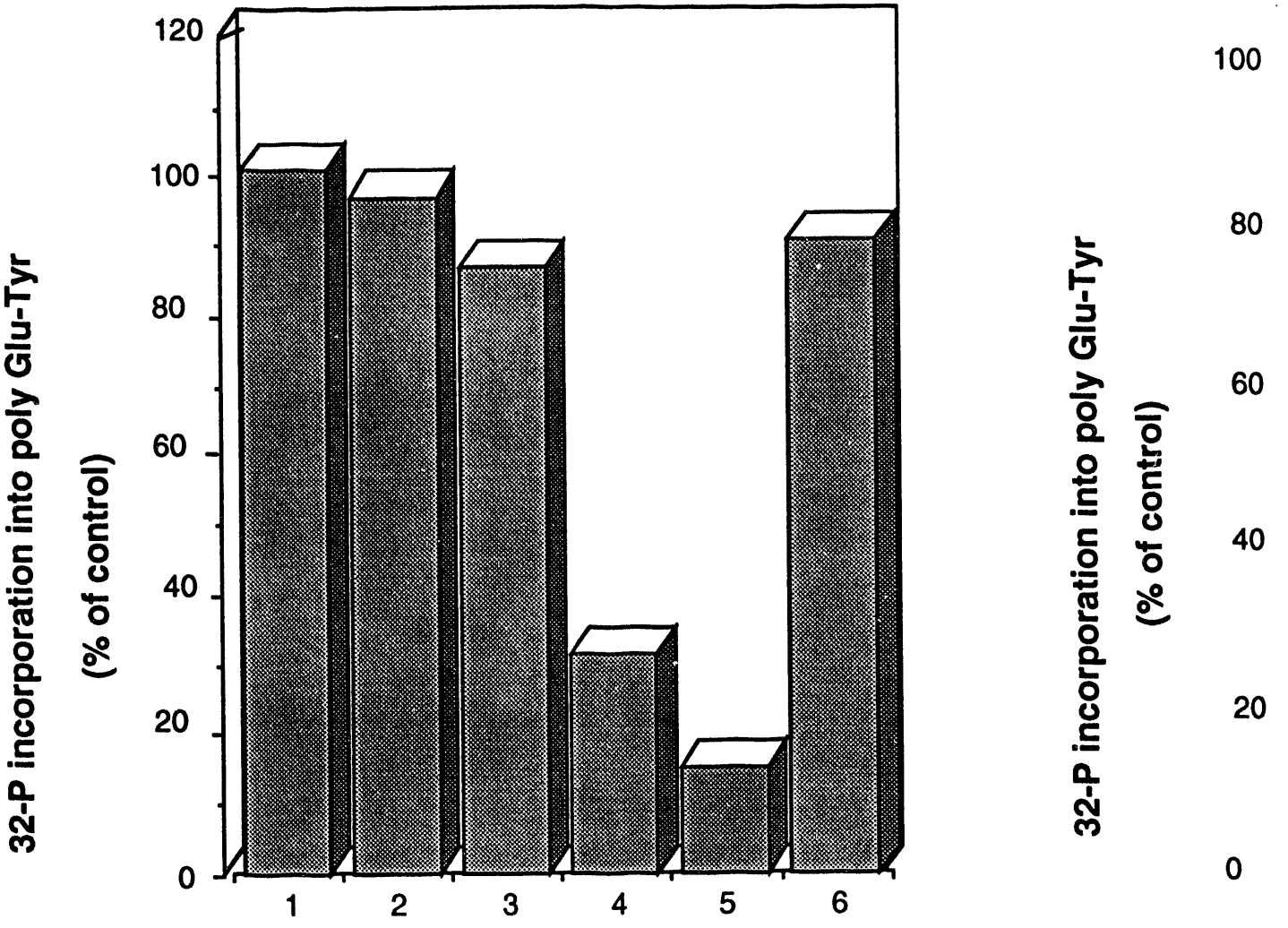
Legend, Fig. 1: Characterization of the recombinant AHSG. Supernatants of insect cells infected with the recombinant virus were purified as described in Methods and analyzed by SDS-polyacrylamide gel electrophoresis and immunoblot.
Fig.1A: Samples were run twice on the same gradient (4-15%, Biorad) SDS-polyacrylamide gel and one half of the gel was stained with Coomassie Brilliant Blue. Lane 1: prestained MW markers (Biorad); Lane 2: normal human plasma, 0.1 µL (approx. 6 µg); Lane 3: Purified AHSG, 0.3 µg; Lane 4: Purified ORM, 0.3 µg.
Fig.1B: The other half of the gel was electroblotted onto nitrocellulose (BA-S NC, Schleicher & Schuell) and developed using the 2-antibody technique [26]. First layer: Rabbit anti-human AHSG antibody (Behringwerke); second layer: goat anti rabbit antibody, peroxidase labeled (Biorad). Lane 1: MW markers; Lane 2: normal human plasma diluted 1/10, 0.5 µL; Lane 3: Purified AHSG, 30 ng; Lane 4: Purified ORM, 30 ng.

Fig.2A



Legend, Fig. 2: Insulin receptor tyrosine kinase activity.

Solubilized, recombinant human insulin receptors were assayed in A. The tyrosine kinase activity was measured as described in Methods, as ^{32}P incorporation into poly Glu-Tyr by ~25 fmol receptors incubated with 25 μM $\gamma[^{32}P]$ATP, for 5 min. at 24°C. Basal IR TK activity was 15-30% of maximally stimulated activity in unsupplemented phosphorylation buffer (~9200 cpm ^{32}P-incorporation into poly Glu-Tyr/5 min. in the presence of 100 nmol insulin); this latter value was considered as 100%. Results are given as percentage of this value. Receptors were preincubated for one hr. at 24°C with the

additions as follows: Lane 1: supernatant from insect cells infected with wild type baculovirus (BCWT). Lanes 2-5: supernatant from insect cells containing AHSG at concentrations of 3, 17, 83 & 166 ng/μL, respectively; Lane 6: BCWT plus alpha1-acid glycoprotein at a concentration of 166 ng/μL. BCWT and AHSG supernatants were subjected to identical purification steps, described in Methods, and were diluted identically for individual assays. Extracts were stored at -80°C for less than a week before assay. All values are means of at least two measurements.

In B, AHSG (stored at -80°C for ~2 months) was assayed on human recombinant IR (Lanes 2-4), at concentrations of 42, 83 & 166 ng/μL) and on rat IR, purified from rat skeletal muscle (Lane 6, hatched), at a concentration of 166 ng/μL; Lanes 1 and 5: human or rat receptors respectively plus BCWT, and Lane 7: human receptors plus BCWT + alpha1-acid glycoprotein (166 ng/μL). Note that AHSG inhibitory activity decreased upon storage, but that inhibition of rat and human receptors is similar.

Description of Animal Use.

1. a. Animals

   (1) 50 Male Osborne-Mendel rats (150-350 g) and 50 male B6C3F$_1$ mice (25-30 g) will be used in the proposed studies.

   b. Description of Use of Animals

   (1) Establishment of rat primary hepatocyte cultures: Hepatocytes will be isolated from male Osborne-Mendel rats (150-250 g) by collagenase perfusion according to the method of Oldham *et al.* (1980) with minor modifications. Animals will be anesthetized by ip injection of pentobarbital (50 mg/kg). While under anesthesia the peritoneal cavity will be opened using aseptic technique. The inferior vena cava will be ligated loosely and then cannulated with a sterile 21g butterfly needle. Once the ligature is secured around the cannula, a small incision will be made through the diaphragm, and the descending aorta and inferior vena cava will be clamped with a small hemostat. The portal vein will be cut and isolation of hepatocytes will proceed by a retrograde perfusion. The animals will not survive the procedure. Approximately 50 animals will be needed for this procedure.

   (2) Establishment of mouse primary hepatocyte cultures: Hepatocytes will be isolated from male B6C3F$_1$ mice (25-30 g) by collagenase perfusion according to the method of Oldham *et al.* (1980) with minor modifications. Animals will be anesthetized by ip injection of pentobarbital (50 mg/kg). While under anesthesia the peritoneal cavity will be opened using aseptic technique. The inferior vena cava will be ligated loosely and then cannulated with a sterile 25g butterfly needle. Once the ligature is secured around the cannula, a small incision will be made through the diaphragm, and the descending aorta and inferior vena cava will be clamped with a small hemostat. The portal vein will be cut and isolation of hepatocytes will proceed by a retrograde perfusion. The animals will not survive the procedure. Approximately 50 animals will be needed for this procedure.

2. Chemically-induced peroxisome proliferation is hypothesized to be a non-genotoxic mechanism of carcinogenesis and, thus, is deserving of study. By using primary hepatocyte cultures instead of whole animals, the number of animals needed for each experiment is drastically reduced. Because of the limited life span of primary hepatocyte cultures, continual re-establishment of the cultures is necessary. B6C3F$_1$ mice were chosen as a test species because this strain of mouse is the only animal species/strain in which trichloroethylene-induced hepatocarcinogenesis has been observed. In addition Osborne-Mendel rats have been the most widely used rat strain to study this phenomenon; they will serve as a non-hepatocarcinogenic control. The principal investigator has extensive experience in isolating rat hepatocytes and is familiar with the procedure used to isolate mouse hepatocytes; an adequate number of hepatocytes can be isolated from one mouse or rat for each experiment.

3. Animals will be housed in the Division of Laboratory Animal Resources under the direction of M. Michael Swindle, D.V.M., a diplomat of ACLAM. An assurance statement is on file with OPRR/DHHS detailing the program for laboratory animal care at MUSC. MUSC has full accreditation from AAALAC effective November 5, 1987.

4. Pentobarbital (50 mg/kg) will be used as an anesthetic in both hepatocyte isolation procedures. Surgery will be performed while the animals are under anesthesia and the animals will not survive the surgery. The animals will at all times be housed and treated such that unnecessary discomfort, distress, pain and injury will be avoided.

5. The following sources were searched to determine that animal use is necessary for this research: AWIC; ILAR; CAAT; PRIM&R; SCAW; Medline; Current Contents.

6. This work does not unnecessarily duplicate previous experiments performed by others, as determined by a literature search using Medline. Also, the proposed studies do not unnecessarily duplicate previous work performed by this laboratory.

MEDICAL UNIVERSITY OF SOUTH CAROLINA
171 Ashley Avenue - Charleston, SC
(DHHS ASSURANCE #A3428-01)

AR# 1317

PRINCIPAL INVESTIGATOR: MCMILLAN, JOELLYN M., Ph.D.

DEPARTMENT: Pharmacology

TITLE OF PROPOSAL: Trichloroethylene Hepatotoxicity: Species Comparison

SPECIES INVOLVED: RATS
MICE

APPROVAL DATE: 10/22/93 MEETING DATE: 10/20/93

STATEMENT OF INVESTIGATOR:

The Principal Investigator assures the following:

1. Alternatives to the use of live vertebrate laboratory animals were considered.
2. This experiment does not unnecessarily duplicate work performed by the PI.
3. The PI has consulted with MUSC staff veterinarians for any procedure involving pain or distress concerning appropriate use of anesthetics and analgesics, or PI is using accepted veterinary procedures.
4. Any facilities where survival surgical procedures or postoperative recovery is to be performed have been inspected and approved by the IACUC.
5. Personnel have been adequately trained for the procedures which they will be performing.
6. The number of animals to be used has been carefully considered and minimum number required to obtain valid results will be used.

STATEMENT OF THE IACUC:

This proposal has been reviewed and approved by the Committee. The IACUC gives assurance that it complies with the Public Health Policy on Humane Care and Use of Laboratory Animals and all applicable provisions of the Animal Welfare Act.

SIGNATURE OF APPROVAL: William C. Gorospe

William C. Gorospe, Ph.D., Chairman
Institutional Animal Care and Use Committee

(AAALAC FULL ACCREDITATION: 11/5/87)

JoEllyn McMillan, Ph.D.

PERFUSION PROCEDURE - Mouse

Materials:
3 bottles perfusion media (Blanch, Collagenase, Isolation)
1 tank 5% CO_2/95% O_2
1 lamp with 100W incandescent bulb
1 M $NaHCO_3$
Collagenase (12,500 units)
1 sterile 100 ml bottle
Heparin
2 Nalgene filter holders (one with a 200µ and one with a 60µ mesh screen)
3 x 50 ml capped plastic centrifuge tubes
3 x 100 ml beakers
1 cotton-plugged long pasteur pipette
1 x 250 ml beaker
70% ethanol
1 scalpel + blade
1 sharp scissors
1 tissue forceps
2 small angled forceps
1 small hemostat
1 x 9-inch length of single O ligature
8 cotton-tipped swabs
2 peristaltic pump tubes with tabs
2 extension tubes with a triple port end (one port plugged)
1 x 6-inch length of Tygon tubing (S-50-HL, class VI)
1 stainless steel stone
1 butterfly needle + tubing (25G X 3/4")
7 small strips of tape (2 inches)
2 long strips of tape (24 inches)
1 styrofoam board wrapped in aluminum foil
1 metal glassware basket (6" x 18")
1 plastic tub
1 peristaltic pump (Buchler, Polystaltic pump)
1 x 1cc tuberculin syringe with 27G needle
1 x 3cc syringe with 21G needle
Unplugged long pasteur pipettes
Suspension medium
2 x 1 ml pipettes
2 x 10-15 ml capped plastic tubes
Trypan blue (0.01% in 0.9% saline)
Hemocytometer
P200 Pipetman
Yellow pipet tips

Methods:
Assemble the perfusion tubing apparatus as follows:

A) Attach one end of each of the two peristaltic pump tubes to the triple port end of one of the extension tubes
B) Attach the other end of each of the two peristaltic pump tubes to the triple port end of the other extension tube
C) Attach the tygon tubing to the free end of one of the extension tubes

D) Attach the stainless steel stone to the free end of the tygon tubing

1. Warm perfusion media to 41°C
2. Set aside:
   2 Nalgene filter units
   3 capped 50 ml centrifuge tubes
   1 sterile 100 ml bottle (kept on ice)
3. Tape the foil-covered styrofoam board to the wire basket and place in dish tub
4. Attach the 7 short tape strips to the edge of the dish tub
5. Position lamp above the board and attach one end of one of the long tape strips to the lamp (the other end should be anchored out of the way)
6. Bubble 5% CO_2/95% O_2 through each perfusion medium for 5 min using a cotton-plugged long pasteur pipette
7. Adjust pH of each to 7.2 with 1 M $NaHCO_3$ using a long pasteur pipette
8. Weigh out 12,500 units of collagenase into the cold sterile 100 ml bottle and place on ice
9. Pour 100-125 ml of 70% ethanol into the 250 ml beaker
10. Place surgical tools and ligature in the ethanol aliquot
11. Pour a 50 ml aliquot of "Collagenase" medium into the bottle containing the collagenase and swirl to dissolve the collagenase
12. Pour collagenase solution back into the 500 ml "Collagenase" bottle
13. Pour out a 40, 60 or 80 ml aliquot of "Isolation" medium into the each of the three 100 ml beakers
14. Place bubbler system in the "Blanch" medium bottle
15. Set the beaker containing 60 ml "Isolation" medium next to the dish tub
16. Place five cotton-tipped swabs into the 60 ml of "Isolation" medium
17. Place the stone-weighted end of the perfusion tubing apparatus into the "Blanch" medium
18. Thread the two peristaltic pump tubes through the upper three levels of the peristaltic pump and anchor using the colored tabs (make sure that each tube is over a row of pump rollers and not caught between rows)
19. Attach the butterfly tubing (bevelled end up) to the free end of the perfusion tubing apparatus and anchor the connection to the styrofoam board with a small strip of tape (leave plastic sheath on needle)
20. Make up injection solution of heparin in a 3 ml syringe (0.5 ml heparin diluted up to 1.5 ml with sterile tissue culture-grade water)
21. Dose mouse with 60 mg/kg pentobarbital (50 mg/ml solution) using a 1cc tuberculin syringe (record amount in a log book)
22. When mouse is asleep weigh it and record weight in log book
23. Animal surgical procedure and liver perfusion procedure:
    A. Tape mouse to styrofoam board using 1 short strip of tape for each paw
    B. Wet the animal's abdominal region with 70% ethanol applied with one cotton-tipped swab
    C. Open skin using the scissors and tissue forceps; peel skin away from muscle layer using the scalpel
    D. Inject 0.5 ml dilute heparin solution into peritoneal cavity
    E. Open peritoneal cavity with the scissors, right side first, while pulling up on tissue flap with the tissue forceps (BE CAREFUL NOT TO DAMAGE LIVER)
    F. Move intestines to the right using a moist swab, exposing the inferior vena cava and the hepatic portal vein; anchor by twisting with dry swab; tape swab to board
    G. Move liver up towards diaphragm with a moist swab to expose more of the vena cava; tape end of swab to board

H. Thread ligature around vena cava (above renal vein) using angled forceps and tie into a loose knot (BE CAREFUL NOT TO RESTRICT THE FLOW OF BLOOD IN THE VEIN)
I. Tighten plate around tubes on peristaltic pump; turn on pump to get flow of liquid through butterfly needle, making sure there are no bubbles in the tubes (MAKE SURE FLOW RATE IS FAST ENOUGH -- 10 ml/min)
J. Cannulate vena cava with butterfly needle above renal vein; anchor butterfly with second long tape strip across plastic wings
K. Turn down pump speed to 50% maximum
L. Tighten ligature knot around needle in vein
M. Open thoracic cavity with a small cut through diaphragm to one side of sternum
N. Clamp off superior vena cava and descending aorta using the hemostat; hold hemostat upright
O Quickly turn on pump and cut hepatic portal vein (QUICKNESS IS IMPORTANT HERE)
P. Slowly increase pump speed to maximum (10 ml/min)
Q. Anchor hemostat upright using long strip of tape attached to lamp (lamp should be on)
R. Run "Blanch" medium through liver for 10 min (unblanched areas should be gotten rid of by **gently** rolling a moist cotton-tipped swab over them)
S. At 5 min transfer bubbler to "Collagenase" medium
T. At 10 min stop pump flow and transfer tubing to "Collagenase" medium; resume pump flow; pour some of remaining "Blanch" medium over liver to moisten it
U. Run "Collagenase" medium through liver for 15 min (at this time liver should crack when touched with a moist swab)
V. Rinse scissors and tissue forceps with "Isolation" medium
W. After 15 min remove liver to beaker containing 40 ml "Isolation" medium (use scissors and tissue forceps); mince liver with scissors

24. Pour supernatant into Nalgene filter unit containing the 200µ screen
25. Wash liver pieces with two 40 ml portions of "Isolation" medium from the beaker containing 80 ml
26. Pour washes into same filter unit as above
27. Ensure all loose cells have passed through screen by stirring with scissors
28. Pour cell suspension into filter unit containing the 60µ screen
29. Apply light vacuum to pull cells through screen
30. Pour this cell suspension into each of three 50 ml capped centrifuge tubes
31. Centrifuge at low speed (50 x g) for 2-3 min
32. Aspirate off supernatants using an unplugged pasteur pipette attached to a vacuum line
33. Resuspend each pellet in 5-10 ml warm (37°C) suspension medium
34. Divide up one of the cell suspensions between the other two
35. Centrifuge tubes again at low speed (50 x g) for 2 min
36. Repeat steps 34 and 35
37. Combine cell suspensions into one tube and bring volume up to 25 ml with warm suspension medium
38. Make a 4-fold dilution of the cell suspension with warm suspension medium in a 10-15 ml capped tube.(0.9 ml medium + 0.3 ml cell suspension)
39. Transfer 0.5 ml of this dilute cell suspension to another 10-15 ml capped tube; add an equal volume of 0.01% Trypan blue; mix thoroughly but gently
40. Assemble hemocytometer
41. Transfer a small drop of Trypan blue/cell suspension to each side of hemocytometer using P200 pipetman
42. Count blue cells vs total cells and calculate % viability {100 x (1 - [blue/total])}

43. Calculate total number of cells per ml (total x 8 x 10,000, where 8 is the dilution factor of the cell suspension and 10,000 is the hemocytometer factor)
44. Multiply this number by 25 to get the total number of cells obtained from the isolation procedure
45. Multiply # cells/ml by fraction viable to get # viable cells/ml
46. Dilute aliquot of original cell suspension with warm suspension medium to the desired concentration of viable cells

JoEllyn McMillan, Ph.D.

PERFUSION PROCEDURE - Rat

Materials:
3 bottles perfusion media (Blanch, Collagenase, Isolation)
1 tank 5% CO_2/95% O_2
1 desk lamp with 100W incandescent bulb
1 M $NaHCO_3$
Collagenase (~12,500 units)
1 sterile 100 ml bottle
Heparin (1,000 U/ml)
2 Nalgene filter holders (one with a 200µ and one with a 60µ mesh screen)
3 x 50 ml capped plastic centrifuge tubes
3 x 100 ml beakers
1 cotton-plugged long pasteur pipette
1 x 250 ml beaker
70% ethanol
1 scalpel + blade
1 sharp scissors
1 tissue forceps
2 small angled forceps
1 small hemostat
1 x 9-inch length of single O ligature
8 cotton-tipped swabs
3 peristaltic pump tubes with tabs
2 extension tubes with a triple port end
1 x 6-inch length of Tygon tubing (S-50-HL, class VI)
1 stainless steel stone
1 butterfly needle + tubing (21G X 3/4")
7 small strips of tape (2 inches)
1 medium strip of tape (reaches across board)
2 long strips of tape (24 inches)
1 styrofoam board wrapped in aluminum foil
1 metal glassware basket (6" x 18")
1 plastic tub
1 peristaltic pump (Buchler, Polystaltic pump)
1 x 1cc tuberculin syringe with 27G needle
1 x 3cc syringe with 21G needle
Unplugged long pasteur pipettes
Suspension medium
2 x 10 ml capped plastic tubes
Trypan blue (0.01% in 0.9% saline)
Hemocytometer
P1000 Pipetman
P200 Pipetman
Blue pipet tips
Yellow pipet tips

Methods:

Assemble the perfusion tubing apparatus as follows:

A) Attach one end of each of the two peristaltic pump tubes to the triple port end of one of the extension tubes
B) Attach the other end of each of the two peristaltic pump tubes to the triple port end of the other extension tube
C) Attach the tygon tubing to the free end of one of the extension tubes
D) Attach the stainless steel stone to the free end of the tygon tubing

1. Warm perfusion media to 41°C
2. Set aside on ice:
   2 Nalgene filter units
   3 capped 50 ml centrifuge tubes
   1 sterile 100 ml bottle
3. Tape the foil-covered styrofoam board to the wire basket and place in dish tub
4. Attach the 7 short tape strips to the edge of the dish tub
5. Position lamp above the board and attach one end of one of the long tape strips to the lamp (the other end should be anchored out of the way)
6. Bubble 5% CO_2/95% O_2 through each perfusion medium for 5 min using a cotton-plugged long pasteur pipette
7. Adjust pH of each to 7.2 with 1 M $NaHCO_3$ using a long pasteur pipette
8. Weigh out approx. 12,500 units of collagenase into the cold sterile 100 ml bottle and place on ice
9. Pour 100-125 ml of 70% ethanol into the 250 ml beaker
10. Place surgical tools and ligature in the ethanol aliquot
11. Pour a 50 ml aliquot of "Collagenase" medium into the bottle containing the collagenase and swirl to dissolve the collagenase
12. Pour collagenase solution back into the 500 ml "Collagenase" bottle
13. Pour out one 40, one 60 and one80 ml aliquot of "Isolation" medium into each of the three 100 ml beakers
14. Place bubbler system in the "Blanch" medium bottle
15. Set the beaker containing 60 ml "Isolation" medium next to the dish tub
16. Place five cotton-tipped swabs into the 60 ml of "Isolation" medium
17. Place the stone-weighted end of the perfusion tubing apparatus into the "Blanch" medium
18. Thread the two peristaltic pump tubes through the upper three levels of the peristaltic pump and anchor using the colored tabs (make sure that each tube is over a row of pump rollers and not caught between rows)
19. Tighten plate around tubes on peristaltic pump; turn on pump to get flow of liquid through butterfly needle, making sure there are no bubbles in the tubes (MAKE SURE FLOW RATE IS FAST ENOUGH -- 30 ml/min)
20. Attach the butterfly tubing (bevelled end up) to the free end of the perfusion tubing apparatus and anchor the connection to the styrofoam board with a small strip of tape (leave plastic sheath on needle)
21. Make up injection solution of heparin in a 3 ml syringe [0.5 ml heparin (1,000 U/ml) diluted up to 1.5 ml with sterile tissue culture-grade water]
22. Dose rat with 50 mg/kg pentobarbital (50 mg/ml solution) using a 1cc tuberculin syringe (record amount in a log book)
23. When rat is asleep weigh it and record weight in log book
24. Animal surgical procedure and liver perfusion procedure:

A. Tape rat to styrofoam board using 1 short strip of tape for each paw
B. Wet the animal's abdominal region with 70% ethanol applied with cotton-tipped swabs
C. Open skin using the scissors and tissue forceps; peel skin away from muscle layer using the scalpel
D. Inject 1.5 ml diluted heparin solution into peritoneal cavity
E. Open peritoneal cavity with the scissors, right side first, while pulling up on tissue flap with the tissue forceps (BE CAREFUL NOT TO DAMAGE LIVER)
F. Move intestines to the right using a moist swab, exposing the inferior vena cava and the hepatic portal vein; anchor intestines by twisting with dry swab; tape swab to board
G. Move liver up towards diaphragm with a moist swab to expose more of the vena cava; tape end of swab to board
H. Thread ligature around vena cava (above renal vein) using angled forceps and tie into a loose knot (BE CAREFUL NOT TO RESTRICT THE FLOW OF BLOOD IN THE VEIN)
I. Cannulate vena cava with butterfly needle above renal vein; anchor butterfly with medium length tape strip across plastic wings
J. Turn down pump speed to 50% maximum
K. Tighten ligature knot around needle in vein
L. Open thoracic cavity with a small cut through diaphragm to one side of sternum
M. Clamp off superior vena cava and descending aorta using the hemostat; hold hemostat upright
N Quickly turn on pump and cut hepatic portal vein (QUICKNESS IS IMPORTANT HERE)
O. Slowly increase pump speed to maximum (30 ml/min)
P. Anchor hemostat upright using long strip of tape attached to lamp (lamp should be on)
Q. Run "Blanch" medium through liver for 10 min (unblanched areas should be gotten rid of by rolling a moist cotton-tipped swab over them)
R. At 5 min transfer bubbler to "Collagenase" medium
S. At 10 min stop pump flow and transfer tubing to "Collagenase" medium; resume pump flow; pour remaining "Blanch" medium over liver to moisten it
T. Run "Collagenase" medium through liver for 15 min (at this time liver should crack when touched with a moist swab)
U. Rinse scissors and tissue forceps with "Isolation" medium
V. After 15 min remove liver to beaker containing 40 ml "Isolation" medium (use scissors and tissue forceps); mince liver with scissors

25. Pour supernatant into Nalgene filter unit containing the 200μ screen
26. Wash liver pieces with two 40 ml portions of "Isolation" medium from the beaker containing 80 ml
27. Pour washes into same filter unit as above
28. Ensure all loose cells have passed through screen by stirring with scissors
29. Pour cell suspension into filter unit containing the 60μ screen
30. Apply a light vacuum to draw cell suspension through screen
31. Pour this cell suspension into each of the three 50 ml capped centrifuge tubes
32. Centrifuge at low speed (50 x g) for 2-3 min

33. Aspirate off supernatants using an unplugged pasteur pipette attached to a vacuum line
34. Resuspend each pellet in 10 ml warm (37°C) suspension medium
35. Divide up one of the cell suspensions between the other two
36. Centrifuge tubes again at low speed (50 x g) for 2-3 min
37. Repeat steps 32 - 35
38. Repeat steps 32 and 33
39. Combine cell suspensions into one tube and bring volume up to 40 ml with warm suspension medium
40. Make a 4-fold dilution of the cell suspension with warm suspension medium in a 10 ml capped tube.(0.9 ml medium + 0.3 ml cell suspension) using a P1000 pipetman
41. Transfer 0.5 ml of this dilute cell suspension to another 10 ml capped tube; add an equal volume of 0.1% Trypan blue; mix thoroughly but gently
42. Assemble hemocytometer
43. Transfer a small drop of Trypan blue/cell suspension to each side of hemocytometer using P200 pipetman
44. Count blue cells vs total cells and calculate % viability [100 x (1 - blue/total)]
45. Calculate total number of cells per ml (total x 8 x 10,000, where 8 is the dilution factor of the cell suspension and 10,000 is the hemocytometer factor)
46. Multiply this number by 40 to get the total number of cells obtained from the isolation procedure
47. Multiply # cells/ml by viability factor to get # viable cells/ml
48. Dilute aliquot of original cell suspension with warm suspension medium to the desired concentration of 8 x 10^{6} viable cells/ml

JoEllyn McMillan, Ph.D.

PALMITOYL-CoA OXIDASE ACTIVITY

Reagents:

In 1 ml cuvette:
0.05 mM Palmitoyl-CoA (omit from blank)
0.25 mM NAD^+
0.125 mM Coenzyme A
6.25 mM Dithiothreitol
1.5 mM KCN
0.01% (w/v) Triton X-100
0.15 mg BSA
125-500 µg homogenate protein
50 mM Tris-HCl buffer, pH 7.6

Method:

Total volume per sample: 1 ml
Spectrophotometer wavelength: 340 nm
Cell temperature: 37°C
Activity quantified as nmoles NADH formed/min/mg homogenate protein
Extinction coefficient: 6.22 cm^{-1} mM^{-1}
Use kinetic mode on Shimadzu spectrophotometer

Stock Reagents:

50mM Tris-HCl, pH 8.0
Weigh out 7.88 g Tris-HCl
Add to 900 ml ddH_2O
Adjust to pH 7.6 with NaOH
Adjust final volume to 1 L with dd H_2O

0.05 mM Palmitoyl-CoA
Weigh out 10 mg palmitoyl-CoA
Add to 10 ml Tris-HCl buffer

Add 50 µl to test cell for 0.05 mM palmitoyl-CoA

0.25 mM NAD^+
Weigh out 33.2 mg NAD^+
Add to 10 ml Tris-HCl buffer

Add 50 µl to test cell for 0.25 mM NAD^+

0.125 mM Coenzyme A
Weigh out 19.2 mg coenzyme A
Add to 10 ml Tris-HCl buffer

Add 50 µl to test cell for 0.125 mM coenzyme A

6.25 mM DTT
Weigh out 192.8 mg DTT
Add to 10 ml Tris-HCl buffer

Add 50 µl to test cell for 6.25 mM DTT

1.5 mM KCN
Weigh out 19.5 mg KCN
Add to 10 ml Tris-HCl buffer

Add 50 µl to test cell for 1.5 mM KCN

0.15 mg/ml BSA
Weigh out 30 mg BSA
Add to 10 ml Tris-HCl buffer

Add 50 µl to test cell for 0.15 mg/ml BSA

0.01% (w/v) Triton X-100
Dilute 10% solution 10-fold with Tris-HCl buffer
(1ml + 9 ml buffer)

Add 10 µl to test cell for 0.01% Triton X-100

JoEllyn McMillan, Ph.D.

CARNITINE ACETYLTRANSFERASE ACTIVITY

Reagents:

In 1 ml cuvette:
3.125 mM DL-Carnitine (omit from blank)
0.25 mM Acetyl-CoA
0.156 mM 5,5'-dithiobis-(2-nitrobenzoic acid)[DTNB]
1.25 mM EDTA
12.5-200 µg homogenate protein
50 mM Tris-HCl, pH 8.0

Method:

Total sample volume: 1 ml
Spectophotometer wavelength: 412 nm
Temperature: 37°C
Activity quantified as nmol acetylcarnitine/min/mg homogenate protein
Extinction coefficient: 13.6 cm^{-1} mM^{-1}
Use kinetic mode on spectrophotometer

Stock Reagents:

50mM Tris-HCl, pH 8.0
Weigh out 7.88 g Tris-HCl
Add to 900 ml ddH_2O
Adjust to pH 8.0 with NaOH
Adjust final volume to 1 L with dd H_2O

3.125 mM Carnitine
Weigh out 123.6 mg carnitine
Add to 10 ml Tris-HCl buffer

Add 50 µl to test sample for 3.125 mM carnitine

0.25 mM Acetyl CoA
Weigh out 40.5 mg acetyl CoA
Add to 10 ml Tris-HCl buffer

Add 50 µl to test sample for 0.25 mM acetyl CoA

0.156 mM DTNB
Weigh out 12.0 mg DTNB
Add to 10 ml Tris-HCl buffer

Add 50 µl to test sample for 0.156 mM DTNB

1.25 mM EDTA
Weigh out 93.0 mg EDTA (sodium salt)
Add to 10 ml Tris-HCl buffer

Add 50 µl to test sample for 1.25 mM EDTA

JoEllyn McMillan, Ph.D.

DNA SYNTHESIS BY ^{3}H-THYMIDINE

Procedure for HepG2 and Hep3B Cells

1. Plate cells in 12-well tissure culture plates
2. When cells have reached 60-70% confluency, medium is changed to serum free medium for 24 hrs
3. After 24 hrs add EGF (20 ng/ml) as a positive control and test compounds in appropriate concentrations
4. Also add ^{3}H-thymidine (1 μCi/ml); incubate cells for 24 hours in cell culture incubator
5. Wash cells 3 times with ice-cold PBS
6. Solubilize cells in 1 ml of 0.1% SDS at 22°C for 1 hour
7. DNA is precipitated with 1.5 ml ice-cold 20% TCA and collected on glass fiber filters (Whatman GF-B)
8. The ppt is washed 3 times with 10% TCA and radioactivity collected on the dried filters is quantitated by liquid scintillation counting in 10 ml of scintillation cocktail

Procedure for Primary Hepatocytes

1. Plate cells in 12-well tissure culture plates at a cell density of 0.4 x 10^6 viable cells/ml in William's medium E containing 10% FBS and 0.32 μg/ml insulin
2. Allow cells to attach for 2 hours.
3. Remove old medium and unattached cells and add new, serum-free medium
4. Add 100ng/ml EGF as a positive control; add test compounds at appropriate concentrations
5. Add ^{3}H-thymidine (1 μCi/ml)
6. Allow cells to sit in incubator for 48 hours
7. Follow steps 5–8 as in HepG2/Hep3B procedure

SPECTRUM '94

NUCLEAR AND HAZARDOUS WASTE MANAGEMENT INTERNATIONAL TOPICAL MEETING

August 14 - 18, 1994

Hyatt Regency Atlanta
Atlanta, Georgia, USA

Lisa

14 V 22 (1-1/2)

June 2, 1994

Dear poster session participant,

Congratulations on the acceptance of your presentation of your paper in a poster session. The poster sessions are a vital part of Spectrum '94 as they allow conference participants to directly and personally interface with the author. Thank you for your participation.

You should have completed your final paper by this time and submitted it to ANS Publications. The paper will be included in the conference proceedings.

The following instructions are provided to aid you in preparing your poster setup.

- The poster must be able to fit on a 4 foot by 8 foot (1.2 meter by 2.4 meter) backboard. The backboard will be provided.
- Velcro and pins for affixing the poster to the backboard will be provided. These items will be provided at the Speakers' Table, located by the Registration Table.
- Poster sessions will begin at 1:30 pm and end at 5:00 pm on Monday, Tuesday, and Wednesday of the conference. Please set your poster up in the morning of the day your poster session is scheduled. Please plan to stay with your poster for the duration of the session. Dismantle your poster at the end of the poster session or first thing the next morning.
- Attached is a layout of the poster session room and a listing of the posters that will be presented in your session. Note that your poster has been assigned to a particular location.
- If you need a table to accompany your backboard, please contact Milton Gordon (803-644-6746, fax 803-644-6922) or Kathy Mottel (803-725-5885, fax 803-725-4704) by June 30.

If you have any questions or comments, please do not hesitate to contact Kathy or Milton. I look forward to meeting you at Spectrum '94.

Sincerely,

M. John Plodinec

John Plodinec
Technical Program Chair

enclosure

A Fast Parallel Algorithm for Computing Lie Series Solutions of Systems of Autonomous Differential Equations with Applications to Physiologically Based Pharmacokinctic Modeling and Simulation

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I. INTRODUCTION

Physiologically-based pharmacokinetic (PB-PK) modeling and simulation have been an integral part of environmental exposure analysis and health risk assessment. PB-PK models are typically represented in the form of a system of *autonomous differential equations* in which the independent variable time does not appear in the right side of the differential equations.[1] For most PB-PK models, these autonomous differential equations are likely to contain nonlinear terms such as the ones describing the effect of Michaelis-Menten saturable metabolism. It is in general a difficult task to derive closed form analytical solutions of a system of nonlinear autonomous differential equations. In fact, even for a simple equation such as the one shown below which has a single Michaelis-Menten nonlinear term,

$$\frac{dx}{dt} = cx - \frac{V_{\max} x}{x + K_m}. \tag{1}$$

the solution $x(t)$ cannot be expressed in an explicit closed form. The common approaches to nonlinear PB-PK modeling and simulation are based on the use of numerical integration methods.

It has been known that the solutions of a system of L autonomous real variable differential equations,

$$\begin{array}{rclrcl} \dot{x}_1 &=& F_1(x_1, x_2, \ldots, x_L) & x_1(0) &=& \alpha_1 \\ \dot{x}_2 &=& F_2(x_1, x_2, \ldots, x_L) & x_2(0) &=& \alpha_2 \\ \vdots & & \vdots & \vdots & & \vdots \\ \dot{x}_L &=& F_L(x_1, x_2, \ldots, x_L) & x_L(0) &=& \alpha_L \end{array} \tag{2}$$

can be expressed in the form of Lie series:

$$\begin{aligned} x_1(t) &= \sum_{n=0}^{\infty} \frac{t^n}{n!} M_{\alpha_1}^{(n)} \\ x_2(t) &= \sum_{n=0}^{\infty} \frac{t^n}{n!} M_{\alpha_2}^{(n)} \\ &\vdots \quad\quad \vdots \\ x_L(t) &= \sum_{n=0}^{\infty} \frac{t^n}{n!} M_{\alpha_L}^{(n)} \end{aligned} \tag{3}$$

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where for $j = 1, 2, \ldots, L$,

$$\begin{aligned} M_{\alpha_j}^{(0)} &= \alpha_j, \\ M_{\alpha_j}^{(1)} &= F_j(\alpha_1, \alpha_2, \ldots, \alpha_L), \quad \text{and} \\ M_{\alpha_j}^{(n)} &= \sum_{i=1}^{L} F_i(\alpha_1, \alpha_2, \ldots, \alpha_L) \frac{\partial M_{\alpha_j}^{(n-1)}(\alpha_1, \alpha_2, \ldots, \alpha_L)}{\partial \alpha_i}, n \geq 2. \end{aligned} \tag{4}$$

Approximate solutions of a system of autonomous differential equations in the form of truncated Lie series offer several advantages. First, the coefficients of the truncated series can be obtained in a systematic way independent of the actual form of the autonomous differential equations. The only input needed in the computation is the initial values of the variables and their higher order derivatives. Secondly, the Lie series solutions are in an explicit functional form which is more amenable to further analysis, interpretation, and evaluation. Thirdly, when the Lie series solution of a particular equation system converges over a reasonably large region, the Lie series method can be used as a meaningful alternative to the commonly used numerical integration-based methods. The main difficulty that has kept the Lie series approach from being of much practical value is the intractable computational complexity involved in computing the Lie series coefficients by directly using the mathematical definitions in (4).

In this paper, we derived a fast algorithm for computing coefficients of truncated Lie series solutions of large systems of autonomous differential equations. The algorithm by its nature can be ideally implemented on a multi-node parallel computer such as the Intel Paragon supercomputer. We prove that for an L variable differential equation system, the number of floating point multiplications needed for the computation of coefficients of an N term truncated Lie series solution has an upper bound that asymptotically approaches $\frac{2}{L^{L-1}(L-1)!}N^{2L+1}$ as N becomes large. Through the use of a run-time storage rearrangement scheme, the required memory space for this algorithm is also kept under a manageable level. An example with a simple Michaelis-Menten nonlinear term demonstrates the application of truncated Lie solutions to PB-PK modeling. Results from the sample are compared to that obtained through a numerical integration method. We also show that the convergence region of the Lie series solution may be enlarged through appropriate nonlinear transformation of variables.

II. Derivation of the Algorithm

Let N be the number of terms in the truncated Lie series solutions of the system of differential equations. We define for $j = 1, 2, \ldots, L$,

$$Q_{j,[p_1 p_2 \cdots p_L]}^{0} = \frac{\partial^{(\sum_{i=1}^{L} p_i)} F_j}{\partial \alpha_1^{p_1} \partial \alpha_2^{p_2} \cdots \partial_L^{p_L}}, \tag{5}$$

and

$$\begin{aligned} Q_{j,[p_1 p_2 \cdots p_L]}^{n} = \sum_{k_1=0}^{p_1} \sum_{k_2=0}^{p_2} \cdots \sum_{k_L=0}^{p_L} \binom{p_1}{k_1} \binom{p_2}{k_2} \cdots \binom{p_L}{k_L} \sum_{l=1}^{L} \Big[& Q_{j,[k_1 k_2 \cdots (k_l+1) \cdots k_L]}^{(n-1)} \\ & \cdot Q_{l,[(p_1-k_1)(p_2-k_2)\cdots(p_L-k_L)]}^{0} \Big], \end{aligned} \tag{6}$$

for $n := 1$ **to** $N-2$ **do**

for $m := N-2-n$ **step** -1 **until** 0 **do**

begin

$sum := 0$;

for $k := 0$ **to** m **do** $sum := sum + (k+1) * w[n+k+1] * s[m-k]$;

$sum := sum/(n+1)$;

$w[n+m+1] := sum$;

end.

A computational complexity analysis of the algorithm in (9) shows that for a system of L real variable autonomous differential equations, the number of floating point multiplications needed for obtaining the coefficients of the first N terms of a truncated Lie series solution will be approximately

$$\sum_{n=0}^{N-2} \sum_{m=0}^{N-2-n} \sum_{\forall (p_1,p_2,\cdots,p_L) \in P(m,L)} 2L \prod_{l=1}^{L} (p_l+1).$$

After a fairly lengthy derivation, it turns out that as N increases, the number of multiplications has an upper bound that asymptotically approaches

$$\frac{2}{L^{L-1} \cdot (L+1)!} N^{2L+1}.$$

We have also developed a memory space saving scheme and proved that, in general, for an N term truncated Lie series solution of a system of L equations, the rate of increase in storage due to increase in L is $(N-2)/(L+1)$ and the rate of increase due to increase in N is $L/(N-1)$.

III. An Example

The simple autonomous differential equation

$$\frac{dx}{dt} = \frac{-x}{1+x}, \qquad x(0) = 1.0$$

is used here to demonstrate the application of our fast algorithm for computing Lie series solutions. We are current implementing the algorithm for solving systems of large number of equations. Results from more complicated multivariate PB-PK models will be presented in the final full length version of this paper.

In order to improve the convergence property of the resultant solution, we applied the non-linear variable transformation $x = e^y$, the new equation in variable y becomes:

$$\frac{dy}{dt} = \frac{-1}{1+e^y}, \qquad y(0) = 0.$$

where $n = 1, 2, \ldots, N-2$, and for $l = 1, 2, \ldots, L$, $p_l = 0, 1, \ldots, N-2-n$ and $\sum_{l=1}^{L} p_l \leq N-2-n$. We then proved that for $j = 1, 2, \ldots, L$

$$\begin{aligned} \frac{\partial Q^n_{j,[p_1 p_2 \cdots p_L]}}{\partial \alpha_j} &= Q^n_{j,[p_1 p_2 \cdots (p_j+1) \cdots p_L]}, \quad \text{and} \\ Q^n_{j,[\underbrace{00\cdots00}_{L}]} &= M^{(n+1)}_{\alpha_j}. \end{aligned} \tag{7}$$

With the following definition

$$S^n_{j,[p_1 p_2 \cdots p_L]} = \frac{Q^n_{j,[p_1 p_2 \cdots p_L]}}{(n+1)!\, p_1!\, p_2! \cdots p_L!}. \tag{8}$$

the iterative formula in (6) can be further simplified as

$$\begin{aligned} S^n_{j,[p_1 p_2 \cdots p_L]} = \frac{1}{(n+1)} \sum_{k_1=0}^{p_1} \sum_{k_2=0}^{p_2} \cdots \sum_{k_L=0}^{p_L} \sum_{l=1}^{L} (k_l+1) \cdot S^{(n-1)}_{j,[k_1 k_2 \cdots (k_l+1) k_{l+1} \cdots k_L]} \\ \cdot S^0_{l,[(p_1-k_1)(p_2-k_2)\cdots(p_L-k_L)]}, \end{aligned} \tag{9}$$

of which

$$S^n_{j,[\underbrace{00\cdots00}_{L}]} = \frac{M^{(n+1)}_{\alpha_j}}{(n+1)!},$$

is the desired coefficient of the $(n+1)$-th term of a truncated Lie series solution for the variable $x_j(t)$. An interesting property of the above algorithm is that the computation of $M^{(n+1)}_{\alpha_j}/(n+1)!$ is total independent of the computation of $M^{(n+1)}_{\alpha_k}/(n+1)!$, for $j \neq k$. This allows the algorithm to be implemented on a multi-node parallel supercomputer where each of the variables in a large systems of autonomous differential equations can be solved independently and in parallel.

As an example, the following pseudo code implements the above iterative algorithm in (9) for the special case of systems with only a single autonomous differential equation. The algorithm computes the coefficients of the first N terms of the Lie series solution and stores the result in vector w.

```
input N, α, F(α), dF/dα, ..., d^(N-2)F/dα^(N-2);
w[0] := α; c := 1;
for m := 0 to N − 2 do
  begin
    w[m + 1] := d^(m)F/dα^(m)/c;
    s[m] := d^(m)F/dα^(m)/c;
    c := c * (m + 1);
  end;
```

The approximate solution to the original equation is the inverse transformation of the truncated Lie series solution to the above equation:

$$x(t) = \exp\left[\sum_{n=0}^{N-1} \frac{M_y^n(0)}{n!} t^n\right].$$

Figure 1 compares the result of evaluating the above Lie series solution against the results from numerical integration. In order to further enlarge the convergence region and improve the results, we used the evaluation of the truncated Lie series solution at points away from the original initial condition point and use the results as initial conditions to compute coefficients of new truncated Lie series. Table 1 compares the evaluation results of Lie series solutions obtained at $t = 0.0$, $t = 3.0$, and $t = 6.0$ with the same numerical integration solution. Since the differences are too small to be seen in a curve plot, only evaluations at selected time points are listed in the table.

IV. CONCLUSIONS

In this paper, we briefly presented a fast parallel algorithm for the computation of coefficients of Lie series solutions of systems of autonomous differential equations. Demonstrated by a simple example, the algorithm has the potential to be used for PBPK modeling and simluation in environmental exposure analysis and health risk assessment.

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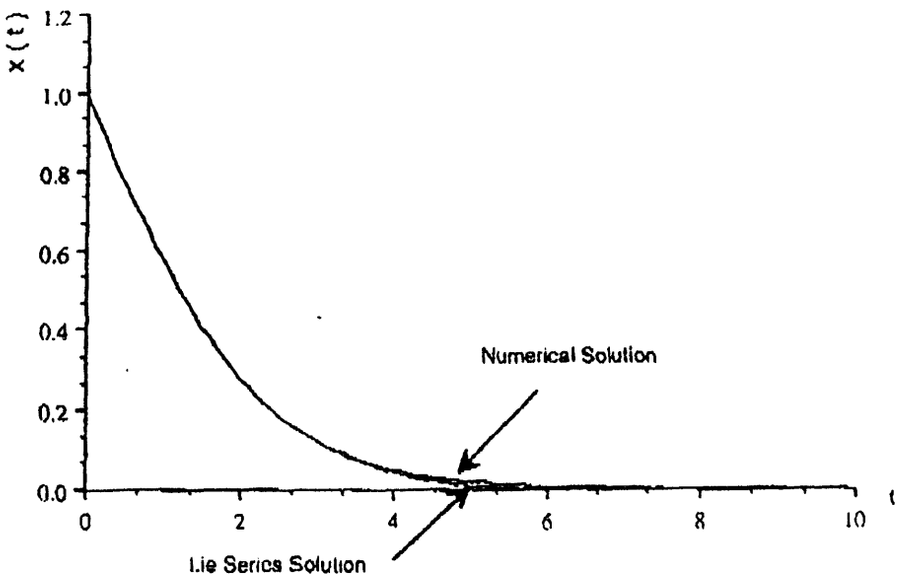

Figure 1: Comparison of solution of $dz/dt = -z/(1+z)$ using numerical integration and evaluation of Lie series solutions obtained through non-linear variable transformation $x = e^y$.

Time t	x(t) Num. Sol.	x(t) 3pt Lie Sol.	Error	Percentage Error
0.0	1.00000000	1.00000000	0.0000000000	0.00000000
0.5	0.76624865	0.76624861	0.0000000375	0.00000489
1.0	0.56714172	0.56714328	-0.0000015523	0.00027370
1.5	0.40467283	0.40467292	-0.0000000844	0.00002086
2.0	0.27846390	0.27844893	0.0000149675	0.00537501
2.5	0.18537640	0.18525530	0.0001211098	0.06533181
3.0	0.12003034	0.11948096	0.0005493819	0.45770255
3.5	0.07607421	0.07571125	0.0003629695	0.47712552
4.0	0.04747994	0.04724708	0.0002328645	0.49044815
4.5	0.02932542	0.02917927	0.0001461520	0.49837968
5.0	0.01798910	0.01789879	0.0000903089	0.50202025
5.5	0.01098719	0.01093001	0.0000571809	0.52043256
6.0	0.00669376	0.00663665	0.0000566035	0.85717839
6.5	0.00407071	0.00403582	0.0000348933	0.84284719
7.0	0.00247257	0.00245173	0.0000208400	0.84284719
7.5	0.00150122	0.00148848	0.0000127363	0.84839709
8.0	0.00091098	0.00090334	0.0000076376	0.83839881
8.5	0.00055276	0.00054810	0.0000046667	0.84425741
9.0	0.00033528	0.00033251	0.0000027737	0.82726983
9.5	0.00020332	0.00020171	0.0000016118	0.79271338
10.0	0.00012333	0.00012239	0.0000009418	0.76367097

Table 1: Comparison of solution of $dz/dt = -z/(1+z)$ using numerical integration and evaluation of Lie series solutions obtained at $t = 0.0$, $t = 3.0$, and $t = 6.0$.

SAVANNAH



Final Program and Abstracts

Society for Risk Analysis
Annual Meeting

December 5-8, 1993
Hyatt Regency
Savannah, Georgia

B Risk Communication Continued

B-TAM-06: A RETROSPECTIVE STUDY IN RISK COMMUNICATION: APPLICATION OF THEORY TO A REAL WORLD SITUATION
J. Fox, C. Ames, D. Fisher and D. Goraon; Eastman Kodak Company

B-TAM-07: RISK COMMUNICATION AND PUBLIC INVOLVEMENT METHODS IN COMPARATIVE RISK PROJECTS
D. H. Gutenson and S. L. Santos; US EPA, Washington, DC and Focus Group

B-TAM-08: RISK COMMUNICATION AND FACILITY PERMITTING: RESPONDING TO PUBLIC CONCERNS
K. M. Kennedy (Student Award Winner); University of California, Berkeley

Ballroom E/F

1:30-3:00 PM

B-TPM: SYMPOSIUM: ELECTRIC AND MAGNETIC FIELDS (EMF): RISK COMMUNICATIONS AND MANAGEMENT (PART I)
Chair: G. L. Hester

SYMPOSIA: B-TPM-01: BACKGROUND ON EMF ISSUE
G. L. Hester; Electric Power Research Institute

SYMPOSIA: B-TPM-02: ADDRESSING PUBLIC PERCEPTIONS AND MISCONCEPTIONS ABOUT EMF
A. Bostrom and C. J. Atman; GA Institute of Technology and University of Pittsburgh

SYMPOSIA: B-TPM-03: COMMUNICATING WITH THE PUBLIC ABOUT POSSIBLE HEALTH RISKS FROM POWER-FREQUENCY FIELDS
M. G. Morgan; Carnegie Mellon University

SYMPOSIA: B-TPM-04: COMMUNICATING WITH UTILITY CUSTOMERS ABOUT EMF
W. T. Croker; GA Power Company

Sloane Room

3:30-5:00 PM

B-TPM: FACTORS IN RISK COMMUNICATION AND MANAGEMENT
Chair: J. K. Doyle

B-TPM-09: THE ROLE OF COOPERATIVE RELATIONSHIPS IN RISK COMMUNICATIONS
S. Selig; The Calamus Group

B-TPM-10: THE RISKS OF COMMUNICATING RISK MAGNITUDES
J. K. Doyle; Worcester Polytechnic Institute

B-TPM-11: THE ROLE OF UNCERTAINTY IN RISK COMMUNICATION REGARDING MAJOR ACCIDENT HAZARDS
C. Vollono and G. Marsili; Istituto Superiore Di Sanita, Italy

B-TPM-12: INTRODUCING A NEW HAZARDOUS TECHNOLOGY: TWO EXPERIMENTS IN RISK COMMUNICATION
J. M. Gutteling; University of Twente, The Netherlands

Wednesday, 8 December

Waterfront Room

8:30-10:00 AM

B-WAM: THE STRUCTURE OF RISK PERCEPTIONS
Chair: P. Slovic

B-WAM-01: FAMILY PRACTICE PATIENTS' PERCEPTIONS OF ENVIRONMENTAL RISKS
C. Musham; Medical University of South Carolina

B-WAM-02: EVALUATING ECOLOGICAL AND HEALTH RISKS: THE GENDER GAP
R. J. Bord and R. E. O'Connor; Pennsylvania State University

B-WAM-03: CULTURAL INVARIANCE OF RISK PERCEPTION: SWEDEN VS BRAZIL
L. Sjoberg; Stockholm School of Economics, Sweden

B-WAM-04: A CAUSAL STRUCTURE APPROACH TO PERCEPTIONS OF SOCIAL AND ECOLOGICAL RISK
S. Sridharan, J. Thomas and M. McDonald; Virginia Commonwealth University

Waterfront Room

10:30 AM-NOON

B-WAM: MEDIA AND PERCEIVED RISK
Chair: R. Kasperson

B-WAM-05: RISK SIGNALS IN NEWSPAPER COVERAGE OF GLOBAL CLIMATE CHANGE: A CROSS-NATIONAL STUDY
S. Emani (Student Award Winner), J. X. Kasperson, R. E. Kasperson, A. Kluke, B. J. Perkins, S. J. Ratick and O. Renn; Clark University

B-WAM-06: THE INFLUENCE OF PRINTED MEDIA ON PERCEIVED RISK
M. K. Pisarcik (Student Award Winner) and D. T. Lackland; Medical University of South Carolina

B-WAM-07: EMERGENT BEHAVIOR AND PERCEIVED RISK: TENANT RESPONSE TO THE BOMBING AT THE WORLD TRADE CENTER
D. E. Wenger, G. O. Rogers and G. N. Vigo; Texas A&M University

B-WAM-08: PERCEIVED RISK AND RESPONSE TO EMERGENCY EVENTS: A CHEMICAL FIRE IN ODESSA, TEXAS
G. O. Rogers; Texas A&M University

B-WAM-06:

THE INFLUENCE OF PRINTED MEDIA ON PERCEIVED RISK. Michael K. Pisarcik, Daniel T. Lackland; The Medical University of South Carolina, Department of Biometry and Epidemiology, 171 Ashley Avenue, Charleston, SC, 29425.

Differences between risk estimation and risk perception can influence the assessment and management of risks, indicating that a better understanding of the factors which influence perceived risk is necessary. The effectiveness of risk communication can be influenced by the media method employed. A newspaper analysis quantifying environmental and health related articles was conducted in two geographic regions surrounding the Savannah River Site in South Carolina. Articles were classified according to content, length of article, availability and newspaper circulation. Categorization of the newspaper media produced a measure quantifying positive and negative messages concerning this major nuclear production facility. Perceived risk estimates from a telephone survey encompassing the same geographic areas were compared with the newspaper article assessment. The formatted telephone questionnaire was completed with individuals residing in a 50 mile and 50 - 100 mile radius of the Savannah River Site. The survey provided the percentage of people in the geographic areas that use printed media as a major source of information. Estimates of the influence from printed media on risk perception is obtained by combining the results from each study. Quantifying the influence provides a measure applicable to risk communication. New evaluation techniques for determining the effectiveness of risk communication has been documented in risk analysis journals. Providing risk communications with an estimate of printed media influence will assist in planning effective risk communication.

C/F-MPM-I-08:

TEMPORARY CFC SUBSTITUTION: EVALUATING THE NEED FOR ACTION BY CHARACTERIZING ASSOCIATED HEALTH RISKS AND BENEFITS.* M. L. Socolof, Oak Ridge National Laboratory, Box 2008, Oak Ridge, TN 37831-6190.

In determining whether or not to temporarily replace losses of chlorofluorocarbons (CFCs) with a substitute at the Department of Energy's (DOE's) gaseous diffusion plants (GDPs), this presentation characterizes the associated human health risks and benefits. The GDPs use about 13 million pounds of CFC-114 in their process cooling systems. The manufacture and purchase of CFC-114, an ozone depleting substance, must cease by January 1, 1996, pursuant to the Clean Air Act Amendments of 1990. DOE has potentially identified perfluorocarbons (PFCs) --non-ozone depleting, but strong global warming chemicals-- as temporary replacements for the CFC-114 and must decide whether or not to introduce them from January 1, 1996 through December 31, 1998. Three alternatives are considered in this presentation: (1) stockpiling CFC-114 and continuing to replace current losses with the stockpiled CFC-114; (2) taking no action with regards to a CFC substitute and continuing with existing operations without replacing losses; and (3) replacing CFC-114 losses with PFCs between January 1, 1996, and December 31, 1998. The health effects associated with each alternative are evaluated in this presentation for use in decisionmaking regarding what action to take from 1996 through 1998. The health effects related to CFC substitution are those from ozone depletion, global warming, and chemical toxicity. PFCs are non-toxic, simple asphyxiants but contain small quantities of perfluoroisobutylene, a toxic impurity. For incident-free operation with PFCs, low perfluoroisobutylene exposure levels would result in no appreciable health impacts. The global public health effects are difficult to confirm and quantify. Some health effects can be quantified (skin cancer and cataracts), while others (immunosuppression, spread of infectious disease, and heat stress) can only be qualitatively assessed or indirectly quantified using a surrogate. In comparing the alternatives, stockpiling increases the risk of skin cancers, cataracts, and immunosuppression to the greatest degree and enhances global warming-related health effects (e.g., infectious disease) to the second greatest degree. Taking no action results in the least amount of adverse health effects. Replacement with PFCs results in the greatest enhancement of global warming-associated effects and the second greatest cancer, cataract, and immunosuppression risks. Comparing the health effects from stockpiling and replacement with PFCs becomes troublesome because we cannot necessarily weigh some health effects over others. Therefore, any enhancement of potential adverse effects should be avoided where possible. From a health perspective (which is only one factor in the decision-making process), taking no action would be preferred. Deciding on a permanent replacement will require additional study into alternative coolants that preferably do not contribute so strongly to global warming. *(Work supported by the U.S. Department of Energy under Contract No. DE-AC05-84OR21400)

THE INFLUENCE OF PRINTED MEDIA ON PERCIEVED RISK. Michael K. Pisarcik, Daniel T. Lackland; The Medical University of South Carolina, Department of Biometry and Epidemiology, 171 Ashely Avenue, Charleston, SC, 29425.

Differences between risk estimation and risk perception can influence the assessment and management of risks, indicating that a better understanding of the factors which influence perceived risk is necessary. The effectiveness of risk communication can be influenced by the media method employed. A newspaper analysis quantifying environmental and health related articles was conducted in two geographic regions surrounding the Savannah River Site in South Carolina. Articles were classified according to content, length of article, availability and newspaper circulation. Categorization of the newspaper media produced a measure quantifying positive and negative messages concerning this major nuclear production facility. Perceived risk estimates from a telephone survey encompassing the same geographic areas were compared with the newspaper article assessment. The formatted telephone questionnaire was completed with individuals in a 50 mile and 50-100 mile radius of the Savannah River Site . The survey provided the percentage of people in the geography areas that use printed media as a major source of information. Estimates of the influence from printed media on risk perception is obtained from combining the results from each study. Quantifying the influence provides a measure applicable to risk communication. New evaluation techniques for determining the effectiveness of risk communication has been documented in risk analysis journals. Providing risk communication with an estimate of printed media influence will assist in planning risk communication.

SAVANNAH



Final Program and Abstracts

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Annual Meeting

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POSTERS

POSTER SESSION: TRACKS A, B, C/F

Monday 6 December - 8:00 AM-5:00 PM

Authors present: 2:30-4:00 PM

A-POSTER-01: ECOLOGICAL RISK ASSESSMENT PROGRAM PLAN FOR THE EVALUATION OF WASTE UNITS ON THE SAVANNAH RIVER SITE

L. A. Haselow, S. A. Dyer, L. Voss, G. P. Friday, J. B. Gladden, W. J. Rogers, Jr. and B. W. Cornaby; Westinghouse Savannah River Company and SAIC,TX and TN

A-POSTER-02: ANALYSIS OF RESULTS OF A PRELIMINARY ECOLOGICAL RISK ASSESSMENT TO GUIDE BASELINE ECOLOGICAL RISK ASSESSMENT EFFORTS AT A LARGE, COMPLEX DOE SITE

R. N. Hull, G. W. Suter II and R. R. Bonczek; Oak Ridge National Lab

A-POSTER-03: A STRATEGY FOR ECOLOGICAL RISK ASSESSMENT AT A LARGE, COMPLEX DOE SITE

R. R. Bonczek, R. N. Hull and G. W. Suter II; Oak Ridge National Lab

A-POSTER-04: ENVIRONMENTAL IMPACTS FROM IMPOUNDMENTS ON BENTHIC MACROINVERTEBRATE POPULATIONS DUE TO CHANGES IN WATER QUALITY: A GENERAL MODEL FOR THE DEVELOPMENT AND INTERPRETATION OF AQUATIC RISK ANALYSES

*J. Robertson **(Student Award Winner)**; University of North Carolina, Chapel Hill*

B-POSTER-01: PERCEIVED RISKS IN GEOGRAPHIC AREAS PROXIMAL TO A NUCLEAR PRODUCTION FACILITY

D. Lackland, M. Pisarcik and C. Musham; Medical University of South Carolina

B-POSTER-02: PHARMACISTS AND ENVIRONMENTAL RISK COMMUNICATION

C. Musham; Medical University of South Carolina

B-POSTER-03: COMMUNICATION OF RISK BY THE ENVIRONMENTAL RESTORATION DEPARTMENT AT THE SAVANNAH RIVER SITE

L. B. Smith and J. W. Immel; Westinghouse Savannah River Company

B-POSTER-04: PUBLIC RESPONSE AND QUANTIFYING RISK REDUCTION

G. O. Rogers, J. H. Sorensen and A. P. Watson; Texas A&M University and Oak Ridge National Lab

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C/F-POSTER-01: RISK-BASED CLEAN CLOSURE OF A HAZARDOUS WASTE STORAGE UNIT UNDER AMENDMENT 12 OF THE VIRGINIA HAZARDOUS WASTE MANAGEMENT REGULATIONS

R. H. Warren, R. B. Warren and K. Foster; Nittany Geoscience Inc.

C/F-POSTER-02: RANKING ACCIDENT SEQUENCE PRECURSORS

J.W. Minarick; Science Applications International Corporation

C/F-POSTER-03: A METHODOLOGY FOR SETTING SOIL CLEANUP GOALS BASED ON PROTECTION AGAINST ALLERGIC CONTACT DERMATITIS

B. L. Finley; ChemRisk

C/F-POSTER-04: AMERICAN SOCIETY FOR TESTING AND MATERIALS-NEW SUBCOMMITTEE ON ASSESSMENT OF RISK TO HUMAN HEALTH AND THE ENVIRONMENT FROM HAZARDOUS WASTE SITES

V. K. Wilkinson, F. Price and M. Kangas; Oak Ridge National Lab, The Mitre Corp and Life Systems Inc.

C/F-POSTER-05: PRELIMINARY RISK ASSESSMENT FOR BACTERIA AND VIRUSES IN LANDFILLED SEWAGE SLUDGE

M. Wilson, C. T. Hadden, M. C. Gibson and N. E. Kowal; SAIC and US EPA, Ohio

C/F-POSTER-06: AN ANALYSIS OF THE IMPACT OF POTENTIAL OFF-SHORE CHEMICAL RELEASES FROM A RCRA FACILITY, ON RISKS ASSOCIATED WITH INGESTION OF SEAFOOD FOR THE LOCAL POPULATION

E. M. Mahoney, K. M. Sayers and S. F. Urschel; E. Mahoney Associates Inc. and McLaren Hart

C/F-POSTER-07: RISK ASSESSMENT AS A PLANNING AND DECISION MAKING TOOL

A. F. Eidson and F. A. Seiler; IT Corporation

C/F-POSTER-08: EXPLORING SOLUTIONS TO GRIDLOCK, OR HOW TO BUILD A BRIDGE: CHOOSING THE PREFERRED CITIZEN PARTICIPATION STRATEGY TO AVOID NIMBY COMMUNITY RESPONSES

W. J. Focht, J. J. Lawler and M. W. Hirlinger; Oklahoma State University

CF-POSTER-09: THE USE OF INFLUENCE DIAGRAM IN EVALUATING THE SUBJECTIVE JUDGEMENT OF STAKEHOLDER

Y. Hong; Chemical Projects International

CF-POSTER-10: ASSESSING EMERGENCY PREPAREDNESS IN CONNECTION WITH SITE SPECIFIC RISK ANALYSES

M. K. Lindell; Michigan State University

Continued on Next Page 18

A-POSTER-04:

Environmental Impacts from Impoundments on Benthic Macroinvertebrate Populations Due to Changes in Water Quality: a general model for the development and interpretation of aquatic risk analyses.[1]

The impoundment of surface waters by natural and man-made dams is known to affect the water quality above, below, and within dammed areas. This alteration of the water quality directly effects the physical nature of the environment, and the natural populations of organisms spread throughout the watershed. These environmental impacts are often intentional; however many more are unanticipated with deleterious side-effects. I have created a model that describes the effects of small and medium sized dams upon downstream populations of benthic macroinvertebrates. This model is a general space-state model, describing spatial changes to benthic populations over time in relation to their proximity to dammed areas. While the model requires rates that are species specific, I believe that it can be applied in general to predict spatial and temporal changes in populations due to the creation of impoundments. I have not yet attempted to validate the model, though I have outlined three possible methods in my full report(two of which are entirely practical) for checking the accuracy of my model, and plan on beginning the validation process this Fall. I believe that this model can be used within the environmental risk assessment process, and as a guideline for risk analyses.

B-POSTER-01:

PERCEIVED RISKS IN GEOGRAPHIC AREAS PROXIMAL TO A NUCLEAR PRODUCTION FACILITY.
Daniel Lackland, Michael Pisarcik, Catherine Mushan; The Medical University of South Carolina, Departments of Biometry and Epidemiology, and Environmental Hazards Assessment Program, 171 Ashley Avenue, Charleston, SC, 29425.

Standard methodologies for risk assessment and determination of remediation levels are increasing the relative weight of perceived risk in the models. An assessment of risk perception in four geographic populations surrounding a major nuclear production facility was performed. In particular, 800 randomly selected individuals residing in a 50 mile radius, 50 - 100 mile radius and two different areas 200 miles from the Savannah River Site in South Carolina were interviewed by telephone. The assessment included measures of knowledge, attitude, behavior and perception regarding environmental exposures and health. The responses will be quantified in a population index to test geographic changes of risk perception related to proximity of a major industry. Such perceived risk assessment should be useful in risk communication and risk analysis.

PERCEIVED RISK IN GEOGRAPHIC AREAS PROXIMAL TO A NUCLEAR PRODUCTION FACILITY. Daniel Lackland, Michael Pisarcik, Catherine Mushan; The Medical University of South Carolina, Departments of Biometry and Epidemiology, and Environmental Hazards Assessment Program, 171 Ashely Avenue, Charleston, SC, 29425.

Standard methodologies for risk assessment and determination of remediation levels are increasing the relative weight of perceived risk models. An assessment of risk perception in four geographic populations surrounding a major nuclear production facility was performed. In particular, 800 randomly selected individuals residing in a 50 mile radius, 50-100 mile radius and two different areas 150 miles from the Savannah River Site in South Carolina were interviewed by telephone. The assessment included measures of knowledge, attitude, behavior, and perception regarding environmental risk perception related to proximity of a major industry. Such perceived risk assessment should be useful in risk communication and risk analysis.



SAVANNAH RIVER REGION
HEALTH INFORMATION SYSTEM

CANCER MORTALITY IN SOUTH CAROLINA

1953-1987

Technical Report
SRRHIS Series: 93:1

CANCER MORTALITY IN SOUTH CAROLINA
1953 - 1987

The Savannah River Region Health Information System

Medical University of South Carolina
Department of Biostatistics, Epidemiology
and Systems Science
Charleston, South Carolina 29425

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Table of Contents

I. Introduction 1

II. Cancer Mortality in South Carolina

A. Population 2
B. Cancer Deaths 2
C. Cancer Mortality Rates 6
D. Limitations of the Data 6
E. Highlights 9

III. Mortality Rates for Selected Primary Sites

A. All Malignant Neoplasms 10
B. All Skin Cancer 10
C. Melanoma 11
D. Lung 11
E. Oral Cavity and Pharynx 11
F. Esophagus 12
G. Stomach 12
H. Colorectal 12
I. Bladder 13
J. Prostate 13
K. Breast 13
L. Cervix Uteri 14
M. Corpus Uteri and Unspecified Uteri . . 14
N. Ovary 14

IV. Maps of County Average Annual Age-Adjusted Mortality Rates for 1953-1987. 15

V. References 111

List of Tables and Figures

Tables

Table 1: 1990 Projected County Population Estimates for South Carolina by Race and Sex . . . 3

Table 2: Population Distribution Percentages for SC by Race and Sex . . 5

Table 3: ICD Codes Conversions for Primary Sites 8

Figures

Figure 1: Map of Counties and State Health District of South Catolina . 4

A. All Malignant Neoplasms

Figure 2: All Race/Sex . . . 15
Figure 3: All Whites 16
Figure 4: All Nonwhites . . . 17
Figure 5: All Males 18
Figure 6: All White Males . . . 19
Figure 7: All Nonwhite Males . . 20
Figure 8: All Females . . . 21
Figure 9: All White Females . . 22
Figure 10: All Nonwhite Females . . 23

B. All Skin Cancer

Figure 11: All Race/Sex . . . 24
Figure 12: All Whites 25
Figure 13: All Nonwhites . . . 26

Figure 14: All Males 27
Figure 15: All White Males 28
Figure 16: All Nonwhite Males . . 29
Figure 17: All Females 30
Figure 18: All White Females . . 31
Figure 19: All Nonwhite Females . . 32

C. Melanoma

Figure 20: All Race/Sex . . . 33
Figure 21: All Whites 34
Figure 22: All Nonwhites . . . 35
Figure 23: All Males 36
Figure 24: All White Males . . . 37
Figure 25: All Nonwhite Males . . 38
Figure 26: All Females 39
Figure 27: All White Females . . 40
Figure 28: All Nonwhite Females . . 41

D. Lung

Figure 29: All Race/Sex . . . 42
Figure 30: All Whites 43
Figure 31: All Nonwhites . . . 44
Figure 32: All Males 45
Figure 33: All White Males . . . 46
Figure 34: All Nonwhite Males . . 47
Figure 35: All Females 48
Figure 36: All White Females . . 49
Figure 37: All Nonwhite Females . . 50

E. Oral Cavity and Pharynx

Figure 38: All Race/Sex . . . 51
Figure 39: All Whites 52
Figure 40: All Nonwhites . . . 53
Figure 41: All Males 54

Figure 42: All White Males . . . 55
Figure 43: All Nonwhite Males . . 56
Figure 44: All Females . . . 57
Figure 45: All White Females . . 58
Figure 46: All Nonwhite Females . . 59

F. Esophagus

Figure 47: All Race/Sex . . . 60
Figure 48: All Whites 61
Figure 49: All Nonwhites . . . 62
Figure 50: All Males 63
Figure 51: All White Males . . . 64
Figure 52: All Nonwhite Males . . 65
Figure 53: All Females . . . 66
Figure 54: All White Females . . 67
Figure 55: All Nonwhite Females . . 68

G. Stomach

Figure 56: All Race/Sex . . . 69
Figure 57: All Whites 70
Figure 58: All Nonwhites . . . 71
Figure 59: All Males 72
Figure 60: All White Males . . . 73
Figure 61: All Nonwhite Males . . 74
Figure 62: All Females . . . 75
Figure 63: All White Females . . 76
Figure 64: All Nonwhite Females . . 77

H. Colorectal

Figure 65: All Race/Sex . . . 78
Figure 66: All Whites 79
Figure 67: All Nonwhites . . . 80
Figure 68: All Males 81
Figure 69: All White Males . . . 82

Figure 70: All Nonwhite Males . . 83
Figure 71: All Females . . . 84
Figure 72: All White Females . . 85
Figure 73: All Nonwhite Females . . 86

I. Bladder

Figure 74: All Race/Sex . . . 87
Figure 75: All Whites 88
Figure 76: All Nonwhites . . . 89
Figure 77: All Males 90
Figure 78: All White Males . . . 91
Figure 79: All Nonwhite Males . . 92
Figure 80: All Females . . . 93
Figure 81: All White Females . . 94
Figure 82: All Nonwhite Females . . 95

J. Prostate

Figure 83: All Males 96
Figure 84: All White Males . . . 97
Figure 85: All Nonwhite Males . . 98

K. Breast

Figure 86: All Females . . . 99
Figure 87: All White Females . . 100
Figure 88: All Nonwhite Females . . 101

L. Cervix Uteri

Figure 89: All Females . . . 102
Figure 90: All White Females . . 103
Figure 91: All Nonwhite Females . . 104

M. Corpus Uteri and Unspecified Uteri

Figure 92: All Females . . . 105
Figure 93: All White Females . . 106
Figure 94: All Nonwhite Females . . 107

N. Ovary

Figure 95: All Females . . . 108
Figure 96: All White Females . . 109
Figure 97: All Nonwhite Females . . 110

I. Introduction

This technical report presents the age-adjusted total, and race and sex specific geographic pattterns of cancer mortality for South Carolina (SC) counties utilizing the 1953 - 1987 average annual age-adjusted mortality rates (AAMRs).

The mortality information was obtained from the State Cancer Control Map and Data Program produced by the National Cancer Institute (NCI), Centers for Disease Control (CDC) and the American Cancer Society (ACS).

The AAMRs for selected primary sites are classified as significantly different or not significantly different (at alpha = 0.05) from the corresponding United States (US) and SC mortality rates. Categories for classification of the rates are determined using 95% confidence intervals (CI). Geographic patterns of significantly high county AAMRs are identified and discussed. Individual county rates are not emphasized. The terminology, "mortality rates"* used throughout this report pertains to the 1953 - 1987 AAMRs.

* Number of deaths per 100,000 people, age-adjusted to the US 1970 standard.

II. Cancer Mortality in South Carolina

A. Population: The1990 projected SC county population estimates are provided in Table 1. The estimates were obtained from the Division of Biostatistics, Research and Statistical Services State Data Center, SC Department of Health and Environmental Control. The counties and state health districts are delineated in Figure 1.

The population of SC is a biracial community. Approximately 32% of the total population is nonwhite and 97.3% of the nonwhite population is black. The race/sex population distribution can be found in the Table 2.

Approximately 55% of the total SC population is located in the following counties: Aiken, Anderson, Berkeley, Charleston, Florence, Greenville, Horry, Richland, Spartanburg and York. These counties will be emphasized in the discussion because the population concentration influences the overall AAMR. Health districts which combine smaller county populations will also be accented since district analysis provides a more stable AAMR estimate [1-5].

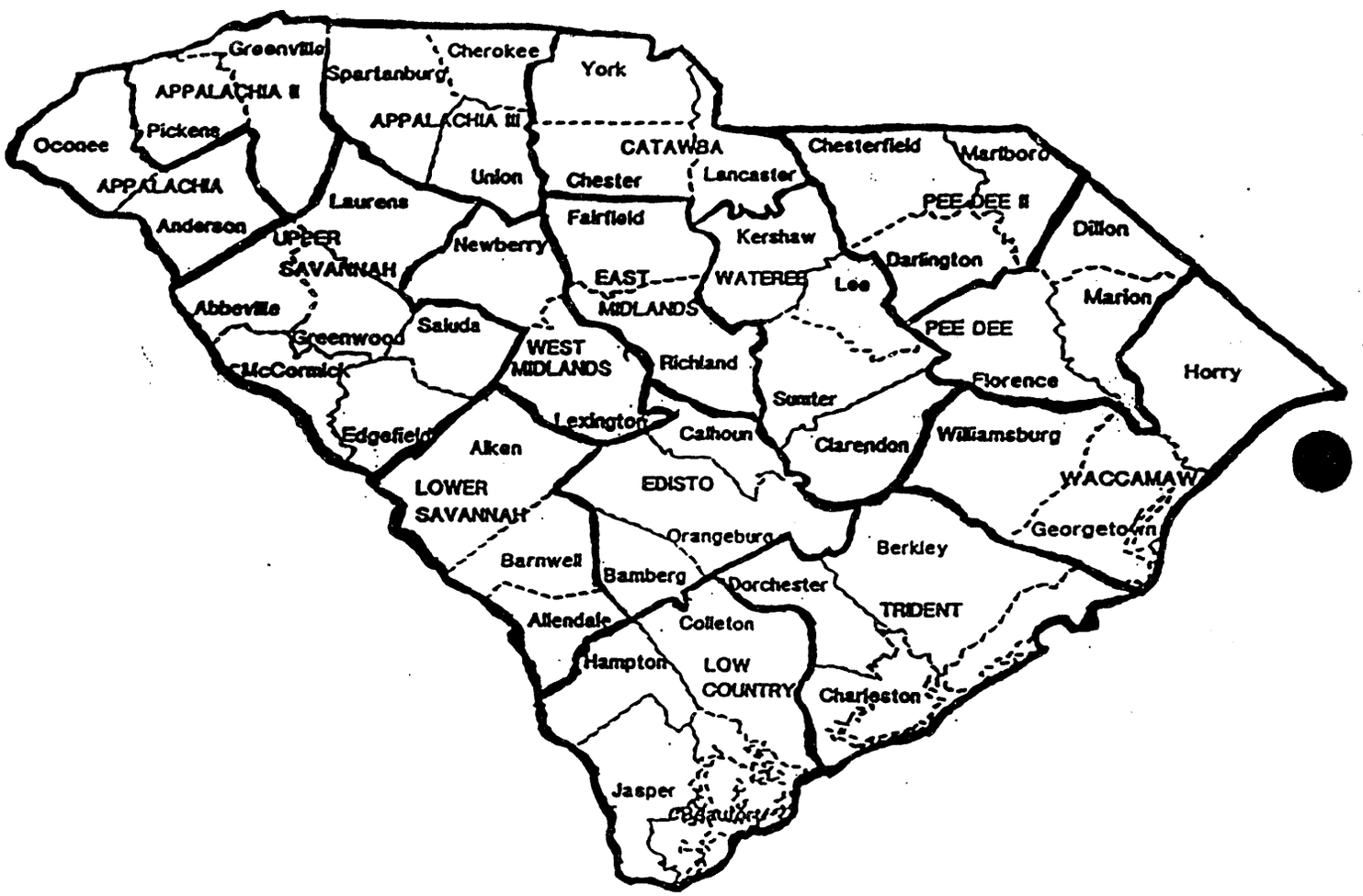
B. Cancer Deaths: Primary sites are grouped according to the World Health Organization's International Classification of Diseases, Ninth Revision (ICD-9). Cancer mortality data was obtained from the National Center for Health Statistics. The codes from ICD-6 through ICD-9 were converted to standardize the cause of death for comparability throughout the time period. See Table 3.

Table 1: 1990 Projected County Population Estimates for SC by Race/Sex

COUNTY	WHITE MALES	WHITE FEMALES	NONWHITE MALES	NONWHITE FEMALES	WHITE	NONWHITE	MALE	FEMALE
S. C. - TOTAL	1,201,400	1,230,400	541,700	595,000	2,431,800	1,136,700	1,743,100	1,825,400
ABBEVILLE	7,760	7,950	3,400	4,020	15,710	7,430	11,160	11,970
AIKEN	45,990	46,810	15,380	17,480	92,800	32,860	61,370	64,300
ALLENDALE	1,660	1,860	3,330	3,880	3,530	7,210	4,990	5,740
ANDERSON	57,780	62,760	12,100	14,060	120,530	26,160	69,880	76,810
BAMBERG	3,410	3,550	5,120	5,590	6,950	10,710	8,530	9,140
BARNWELL	5,300	5,550	4,880	5,710	10,850	10,590	10,180	11,260
BEAUFORT	33,530	28,240	16,430	14,360	61,770	30,790	49,960	42,600
BERKELEY	49,400	49,810	18,420	19,460	99,210	37,880	67,820	69,270
CALHOUN	3,220	3,090	2,820	3,080	6,310	5,900	6,040	6,170
CHARLESTON	99,960	86,370	58,050	63,110	186,330	121,150	158,010	149,470
CHEROKEE	16,010	17,600	4,100	4,820	33,600	8,920	20,100	22,420
CHESTER	9,160	9,890	5,880	6,540	19,050	12,420	15,040	16,430
CHESTERFIELD	12,660	13,170	6,480	7,080	25,830	13,570	19,140	20,250
CLARENDON	6,020	6,660	7,890	8,740	12,680	16,630	13,920	15,400
COLLETON	9,480	10,130	7,680	8,560	19,610	16,240	17,160	18,690
DARLINGTON	19,020	20,090	12,410	14,140	39,110	26,560	31,440	34,230
DILLON	8,090	8,950	7,870	8,760	17,030	16,630	15,960	17,710
DORCHESTER	32,580	33,980	10,190	11,830	66,560	22,020	42,770	45,810
EDGEFIELD	4,680	5,300	4,620	4,790	9,980	9,410	9,300	10,090
FAIRFIELD	4,580	5,060	5,990	6,600	9,640	12,590	10,560	11,660
FLORENCE	36,080	39,260	20,580	24,110	75,340	44,690	56,660	63,370
GEORGETOWN	13,740	15,020	10,540	12,090	28,750	22,630	24,280	27,100
GREENVILLE	125,590	134,590	28,930	32,000	260,180	60,930	154,520	166,590
GREENWOOD	19,010	20,940	9,090	10,820	39,950	19,920	28,100	31,760
HAMPTON	4,290	4,520	5,010	5,610	8,810	10,620	9,300	10,130
HORRY	58,040	57,880	15,920	17,070	115,920	32,990	73,950	74,950
JASPER	3,470	3,590	4,040	4,630	7,060	8,680	7,510	8,230
KERSHAW	15,010	15,910	7,200	8,080	30,920	15,280	22,210	23,990
LANCASTER	20,830	22,550	6,580	7,510	43,380	14,090	27,410	30,050
LAURENS	18,380	20,190	7,480	8,360	38,570	15,840	25,860	28,550
LEE	3,440	3,640	5,500	6,120	7,080	11,620	8,940	9,760
LEXINGTON	77,130	81,350	8,560	10,450	158,480	19,010	85,690	91,800
MCCORMICK	1,360	1,380	2,230	2,320	2,740	4,550	3,590	3,700
MARION	7,350	8,620	8,490	10,920	15,960	19,410	15,830	19,540
MARLBORO	7,900	8,410	7,570	8,230	16,300	15,800	15,460	16,640
NEWBERRY	11,360	11,650	4,520	5,360	23,010	9,880	15,880	17,010
OCONEE	25,530	25,400	2,910	3,180	50,930	6,090	28,440	28,590
ORANGEBURG	18,010	19,220	24,670	28,790	37,220	53,470	42,680	48,010
PICKENS	43,720	42,590	2,790	3,130	86,310	5,920	46,500	45,720
RICHLAND	78,570	76,820	69,270	66,700	155,390	135,970	147,840	143,520
SALUDA	5,330	5,770	2,730	2,990	11,090	5,720	8,060	8,750
SPARTANBURG	84,110	88,870	21,570	23,920	172,990	45,490	105,680	112,800
SUMTER	26,000	25,130	22,580	25,780	51,130	48,360	48,580	50,910
UNION	9,860	11,250	4,350	5,240	21,110	9,590	14,210	16,490
WILLIAMSBURG	6,440	6,720	12,250	13,820	13,150	26,070	18,690	20,530
YORK	50,590	52,330	13,270	15,200	102,910	28,480	63,860	67,530

SOURCE: STATE DATA CENTER, DIV. OF RES. & STAT. SERVICES.
NOTE : DETAIL MAY NOT SUM TO TOTALS DUE TO ROUNDING.

Figure 1: Counties and State Health Districts of SC.



Health Districts: ▬▬

Counties: - - - -

Table 2: Population Distribution Percentages for SC by Race and Sex

Race/Sex Category	Number in Category	Percentage in Category
Total Population	3,568,500	100.0
-White	2,431,800	68.2
-Nonwhite	1,136,700	31.9
Male	1,743,100	48.8
-White	1,201,400	33.7
-Nonwhite	541,700	15.2
Female	1,825,400	51.2
-White	1,230,400	34.5
-Nonwhite	595,000	16.7

C. Cancer Mortality Rates: Annual age-adjusted mortality rates were calculated using the direct method of age-adjustment, with the total US population for 1970 as the standard. The average annual age-adjusted mortality rate is calculated by averaging the annual age-adjusted mortality rates over the 15 year span from 1953 to 1987 [6]. The 95% confidence intervals of the age-adjusted rates were calculated using the standard error estimated by the method of Chiang [7]. County rate categories were defined by comparison to the US and SC AAMR 95% CI. Each county's mortality rate was then separately classified as significantly different (above or below the 95% CI) or not significantly different (within the 95% CI) [4]. Data is presented geographically with each county delineated by its classification. Maps for each primary cancer site begin with the total population figures followed by race/sex specific classifications. This format permits an overlay for the maps which aid in visualizing the cancer mortality patterns.

Certain primary site discussions contain SC AAMR rank comparisons in the US and/or various age categories. Rankings were obtained for each state in the US and ordered by magnitude utilizing the Map Program produced by the National Cancer Institute. Age categories were chosen so as to correspond to the most frequent US incident and mortality age ranges for the given primary site. Age categories are not presented seperately. However, any special age effects are included in the primary site discussions.

D. Limitations of the data: Some counties have small populations which may cause unstable AAMR estimate. For this reason population data is included to help assess the impact of a significantly higher rate for a given county. Furthermore, special emphasis has been given to patterns in large population counties and health districts throughout the discussion to minimize spurious patterns.

County AAMRs were classified with respect to the US and SC 95% confidence intervals for each primary site. Standard errors for county estimated AAMRs were not utilized in the classification process because small population county estimates may result in large standard error estimates.

Calculation of AAMRs were performed to adhere to accepted methodologies. Nevertheless, a cohort effect may be present due to averaging the annual age-adjusted mortality rates for the 15 year span from 1953 to 1987. This would not be expected to seriously alter the major patterns.

Table 3: ICD Codes Conversions for Primary Sites

Primary Site	ICD-6 Revision 1949-1958	ICD-7 Revision 1959-1968	ICD-8 Revision 1969-1978	ICD-9 Revision 1979-1993
All Malignant Neoplasms	140.0-205.9	140.0-205.9	140.0-207.9	140.0-208.9
Skin	190.0-190.9 191.0-191.9	190.0-190.9 191.0-191.9	172.0-172.4 172.6-172.9 173.0-173.9 173.6-173.9	172.0-172.9 173.0-173.9
Melanoma	190.0-190.9	190.0-190.9	172.0-172.4 172.6-172.9	172.0-172.9
Lung	162.0-163.9	162.0-163.9	162.0-163.0	162.0-162.9 163.0-163.9
Oral Cavity & Pharnyx	140.0-149.9	140.0-149.9	140.0-149.9	140.0-149.9
Esophagus	150.0-150.9	150.0-150.9	150.0-150.9	150.0-150.9
Stomach	151.0-151.9	151.0-151.9	151.0-151.9	151.0-151.9
Colorectal	153.0-154.9	153.0-154.9	153.0-154.9	153.0-154.9 159.0-159.0
Bladder	181.0-181.9	181.0-181.8	188.0-188.9 189.9-189.9	188.0-188.9 189.3-189.3 189.8-189.9
Prostate	177.0-177.9	177.0-177.9	185.0-185.9	185.0-185.9
Breast	170.0-170.9	170.0-170.9	174.0-174.9	174.0-174.9
Cervix Uteri	171.0-171.9	171.0-171.9	180.0-180.9	180.0-180.9
Corpus Uteri	172.0-174.9	172.0-174.9	182.0-182.9	179.0-179.9 182.0-182.8
Ovary	175.0-175.9	175.0-175.9	183.0-183.9	183.0-183.9

E. Highlights:

* Skin cancer AAMRs for SC white males and females are significantly higher than the corresponding US rates.

* Rates for SC white males are significantly above the US rates for lung cancer.

* Geographical patterns and significantly high AAMRs exist for nonwhite males and nonwhite females in SC for three of the four gastrointestinal primary sites.

* South Carolina prostate cancer AAMRs for both race categories are significantly higher than the corresponding US rates.

* South Carolina has significantly lower AAMRs for female breast cancer than the US.

* Cervical cancer AAMRs for SC exceed the US rate for both race categories.

* South Carolina nonwhite females have uterine AAMRs significantly higher than the US rates.

III Mortality Rates for Selected Primary Sites

A. All Malignant Neoplasms: The overall SC AAMR due to all malignant neoplasms is significantly lower than the US rate. All county rates with the exception of Charleston county rate, also remain below the US rate . This pattern persists for the State throughout the race categories. However, for sex and race specific AAMRs, 42.5% of the counties exceed the US rates for white males. Cancer mortality is higher among males than females in SC, a pattern which is consistent with the US rates for malignant neoplasms. Nonwhites have higher mortality rates than whites, although fewer SC counties have rates which exceed the US nonwhite AAMR. This phenomenon masks the excessive rates in white males within the total population map .

B. All Skin Cancer: South Carolina ranks 14th among all the states for overall skin cancer mortality. Seven of the ten large population counties exhibit significantly higher AAMRs than the overall US rate. A similar pattern exists for race-specific and sex-specific rates. Whites have a significantly higher mortality rate than nonwhites, while white male rates exceed those of the white female. The rates for white males and white females in SC ranks eighth and ninth respectively in comparison to the given US AAMR. Maps for all males and white males manifest a concentration of the excessive county rates in the Appalachian, Catawba, Pee Dee (northern border counties) and Lower Savannah health districts. The northern border and midland counties pattern is present for excessive white female AAMRs, but several of these counties contain small populations and associated rates may be unstable .

C. Melanoma: Results for SC melanoma AAMRs are similar to those found for all skin cancer mortality. White mortality rates exceed the nonwhite rates while white male rates surpass the white female rates. The SC white male and white female melanoma mortality

rates rank 13th and 9th in comparison to all other states, respectively. The Appalachian, Midlands Lower Savannah and Coastal regions appear to have excessive rates for both white males and females.

D. Lung: The SC lung cancer mortality rates for race/sex are comparable to those for the US. The SC male AAMRs exceed female rates for both race categories; however, only white males have an AAMR which exceeds the corresponding US rate. South Carolina ranks seventh among all of the states for white male lung cancer mortality, with six of the large population SC counties displaying an excessive AAMR. The Trident, Low Country, Lower Savannah and Midlands health districts (southwestern and midland counties) show a distinctive aggregate of significantly higher mortality rates. A similar, less extensive pattern exists for white females. The overall AAMR for SC shows a comparably higher rate, demonstrating the effects of the increased white male rates.

E. Oral Cavity and Pharynx: The SC AAMR significantly exceeds the US mortality rate for oral cavity and pharynx. County mortality rates essentially exhibit a dichotomous pattern when compared to the overall US and to SC rates, that is, they are either significantly above the SC rate or significantly below the US rate. The hour-glass geographical pattern of excessive mortality noted for the all race/sex map appears again in the white, male ,and white male maps. South Carolina ranks seventh among all states for oral cavity and pharyngeal cancer mortality for white females. The counties with significantly higher mortality rates for white females and nonwhite females differ substantially. The white female mortality map shows a midland and northern concentration, while the nonwhite female map reveals a midland and southern coastal concentration. The Midlands health district is classified as significantly higher for all of the race/sex maps.

F. Esophagus: The SC AAMR significantly exceeds the US mortality rate for esophageal cancer. Examination of the race/sex rates show that most of this excess is due to cancer in nonwhites, with male AAMRs exceeding female rates for both race categories. Aggregation of the significantly high county AAMRs for nonwhites is observed primarily in the coastal and southwestern counties. The same geographic pattern is noted for the all race/sex map and for the oral cavity and pharynx map for nonwhite females. There is a dichotomous pattern of significantly higher AAMRs evident in the nonwhite male and nonwhite female maps. The mortality rate for nonwhite females ranks 14th in the US .

G. Stomach: The SC stomach cancer AAMRs for nonwhites, nonwhite males and nonwhite females are significantly higher than the US rate, with male rates significantly higher that female AAMRs. South Carolina ranks 11th and 14th among all US states for nonwhite male and nonwhite female stomach cancer mortality rates, respectively. The Midlands, Edisto, Low Country, Trident and Waccamaw health districts (central and southwestern coastal regions of SC) represent geographic concentrations of excessive AAMRs for both nonwhite males and nonwhite females. This general pattern also exists with the other gastrointestinal primary sites previously discussed.

H. Colorectal: The SC AAMR is significantly below the US rate for all race/sex categories. A geographic pattern is noted for nonwhite, nonwhite male and nonwhite female categories when examining the county AAMRs which are significantly higher than the overall SC colorectal mortality rate. A northwestern concentration appears in the Appalachian and Catawba health districts with Oconee and Pickens counties having significantly higher rates than the US. This pattern is unlike the previous geographic patterns shown for nonwhites in oral, esophageal, and stomach cancer mortality rate classifications. The coastal county of Beaufort (estimated population 92,560) however, is significantly higher than the US colorectal AAMR

for nonwhite females which corresponds to the other gastrointestinal sites.

H. Bladder: The SC rates are significantly below the corresponding US mortality rates for bladder cancer in all race/sex classifications except for nonwhite females. The male AAMRs are significantly higher than female rates for both race classifications in SC. This pattern is consistent with that of the US [8]. Nonwhite males and nonwhite females have significantly higher AAMRs in 14 and 22 counties respectively, encompassing three to five of the SC counties with populations of 100,000 or greater. Significantly lower rates in the remaining counties cause the overall nonwhite mortality rate for bladder cancer to be diminished. No consistent geographical pattern was observed for the race/sex categories.

I. Prostate: South Carolina ranks 11th and 12th among all the states for nonwhite and white male prostate cancer AAMRs, respectively. Three-fourths of the counties exceed the nonwhite male rate and two-thirds of them exceed that of the white male rate of the US. Geographical patterns are different between whites and nonwhites. Significantly higher prostate mortality rates for white males are notable throughout the State, while nonwhite AAMRs are present in the northern and central counties.

J. Breast: The SC rates are significantly below the US rates for both white and nonwhite females. The nonwhite breast cancer mortality rate is significantly higher than the white female rate in SC, analogous to US race/sex comparisons in breast cancer mortality. A northwestern concentration of the excessive rates is evident for nonwhite females. Breast cancer mortality for nonwhite females ages 30 - 39 is significantly higher than the corresponding US rate. Small population sizes in this age category throughout the counties tend to decrease the importance of this finding.

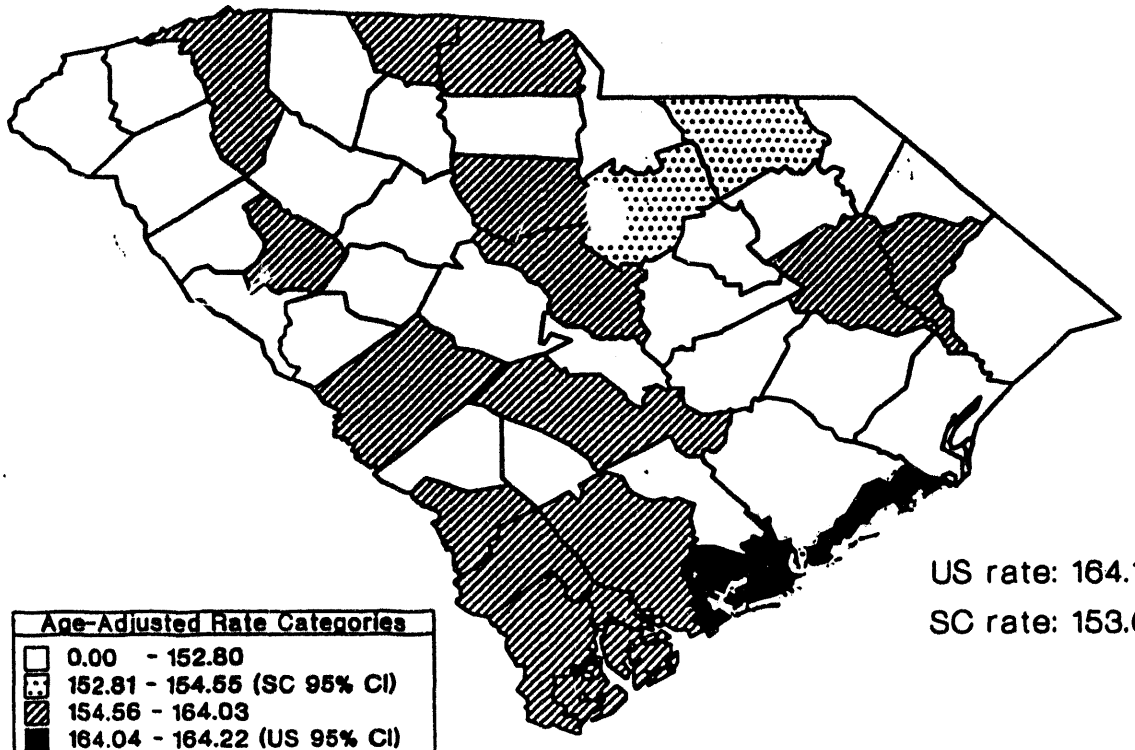
K. Cervix Uteri: The SC AAMR for females is significantly higher than the US rate. South Carolina ranks fifth among all the states for cervix uteri cancer mortality rate. Ninety-one percent of the counties exceed the US AAMR for all females. Nonwhite females have a significantly higher mortality rate than white females. South Carolina ranks 14th among all the states for nonwhite female AAMRs. A concentration of the excessive AAMRs appears in the northwestern counties of the State for nonwhite females. Cervical cancer mortality for white females ages 40 and above is excessive in the northern counties.

L. Corpus Uteri and Unspecified Uteri: South Carolina ranks 14th among all the states for corpus uteri cancer mortality rates in females. Fifty-two percent of SC counties have significantly higher AAMRs than the US rate for females. The nonwhite female AAMR for SC ranks eighth among all the states and is significantly higher than the corresponding US rate. Geographical patterns are not evident for all of the race categories.

M. Ovary: South Carolina ranks significantly below the US AAMR for all, and for white and nonwhite female categories. Four of the SC counties with populations exceeding 100,000 have significantly higher rates for nonwhite females than the corresponding US rate. The four county average rate is significantly higher than the nonwhite US rate. No geographical pattern is evident for the all race categories.

Figure 2:

Cancer Mortality in SC
All Malignant Neoplasms
Average Annual Age-Adjusted Rates for 1953 - 1987



Race: All
Gender: All
Ages: All

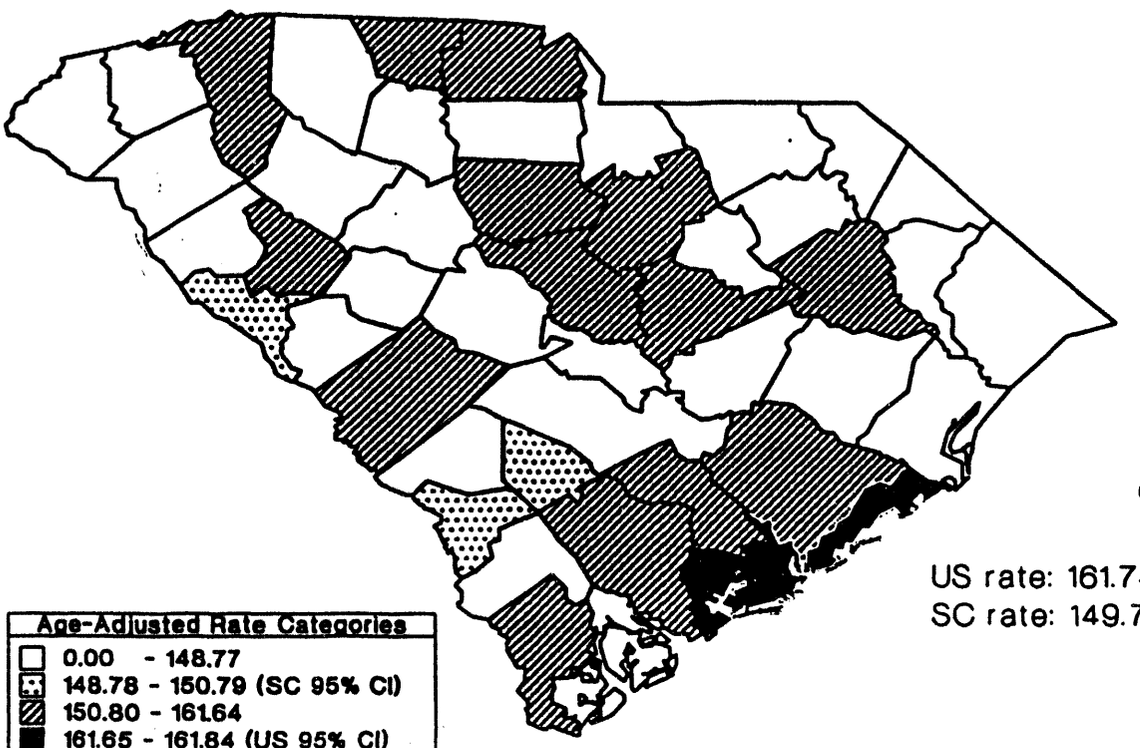
US rate: 164.13, 1.96 sd = 0.09

SC rate: 153.68, 1.96 sd = 0.87

Rates adjusted to 1970 US population.

Figure 3:

Cancer Mortality in SC
All Malignant Neoplasms
Average Annual Age-Adjusted Rates for 1953 - 1987



Race: White
Gender: All
Ages: All

US rate: 161.74, 1.96 sd = 0.10
SC rate: 149.78, 1.96 sd = 1.01

Rates adjusted to 1970 US population.

Figure 4:

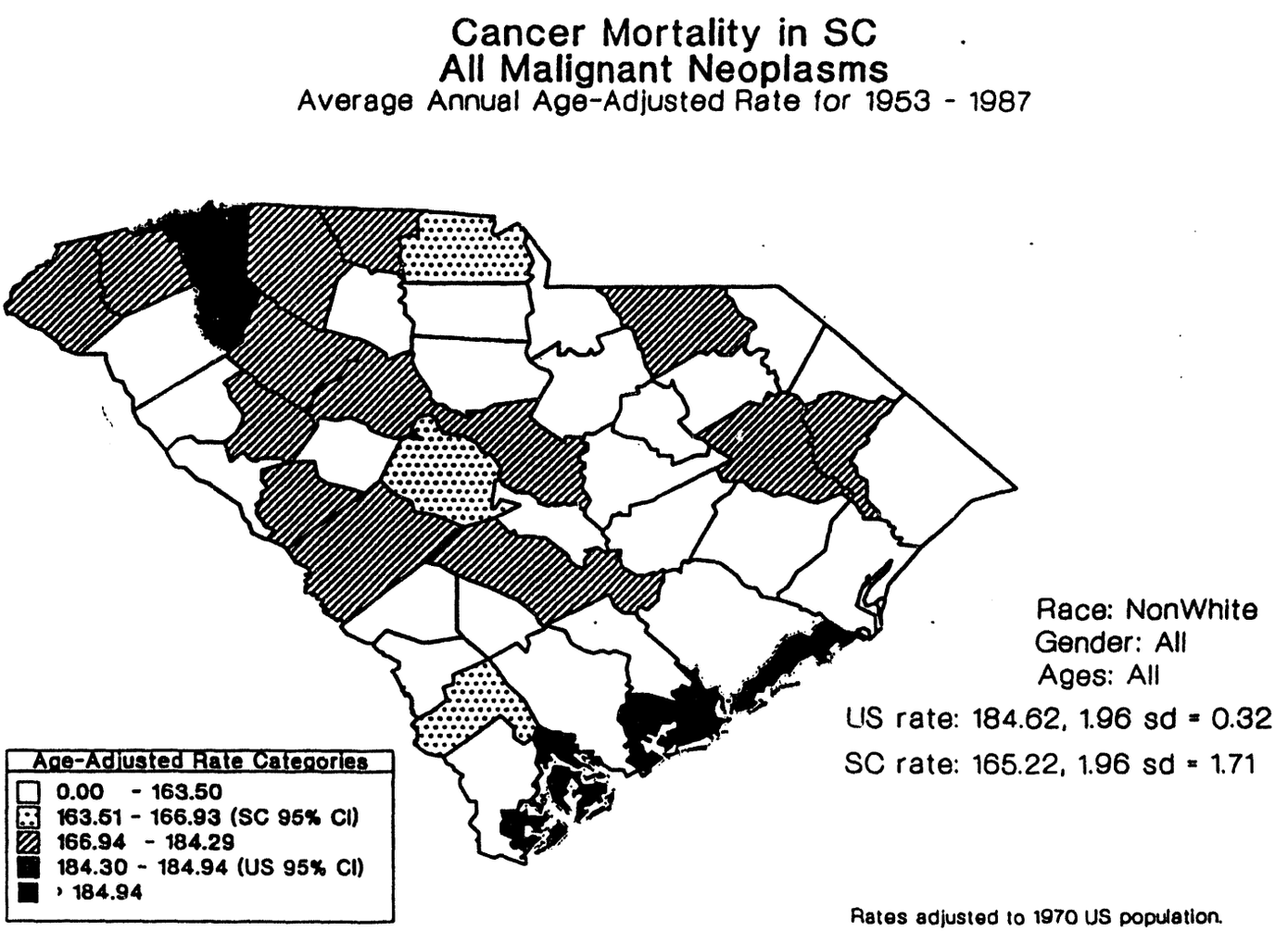

Cancer Mortality in SC
All Malignant Neoplasms
Average Annual Age-Adjusted Rate for 1953 - 1987
Age-Adjusted Rate Categories
0.00 - 163.50
163.51 - 166.93 (SC 95% CI)
166.94 - 184.29
184.30 - 184.94 (US 95% CI)
› 184.94
Race: NonWhite
Gender: All
Ages: All
US rate: 184.62, 1.96 sd = 0.32
SC rate: 165.22, 1.96 sd = 1.71
Rates adjusted to 1970 US population.

Figure 5:

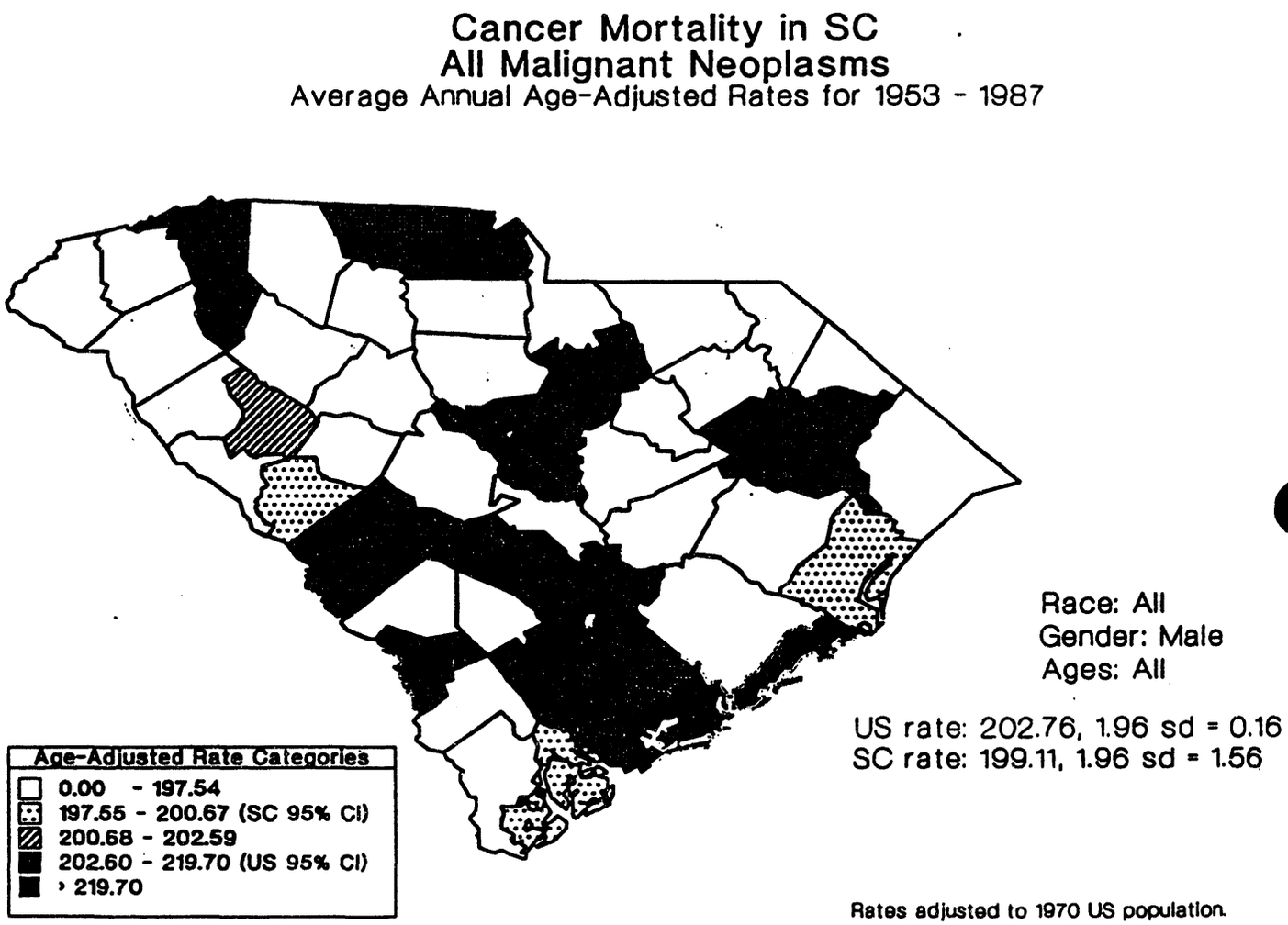
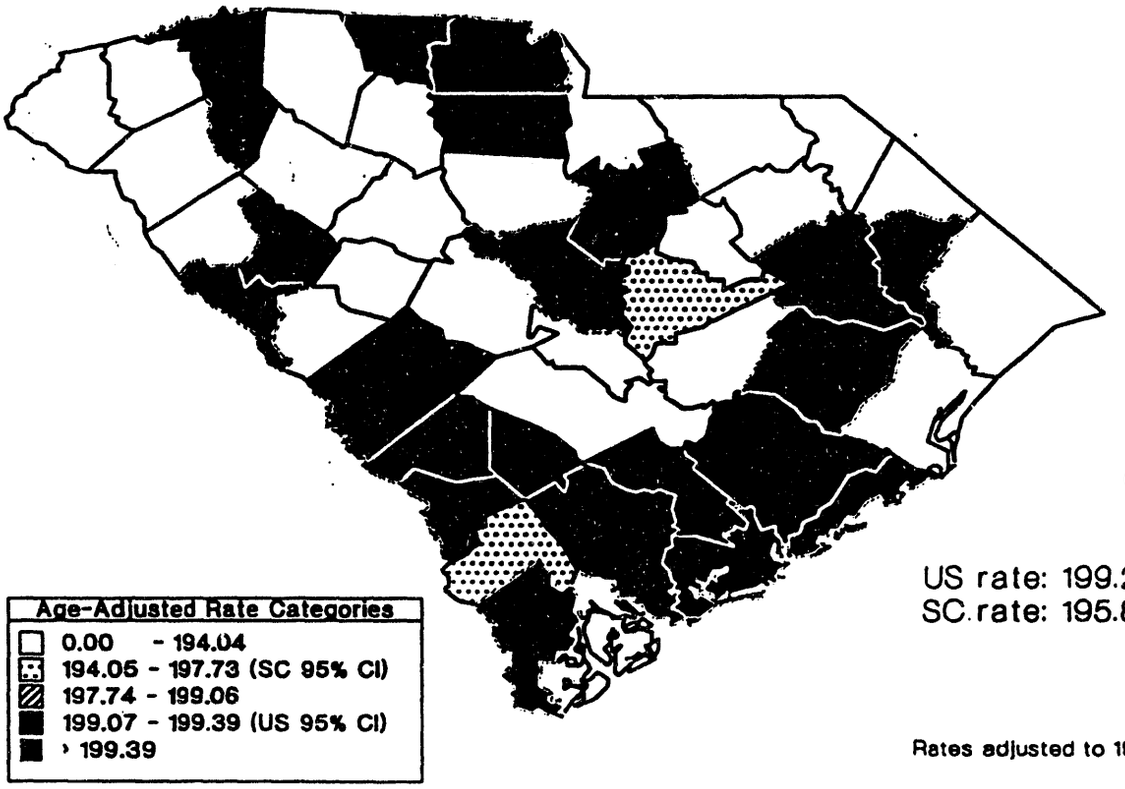

Cancer Mortality in SC
All Malignant Neoplasms
Average Annual Age-Adjusted Rates for 1953 - 1987
Age-Adjusted Rate Categories
0.00 - 197.54
197.55 - 200.67 (SC 95% CI)
200.68 - 202.59
202.60 - 219.70 (US 95% CI)
› 219.70
Race: All
Gender: Male
Ages: All
US rate: 202.76, 1.96 sd = 0.16
SC rate: 199.11, 1.96 sd = 1.56
Rates adjusted to 1970 US population.

Figure 6:

Cancer Mortality in SC
All Malignant Neoplasms
Average Annual Age-Adjusted Rates for 1953 - 1987



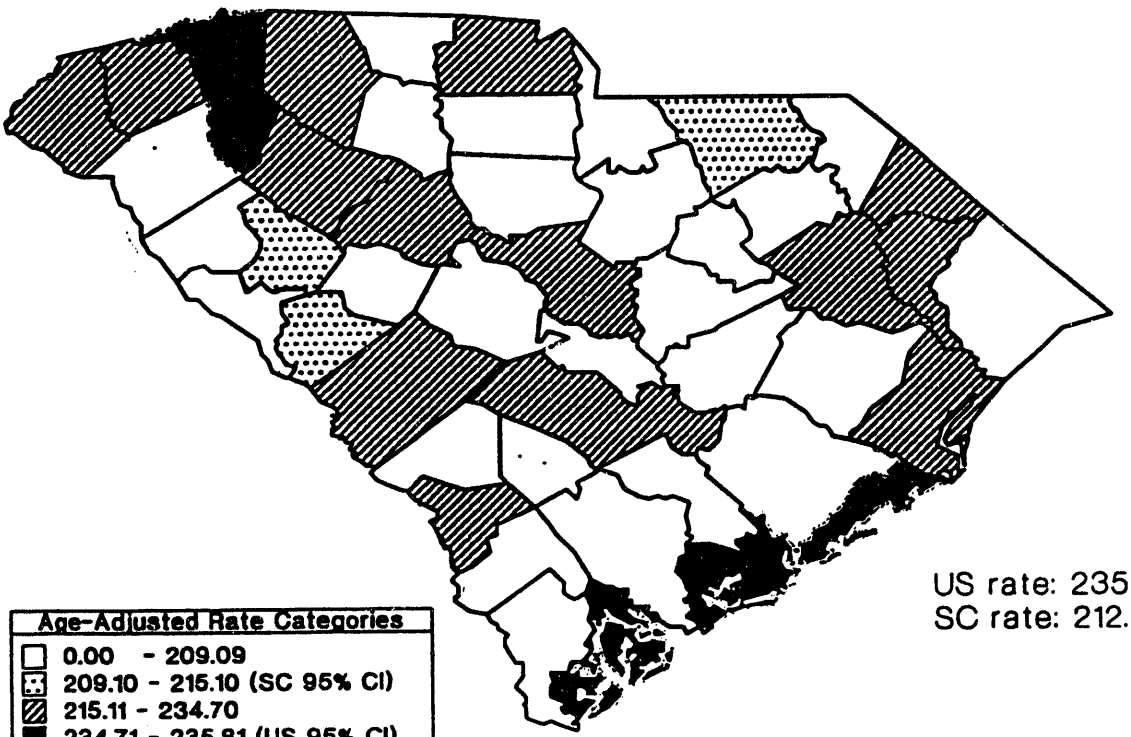
Race: White
Gender: Male
Ages: All

US rate: 199.23, 1.96 sd = 0.16
SC rate: 195.89, 1.96 sd = 1.84

Rates adjusted to 1970 US population.

Figure 7:

Cancer Mortality in SC
All Malignant Neoplasms
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 209.09
- 209.10 - 215.10 (SC 95% CI)
- 215.11 - 234.70
- 234.71 - 235.81 (US 95% CI)
- › 235.81

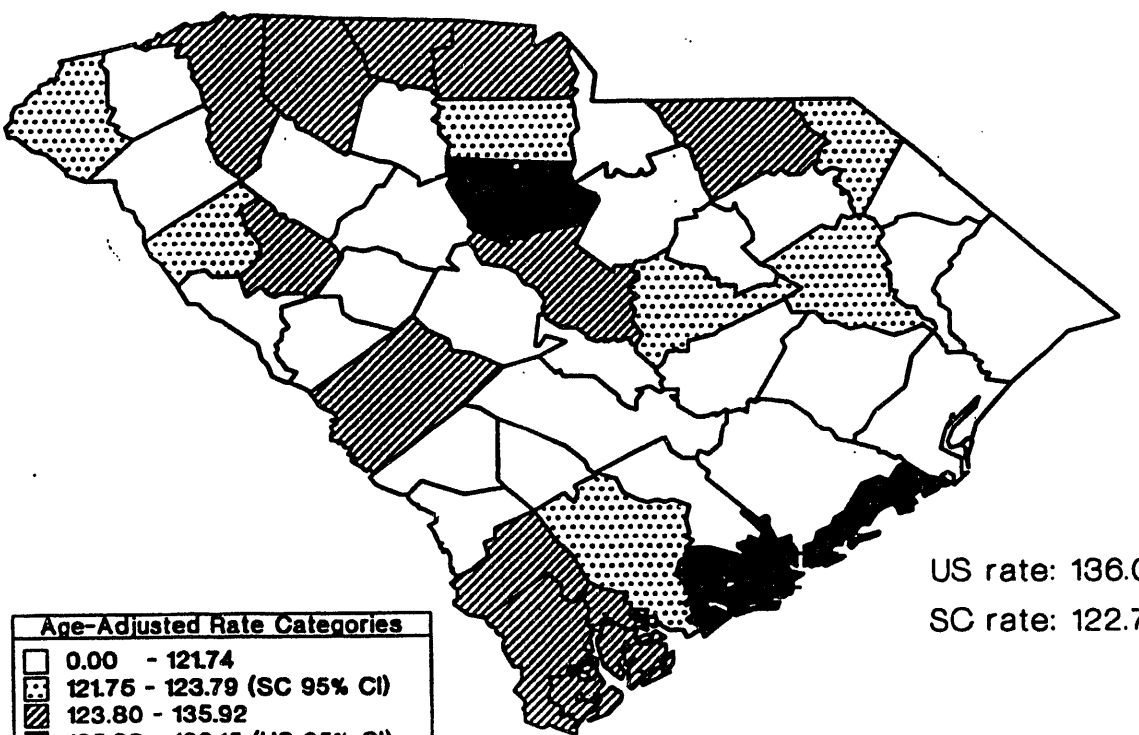
Race: NonWhite
Gender: Male
Ages: All

US rate: 235.26, 1.96 sd = 0.55
SC rate: 212.10, 1.96 sd = 3.00

Rates adjusted to 1970 US population.

Figure 8:

Cancer Mortality in SC
All Malignant Neoplasms
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 121.74
- 121.75 - 123.79 (SC 95% CI)
- 123.80 - 135.92
- 135.93 - 136.15 (US 95% CI)
- > 136.15

Race: All
Gender: Female
Ages: All

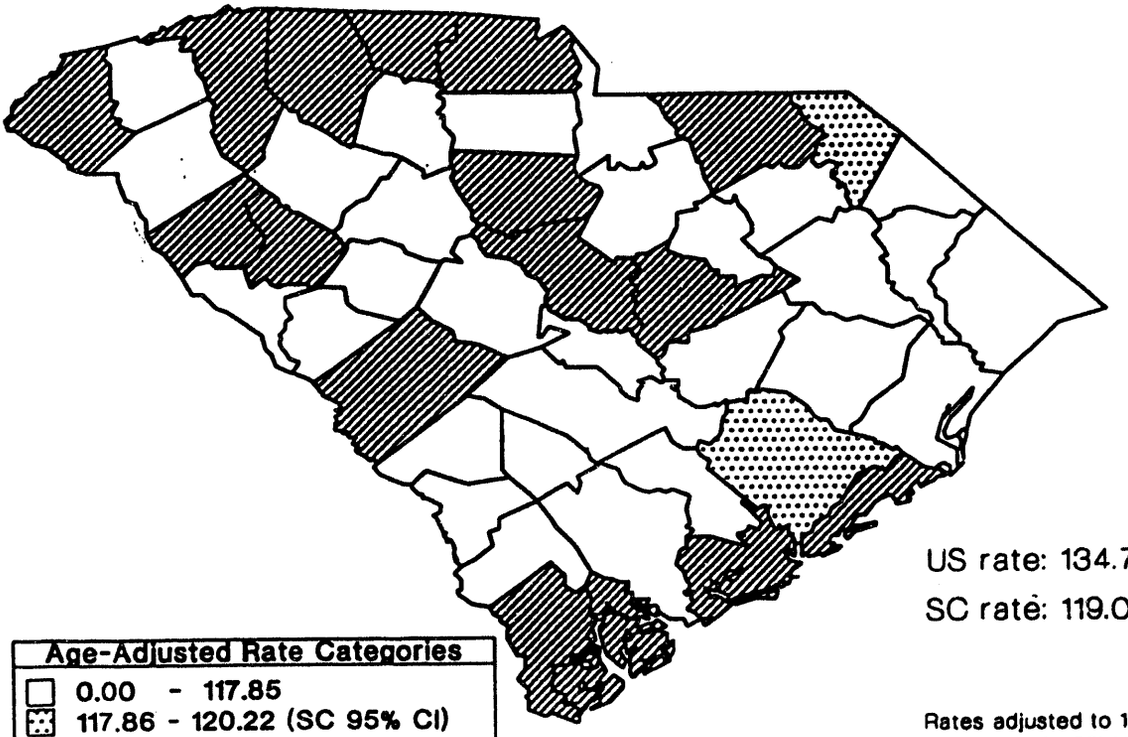
US rate: 136.04, 1.96 sd = 0.11

SC rate: 122.77, 1.96 sd = 1.02

Rates adjusted to 1970 US population.

Figure 9:

Cancer Mortality in SC
All Malignant Neoplasms
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 117.85
- 117.86 - 120.22 (SC 95% CI)
- 120.23 - 134.14 *

Race: White
Gender: Female
Ages: All

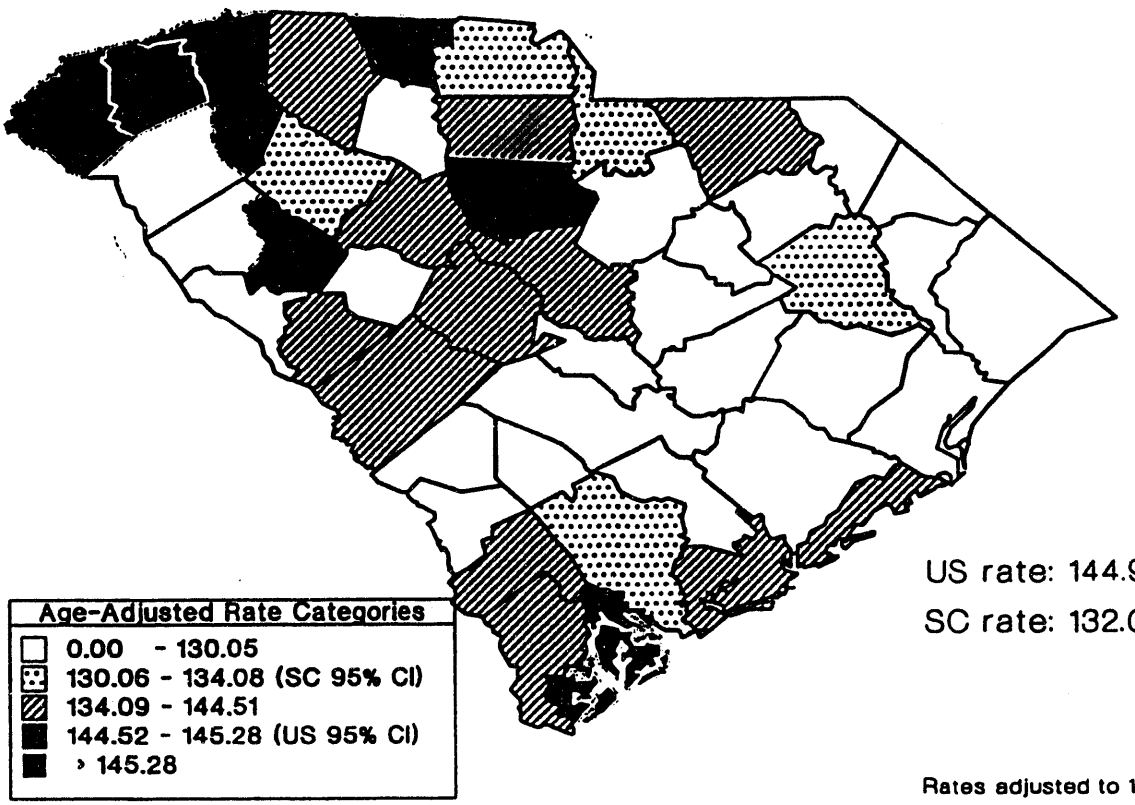
US rate: 134.77, 1.96 sd = 0.12

SC rate: 119.04, 1.96 sd = 1.18

Rates adjusted to 1970 US population.
* (134.65, 134.89) US 95% CI

Figure 10:

Cancer Mortality in SC
All Malignant Neoplasms
Average Annual Age-Adjusted Rates for 1953 - 1987



Race: NonWhite
Gender: Female
Ages: All

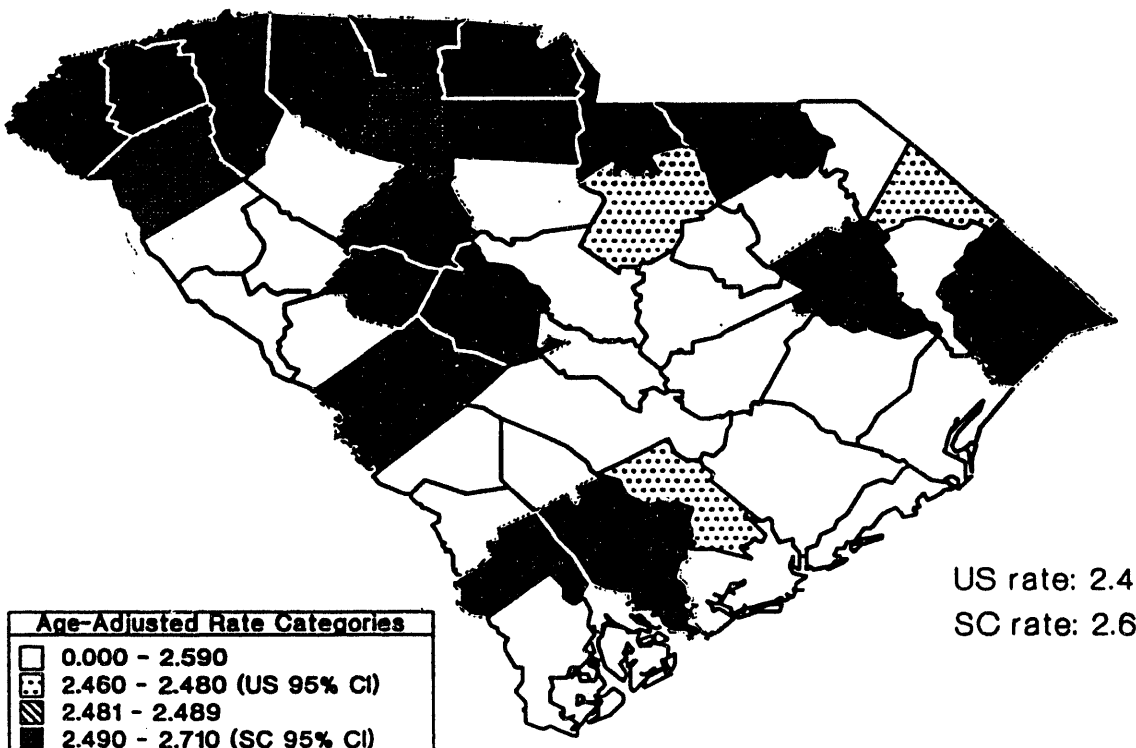
US rate: 144.90, 1.96 sd = 0.38

SC rate: 132.07, 1.96 sd = 2.01

Rates adjusted to 1970 US population.

Figure 11:

Cancer Mortality in SC
All Skin Cancer
Average Annual Age-Adjusted Rates for 1953 - 1987



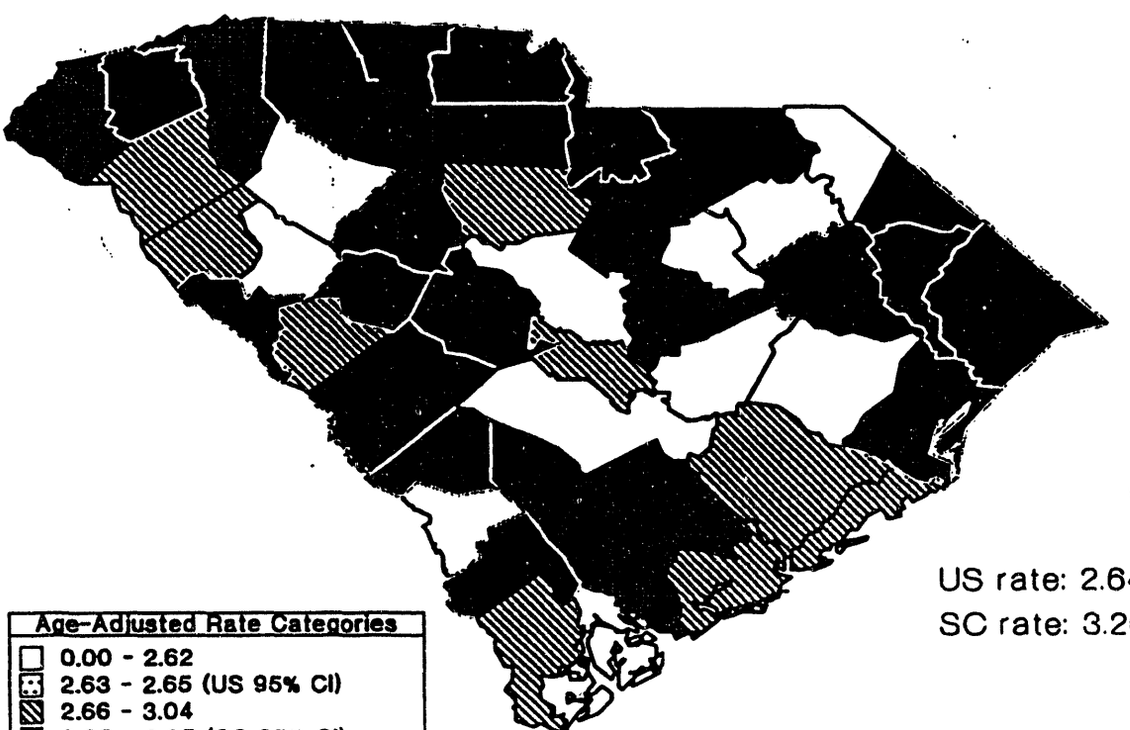
Race: All
Gender: All
Ages: All

US rate: 2.47, 1.96 sd = 0.01
SC rate: 2.60, 1.96 sd = 0.11

Rates adjusted to 1970 US population.

Figure 12:

Cancer Mortality in SC
All Skin Cancer
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 2.62
- 2.63 - 2.65 (US 95% CI)
- 2.66 - 3.04
- 3.05 - 3.35 (SC 95% CI)
- › 3.35

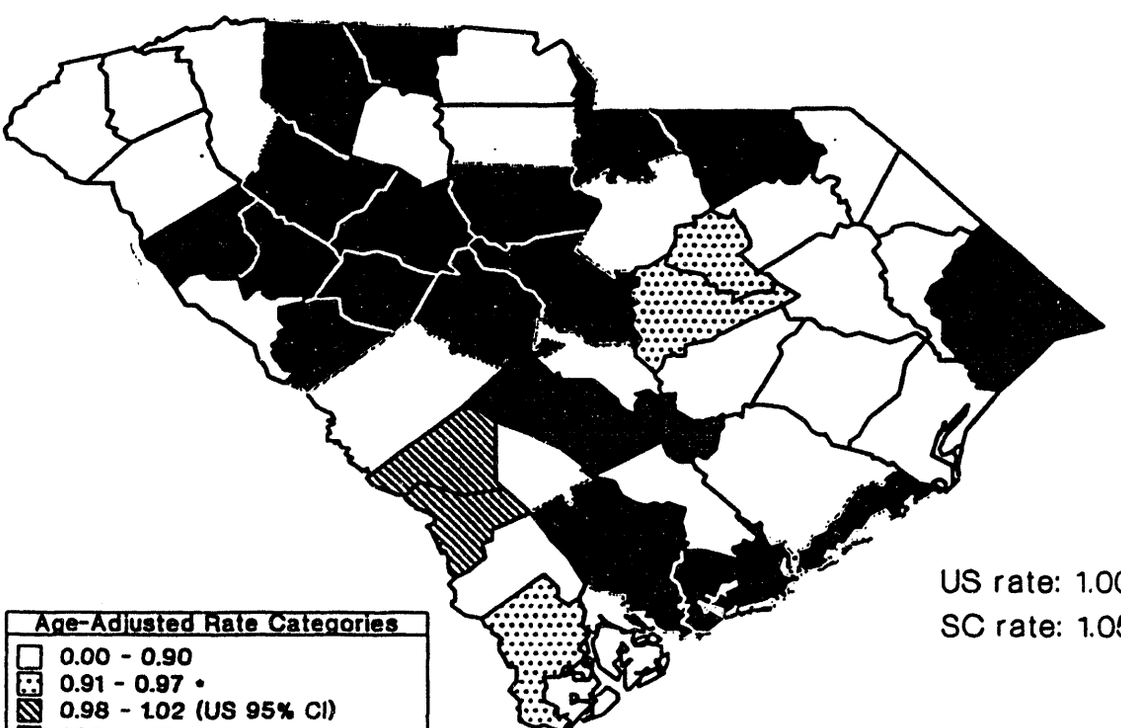
Race: White
Gender: All
Ages: All

US rate: 2.64, 1.96 sd = 0.01
SC rate: 3.20, 1.96 sd = 0.15

Rates adjusted to 1970 US population.

Figure 13:

Cancer Mortality in SC
All Skin Cancer
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 0.90
- 0.91 - 0.97 *
- 0.98 - 1.02 (US 95% CI)
- 1.03 - 1.19 *
- > 1.19

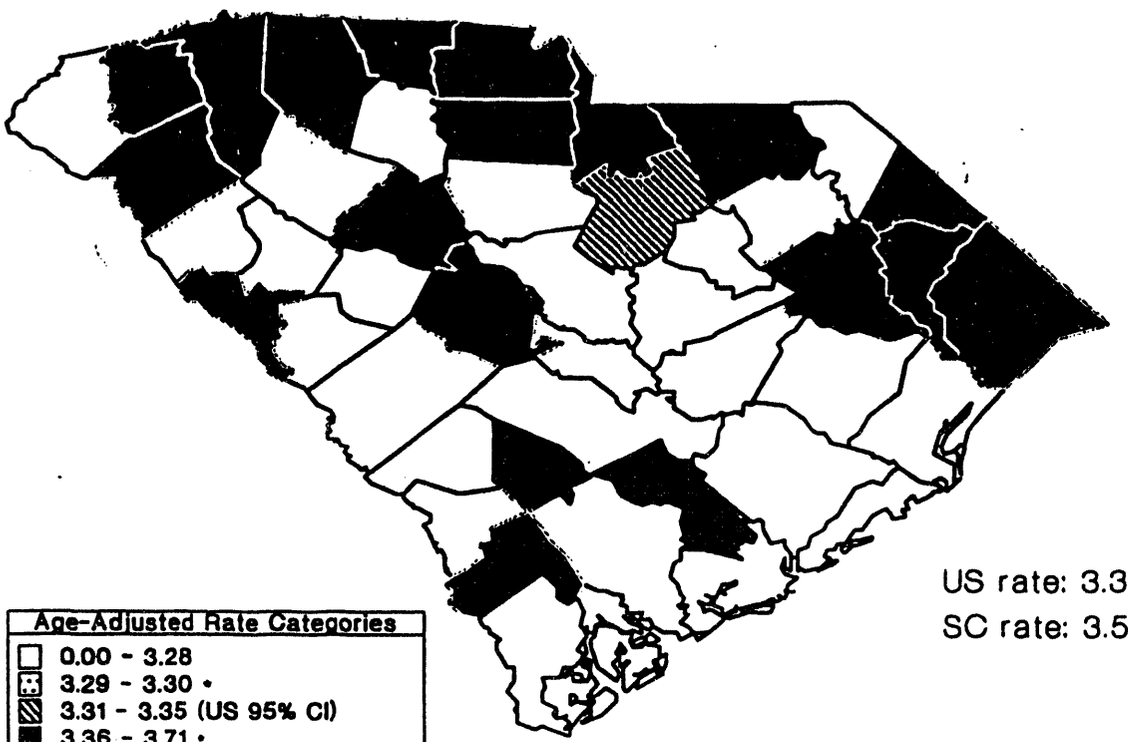
Race: Nonwhite
Gender: All
Ages: All

US rate: 1.00, 1.96 sd = 0.02
SC rate: 1.05, 1.96 sd = 0.14

Rates adjusted to 1970 US population.
* (0.91, 1.19) SC 95% CI

Figure 14:

Cancer Mortality in SC
All Skin Cancer
Average Annual Age-Adjusted Rates for 1953 - 1987



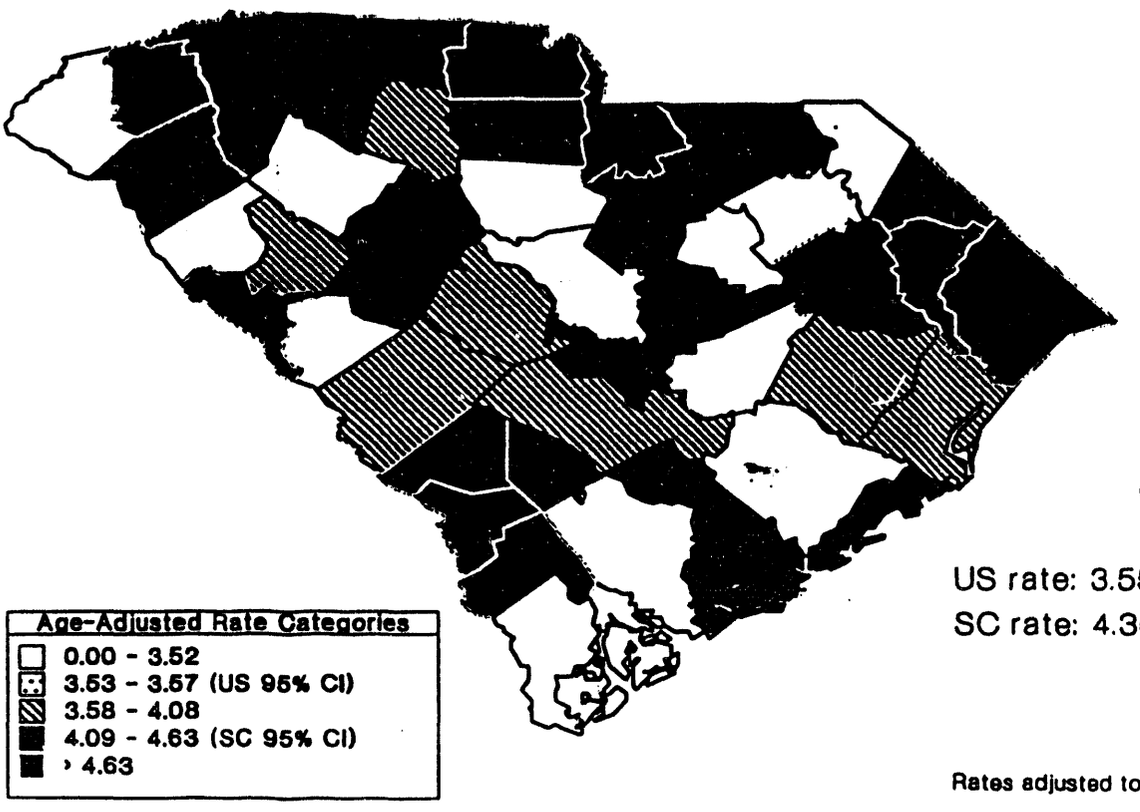
Race: All
Gender: Male
Ages: All

US rate: 3.33, 1.96 sd = 0.02
SC rate: 3.50, 1.96 sd = 0.21

Rates adjusted to 1970 US population.
• (3.29, 3.71) SC 95% CI

Figure 15:

Cancer Mortality in SC
All Skin Cancer
Average Annual Age-Adjusted Rates for 1953 - 1987



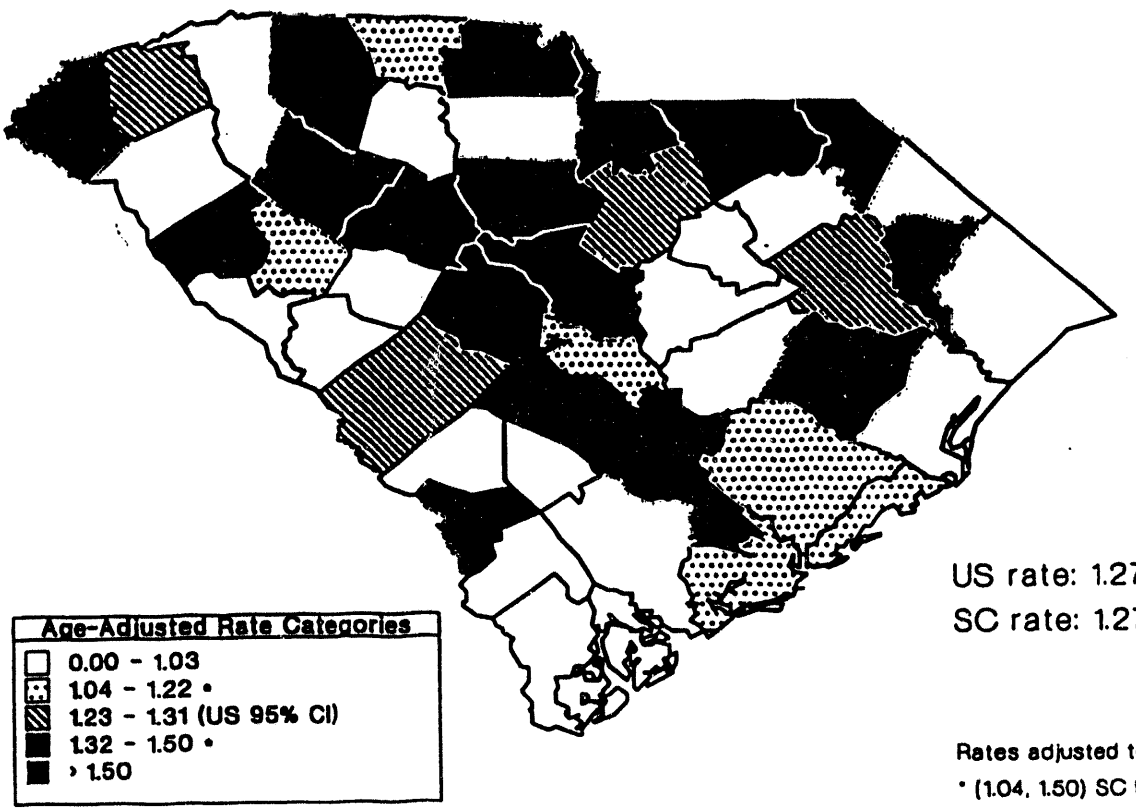
Race: White
Gender: Male
Ages: All

US rate: 3.55, 1.96 sd = 0.02
SC rate: 4.36, 1.96 sd = 0.27

Rates adjusted to 1970 US population.

Figure 16:

Cancer Mortality in SC
All Skin Cancer
Average Annual Age-Adjusted Rates for 1953 -1987



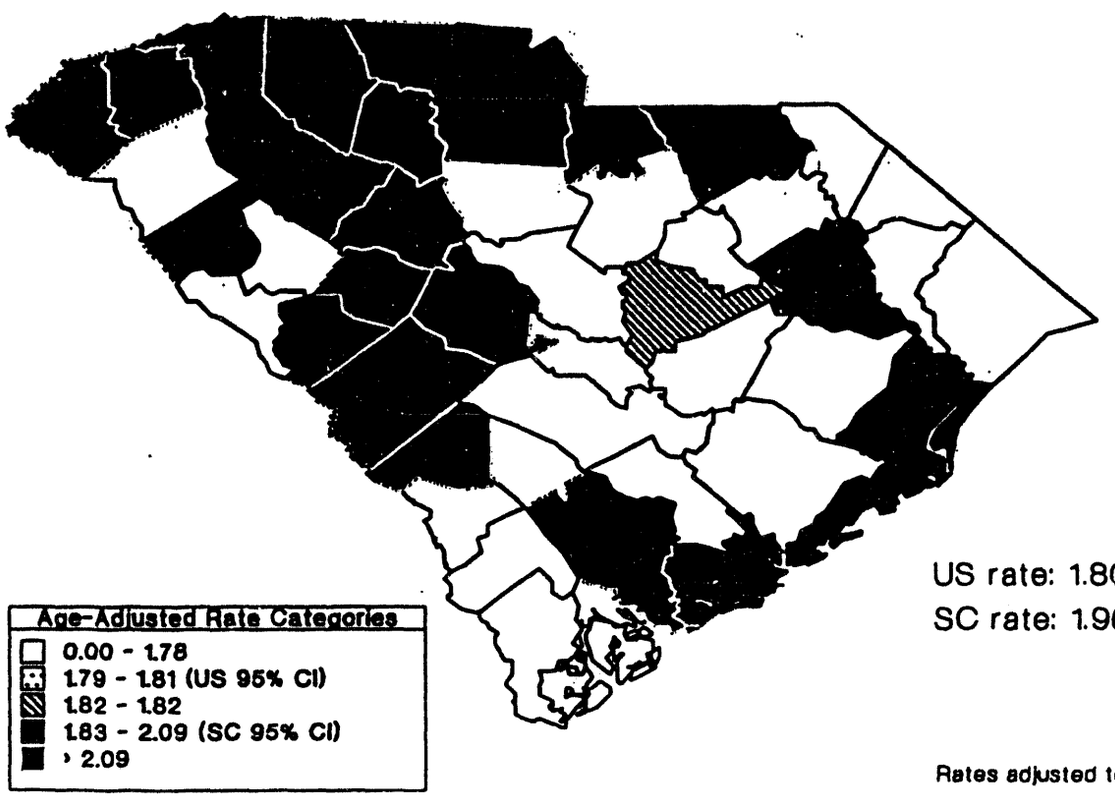
Race: NonWhite
Gender: Male
Ages: All

US rate: 1.27, 1.96 sd = 0.04
SC rate: 1.27, 1.96 sd = 0.23

Rates adjusted to 1970 US population.
• (1.04, 1.50) SC 95% CI

Figure 17:

Cancer Mortality in SC
All Skin Cancer
Average Annual Age-Adjusted Rates for 1953 - 1987



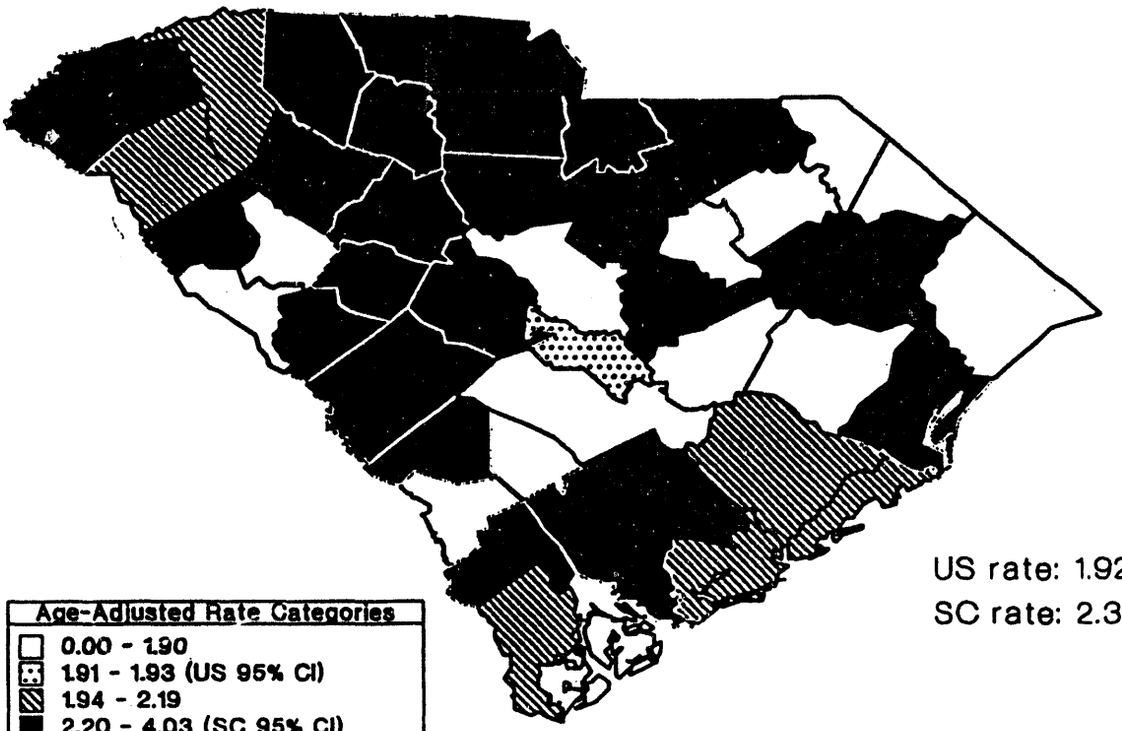
Race: All
Gender: Female
Ages: All

US rate: 1.80, 1.96 sd = 0.01
SC rate: 1.96, 1.96 sd = 0.13

Rates adjusted to 1970 US population

Figure 18:

Cancer Mortality in SC
All Skin Cancer
Average Annual Age-Adjsuted Rates for 1953 -1987



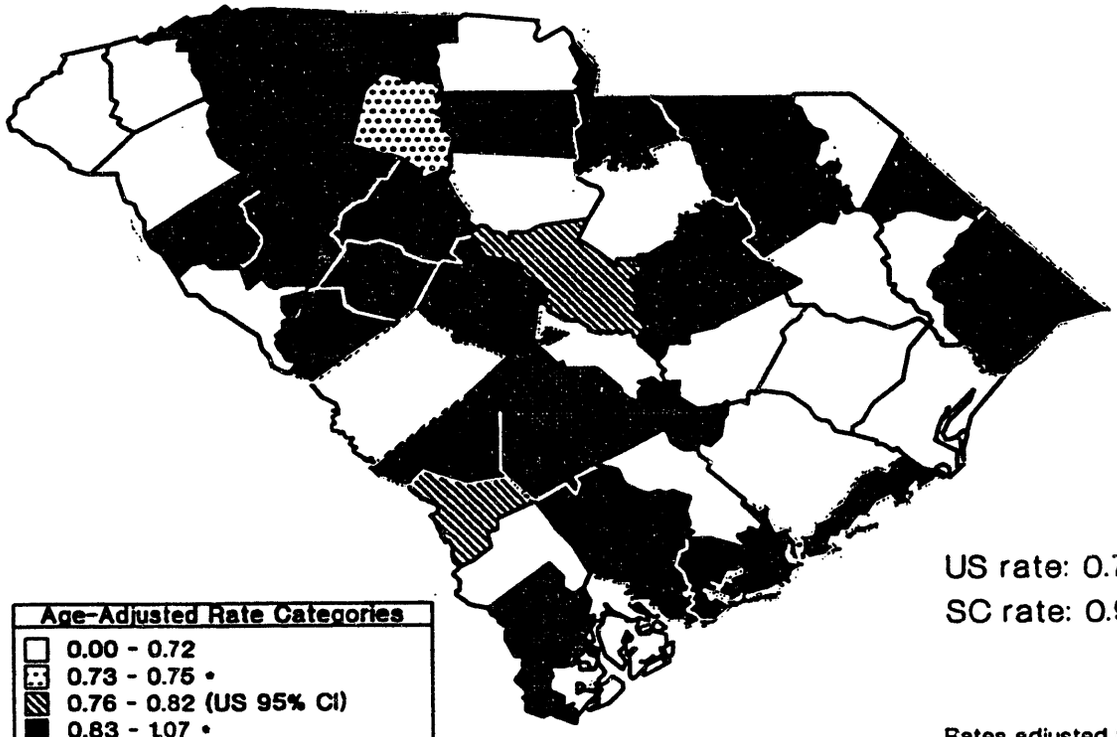
Race: White
Gender: Female
Ages: All

US rate: 1.92, 1.96 sd = 0.01
SC rate: 2.37, 1.96 sd = 0.17

Rates adjusted to 1970 US population.

Figure 19:

Cancer Mortality in SC
All Skin Cancer
Average Annual Age-Adjusted Rates for 1953 - 1987



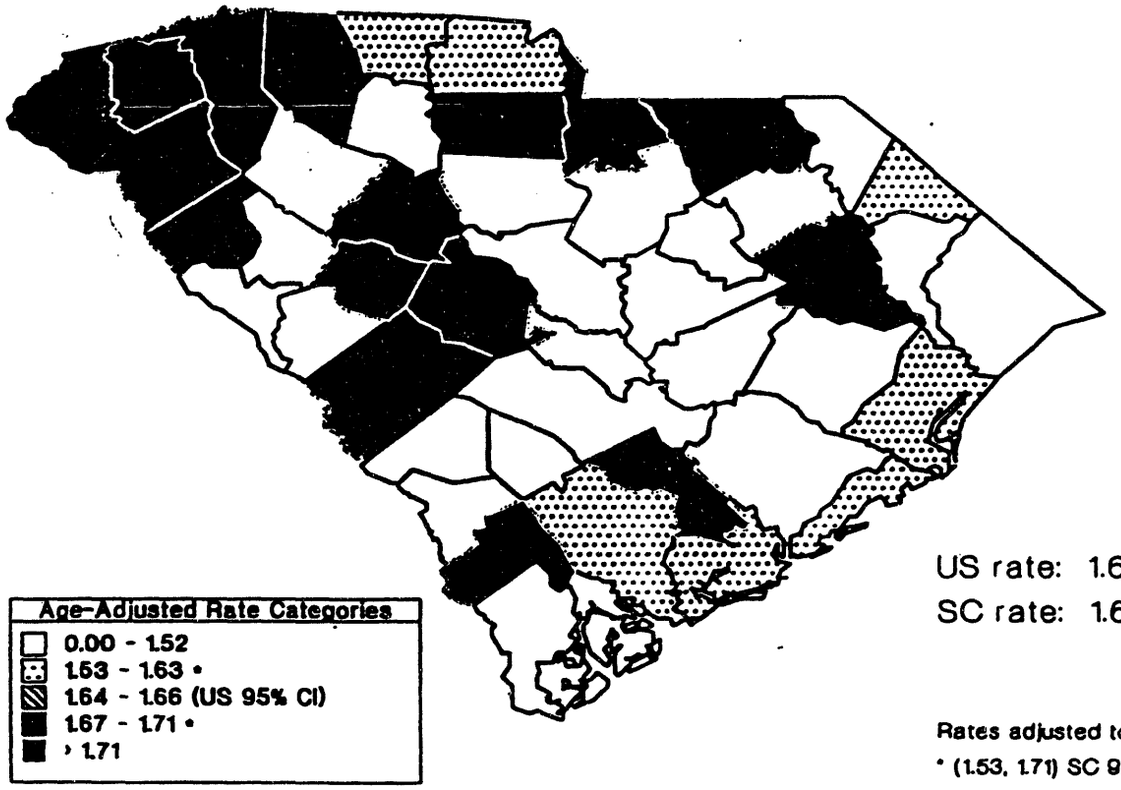
Race: NonWhite
Gender: Female
Ages: All

US rate: 0.79, 1.96 sd = 0.03
SC rate: 0.90, 1.96 sd = 0.17

Rates adjusted to 1970 US population.
• (0.73, 1.07) SC 95% CI

Figure 20:

Cancer Mortality in SC
Melanoma
Average Annual Age-Adjusted Rates for 1953 - 1987



Race: All
Gender: All
Ages: All

US rate: 1.65, 1.96 sd = 0.01
SC rate: 1.62, 1.96 sd = 0.09

Rates adjusted to 1970 US population.
• (1.53, 1.71) SC 95% CI

Figure 21:

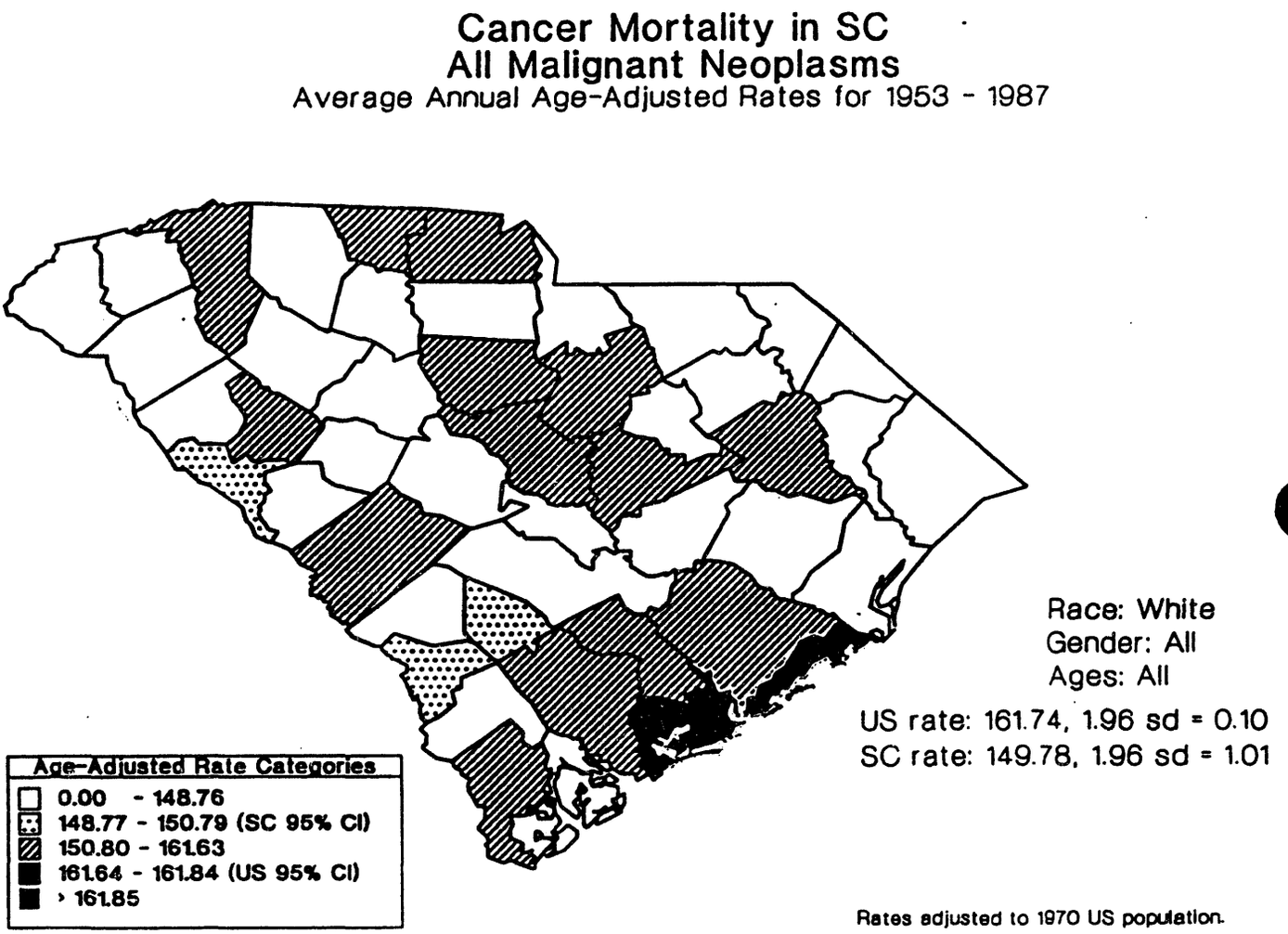
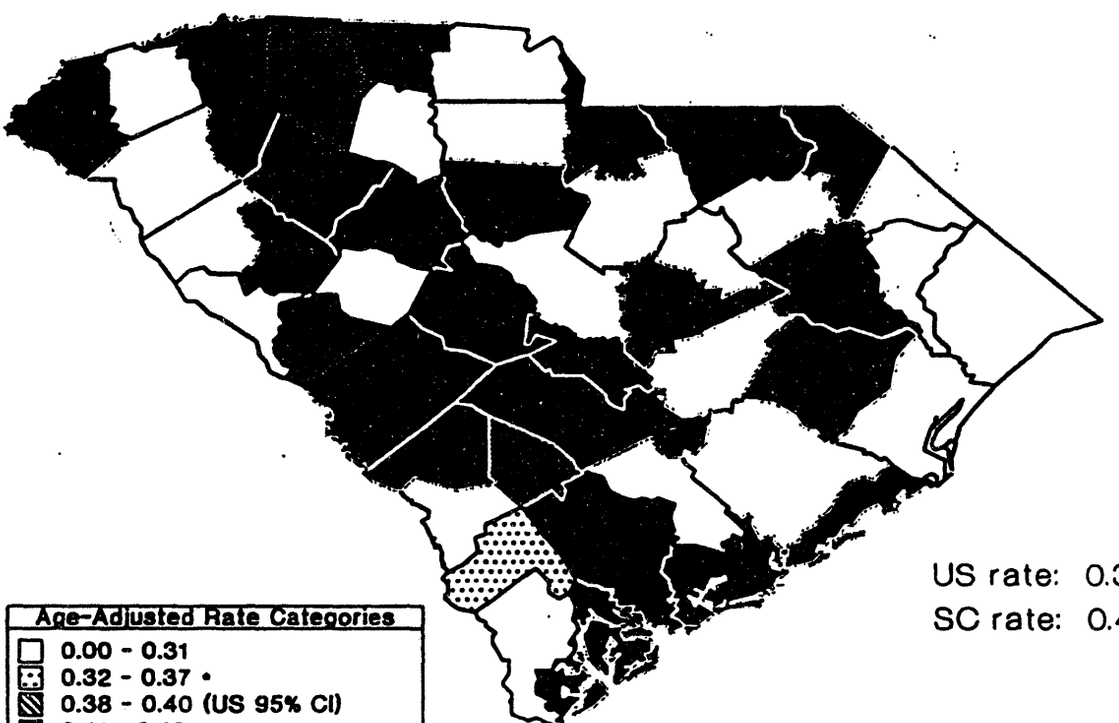

Cancer Mortality in SC
All Malignant Neoplasms
Average Annual Age-Adjusted Rates for 1953 - 1987
Age-Adjusted Rate Categories
0.00 - 148.76
148.77 - 150.79 (SC 95% CI)
150.80 - 161.63
161.64 - 161.84 (US 95% CI)
› 161.85
Race: White
Gender: All
Ages: All
US rate: 161.74, 1.96 sd = 0.10
SC rate: 149.78, 1.96 sd = 1.01
Rates adjusted to 1970 US population.

Figure 22:

Cancer Mortality in SC
Melanoma
Average Annual Age-Adjusted Rates for 1953 - 1987



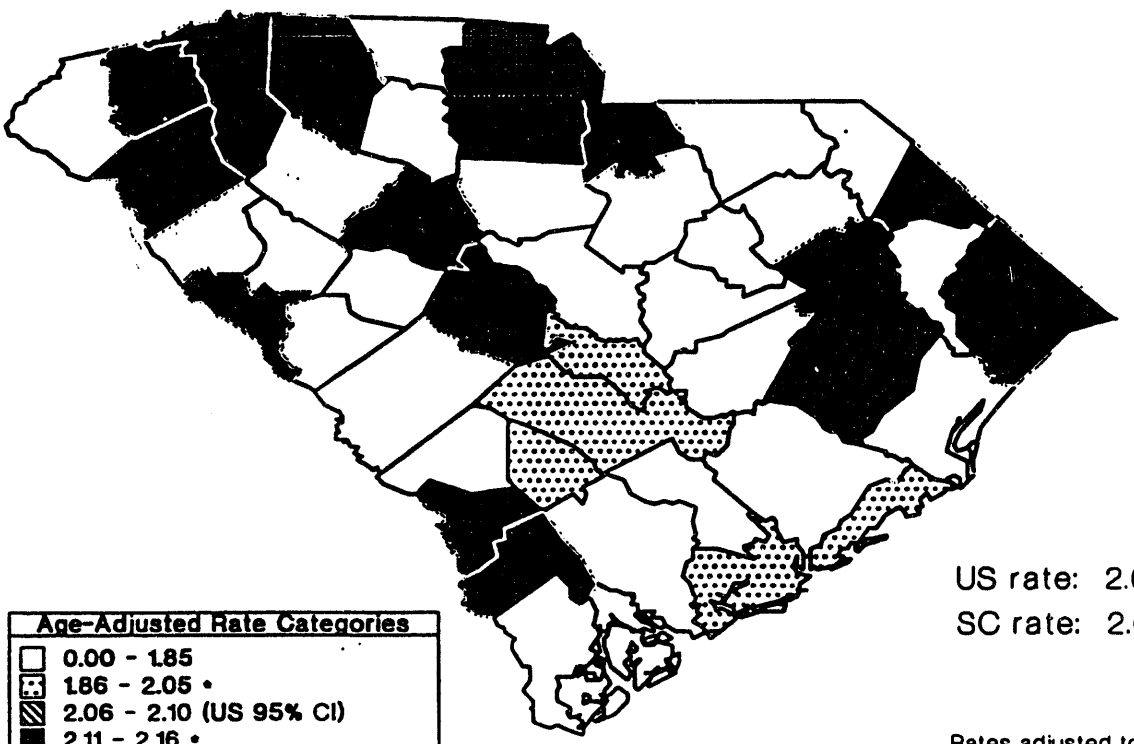
Race: NonWhite
Gender: All
Ages: All

US rate: 0.39, 1.96 sd = 0.01
SC rate: 0.40, 1.96 sd = 0.08

Rates adjusted to 1970 US population.
• (0.32, 0.48) SC 95% CI

Figure 23:

Cancer Mortality in SC
Melanoma
Average Annual Age-Adjusted Rates for 1953 - 1987



Race: All
Gender: Male
Ages: All

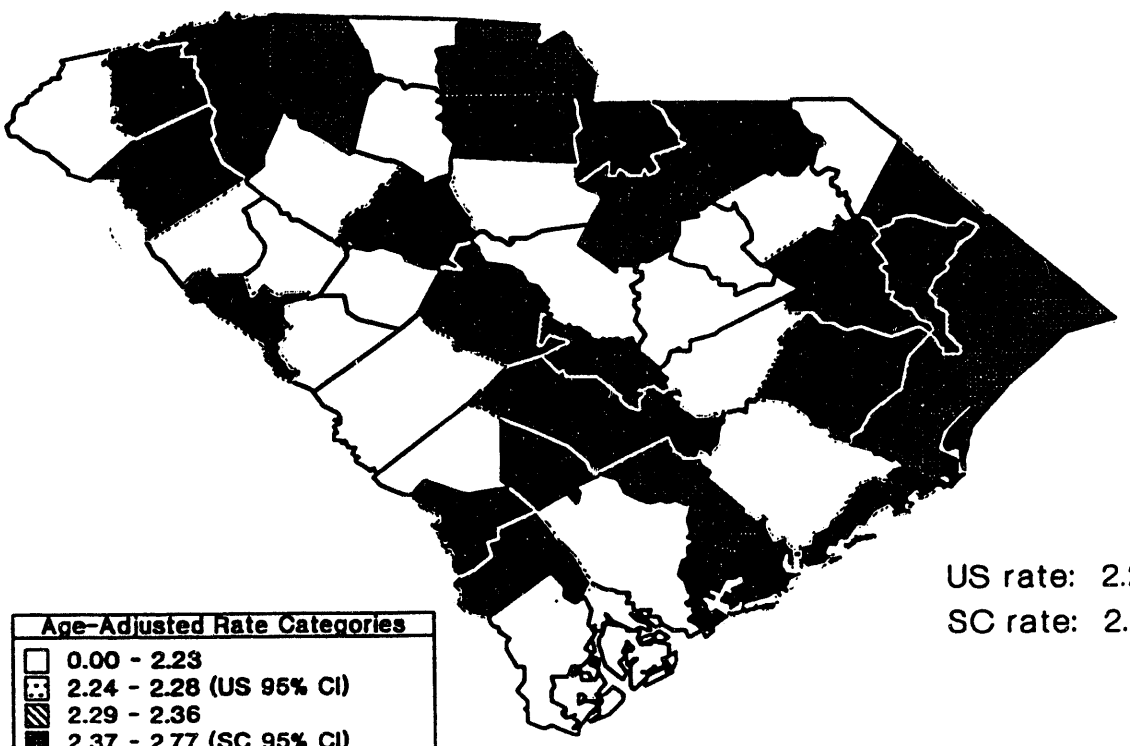
US rate: 2.08, 1.96 sd = 0.02
SC rate: 2.01, 1.96 sd = 0.15

Rates adjusted to 1970 US population.

* (1.86, 2.16) SC 95% CI

Figure 24:

Cancer Mortality in SC
Melanoma
Average Annual Age-Adjusted Rates for 1953 - 1987



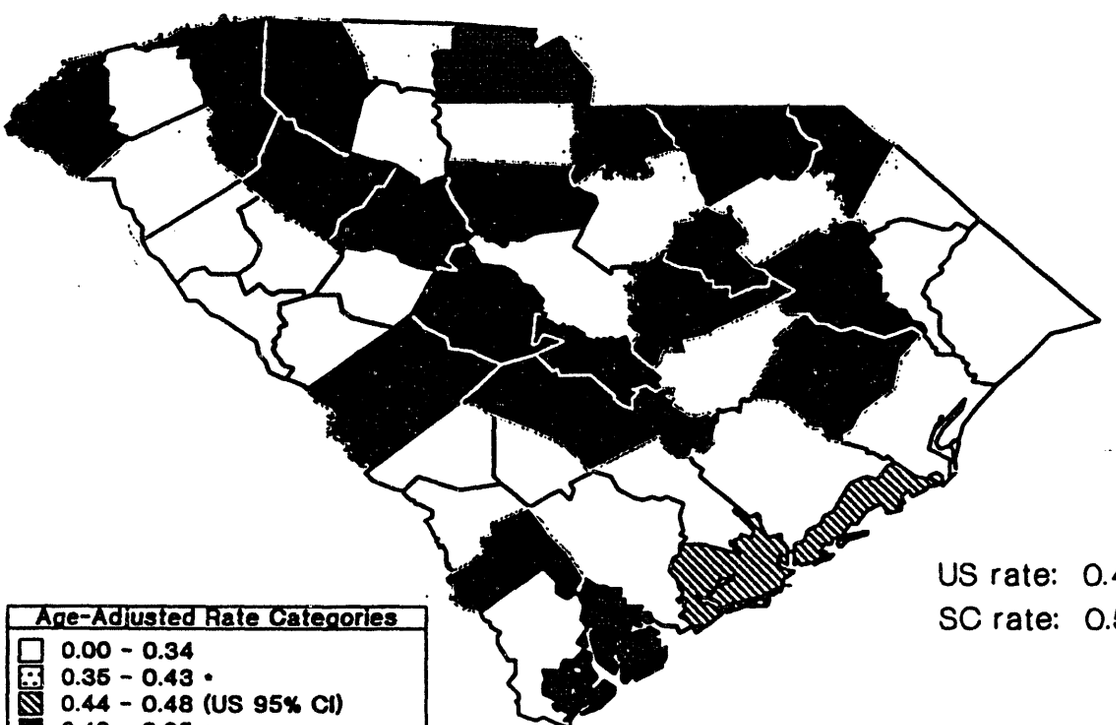
Race: White
Gender: Male
Ages: All

US rate: 2.26, 1.96 sd = 0.02
SC rate: 2.57, 1.96 sd = 0.20

Rates adjusted to 1970 US population.

Figure 25:

Cancer Mortality in SC
Melanoma
Average Annual Age-Adjusted Rates for 1953 - 1987



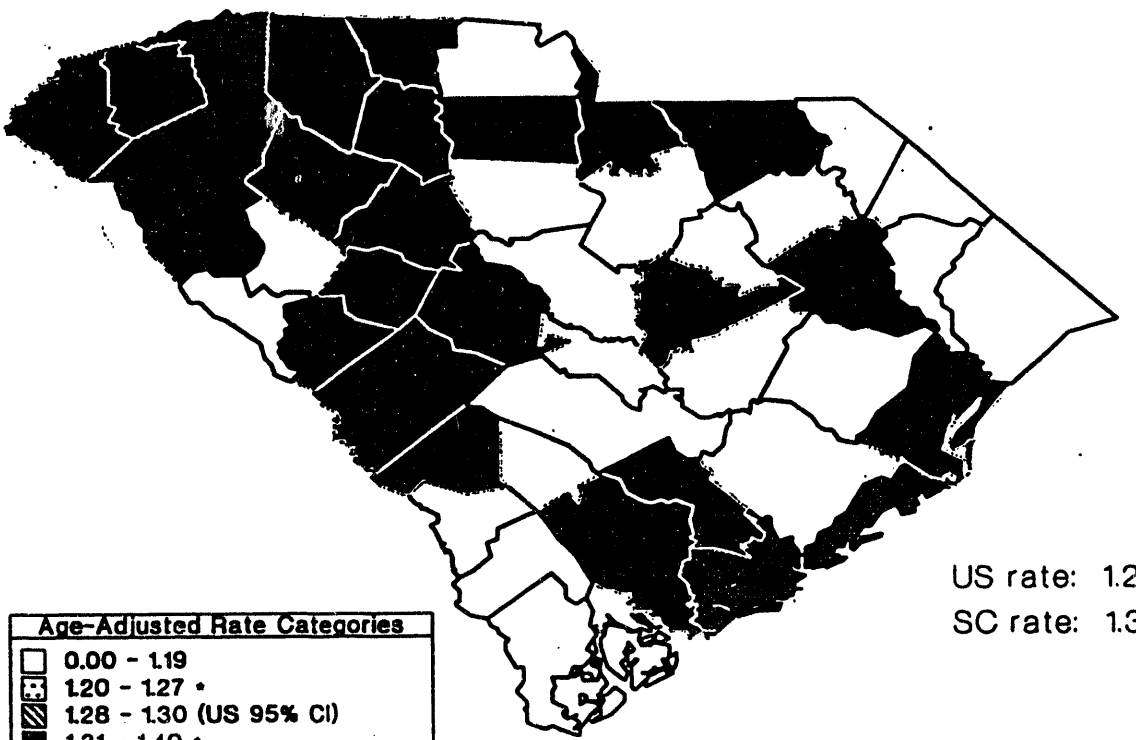
Race: NonWhite
Gender: Male
Ages: All

US rate: 0.46, 1.96 sd = 0.02
SC rate: 0.50, 1.96 sd = 0.15

Rates adjusted to 1970 US population.
* (0.35, 0.65) SC 95% CI

Figure 26:

Cancer Mortality in SC
Melanoma
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 1.19
- 1.20 - 1.27 *
- 1.28 - 1.30 (US 95% CI)
- 1.31 - 1.40 *
- > 1.40

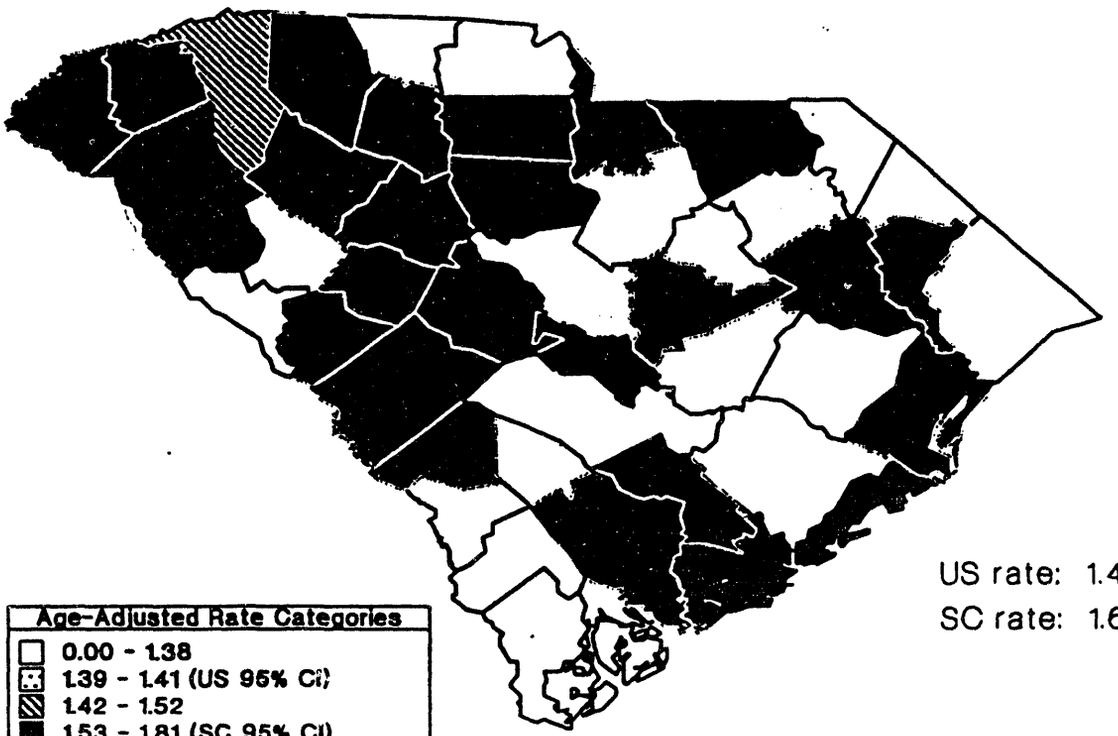
Race: All
Gender: Female
Ages: All

US rate: 1.29, 1.96 sd = 0.01
SC rate: 1.30, 1.96 sd = 0.10

Rates adjusted to 1970 US population.
* (1.20, 1.40) SC 95% CI

Figure 27:

Cancer Mortality in SC
Melanoma
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 1.38
- 1.39 - 1.41 (US 95% CI)
- 1.42 - 1.52
- 1.53 - 1.81 (SC 95% CI)
- > 1.81

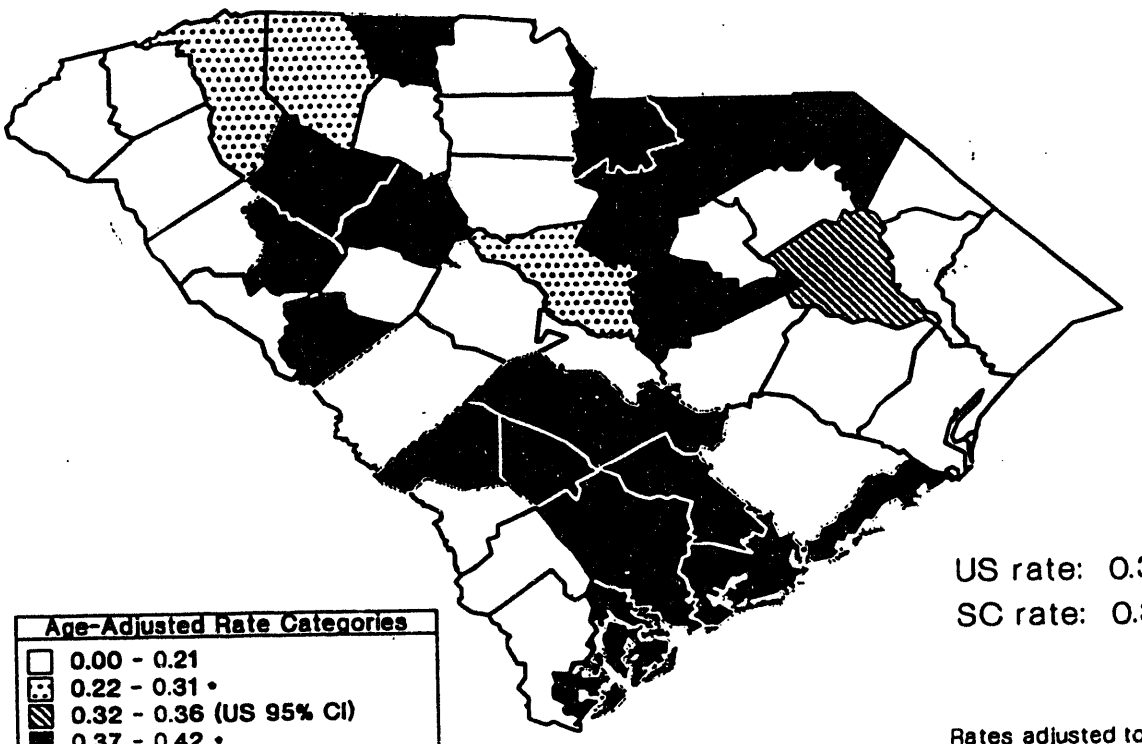
Race: White
Gender: Female
Ages: All

US rate: 1.40, 1.96 sd = 0.01
SC rate: 1.67, 1.96 sd = 0.14

Rates adjusted to 1970 US population

Figure 28:

Cancer Mortality in SC
Melanoma
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 0.21
- 0.22 - 0.31 •
- 0.32 - 0.36 (US 95% CI)
- 0.37 - 0.42 •
- › 0.42

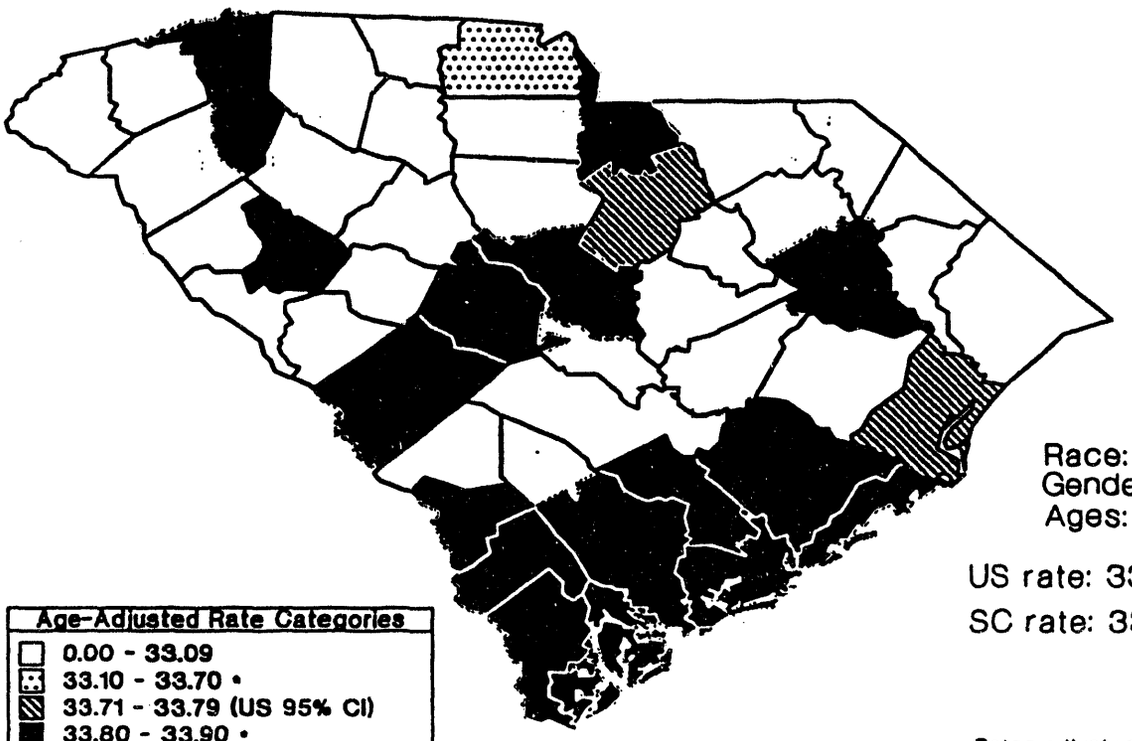
Race: NonWhite
Gender: Female
Ages: All

US rate: 0.34, 1.96 sd = 0.02
SC rate: 0.32, 1.96 sd = 0.10

Rates adjusted to 1970 US population.
• (0.22, 0.42) SC 95% CI

Figure 29:

Cancer Mortality in SC
Lung, Trachea and Pleura
Average Annual Age-Adjusted Rates for 1953 - 1987



Race: All
Gender: All
Ages: All

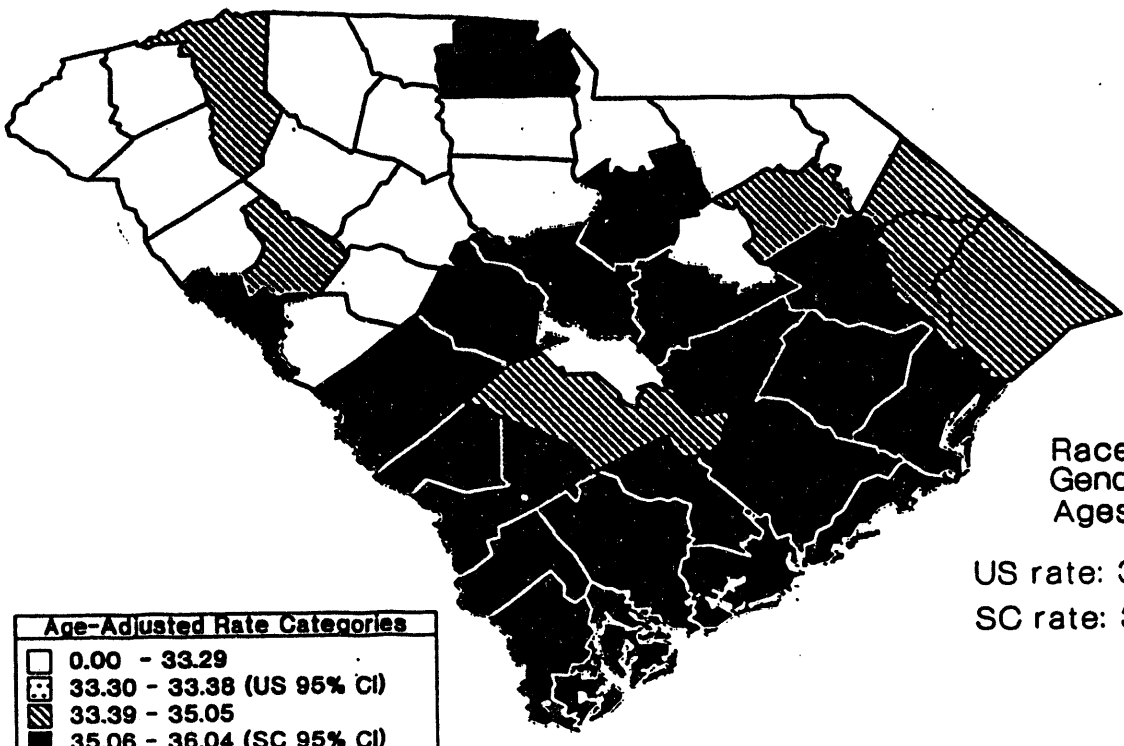
US rate: 33.75, 1.96 sd = 0.04
SC rate: 33.50, 1.96 sd = 0.40

Rates adjusted to 1970 US population.

• (33.10, 33.90) SC 95% CI

Figure 30:

Cancer Mortality in SC
Lung, Trachea and Pleura
Average Annual Age-Adjusted Rates for 1953 - 1987



Race: White
Gender: All
Ages: All

US rate: 33.34, 1.96 sd = 0.04
SC rate: 35.55, 1.96 sd = 0.49

Rates adjusted to 1970 US population

Figure 31:

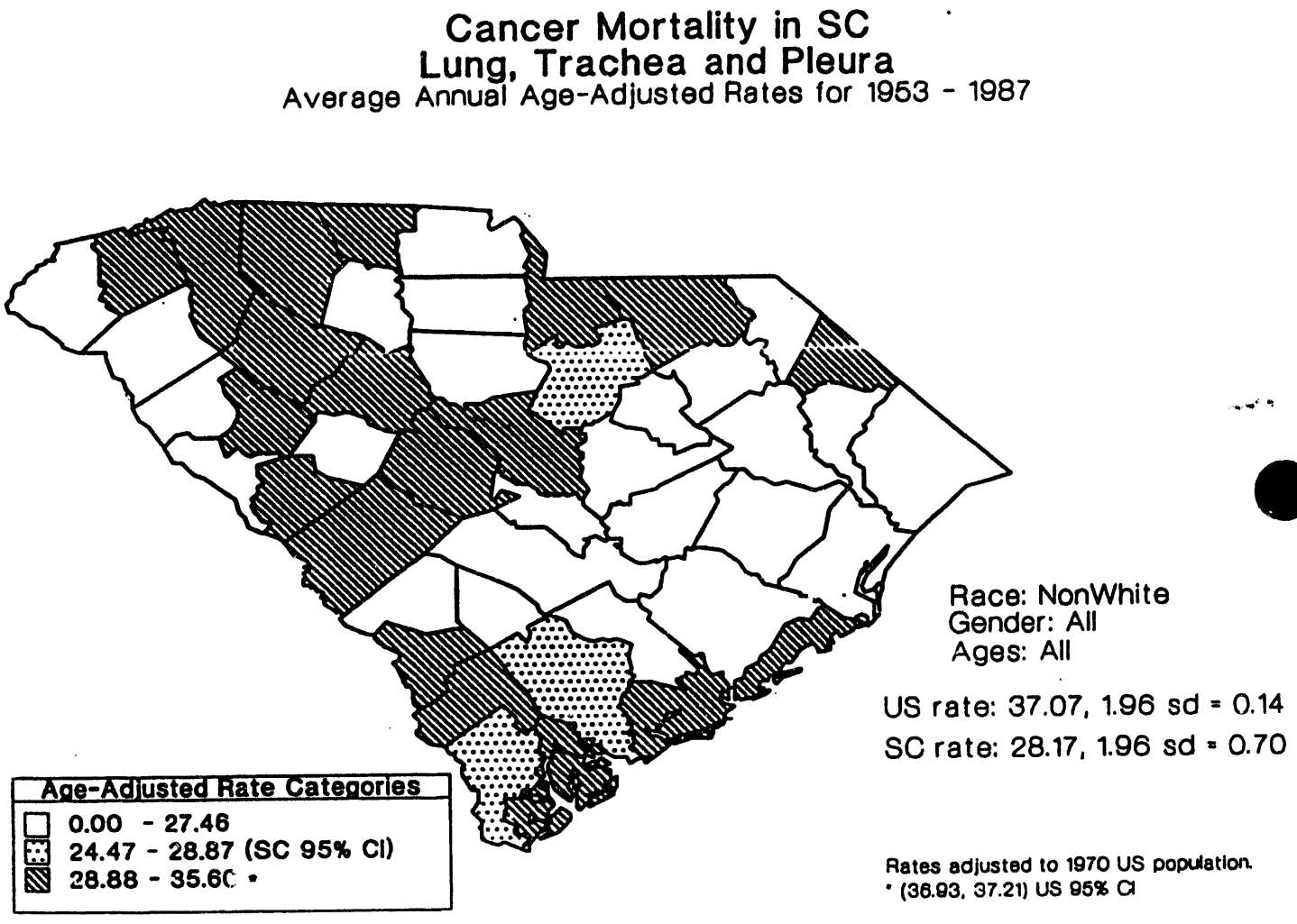
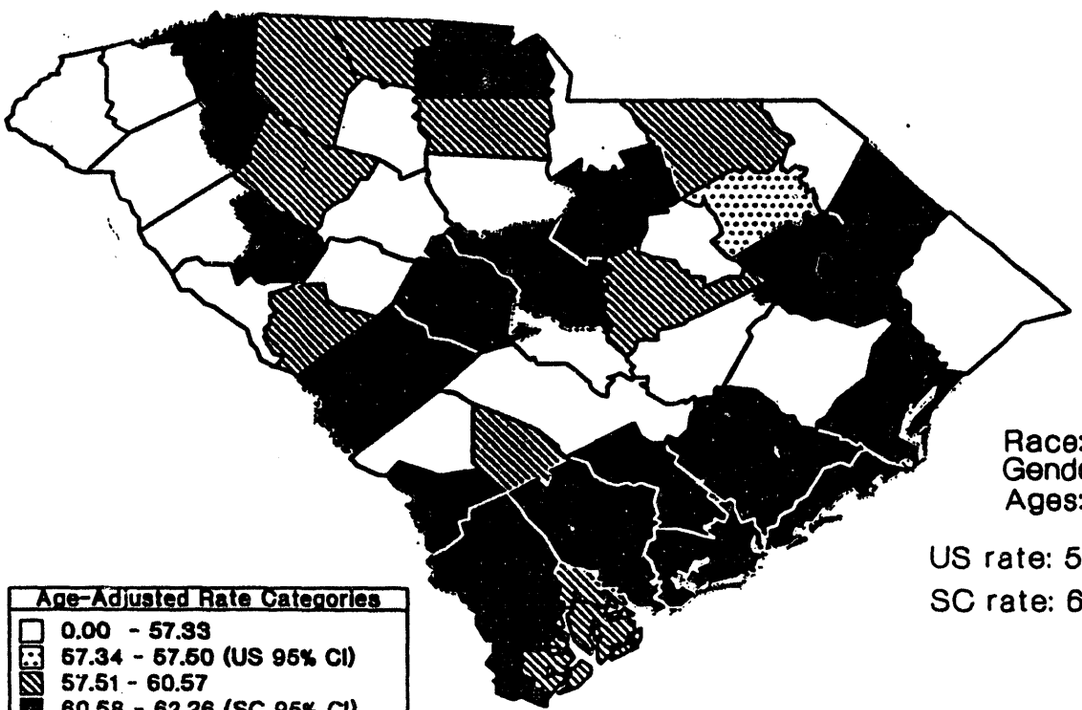

Cancer Mortality in SC
Lung, Trachea and Pleura
Average Annual Age-Adjusted Rates for 1953 - 1987
Race: NonWhite
Gender: All
Ages: All
US rate: 37.07, 1.96 sd = 0.14
SC rate: 28.17, 1.96 sd = 0.70
Age-Adjusted Rate Categories
0.00 - 27.46
24.47 - 28.87 (SC 95% CI)
28.88 - 35.60 *
Rates adjusted to 1970 US population.
* (36.93, 37.21) US 95% CI

Figure 32:

Cancer Mortality in SC
Lung, Trachea and Pleura
Average Annual Age Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 57.33
- 57.34 - 57.50 (US 95% CI)
- 57.51 - 60.57
- 60.58 - 62.26 (SC 95% CI)
- > 62.26

Race: All
Gender: Male
Ages: All

US rate: 57.42, 1.96 sd = 0.08
SC rate: 61.42, 1.96 sd = 0.84

Rates adjusted to 1970 US population.

19075

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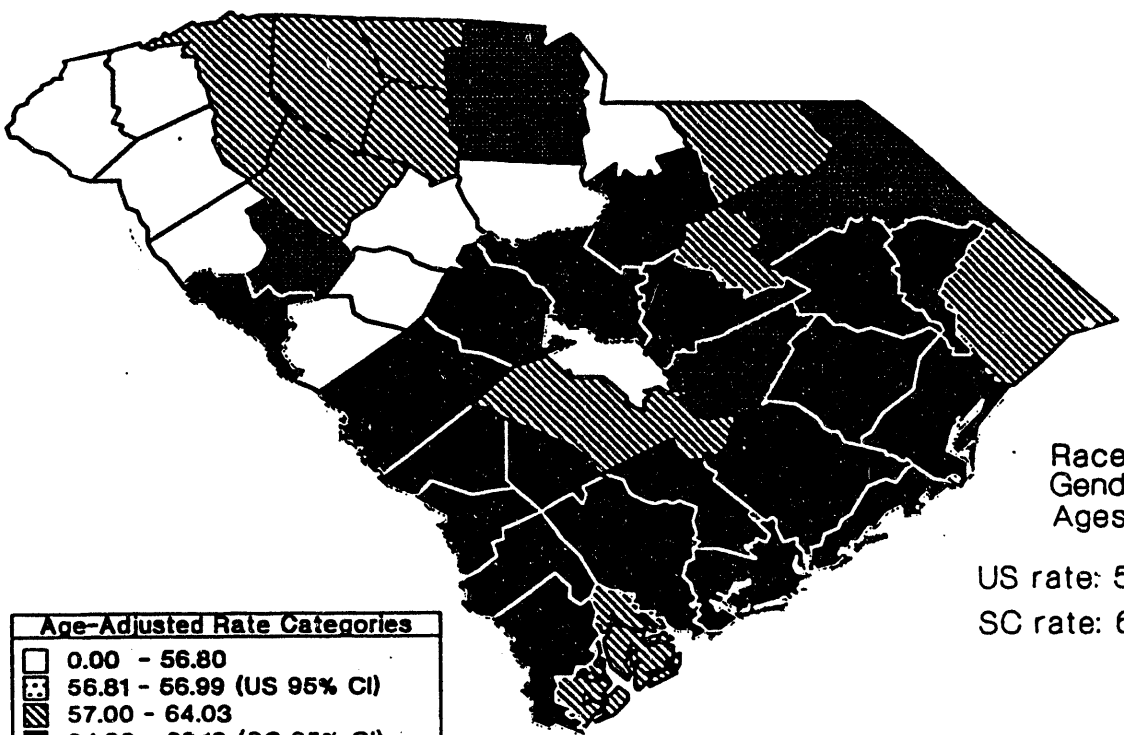
2 of 8

Figure 33:

Cancer Mortality in SC
Lung, Trachea and Pleura
Average Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 56.80
- 56.81 - 66.99 (US 95% CI)
- 57.00 - 64.03
- 64.03 - 66.10 (SC 95% CI)
- › 66.10

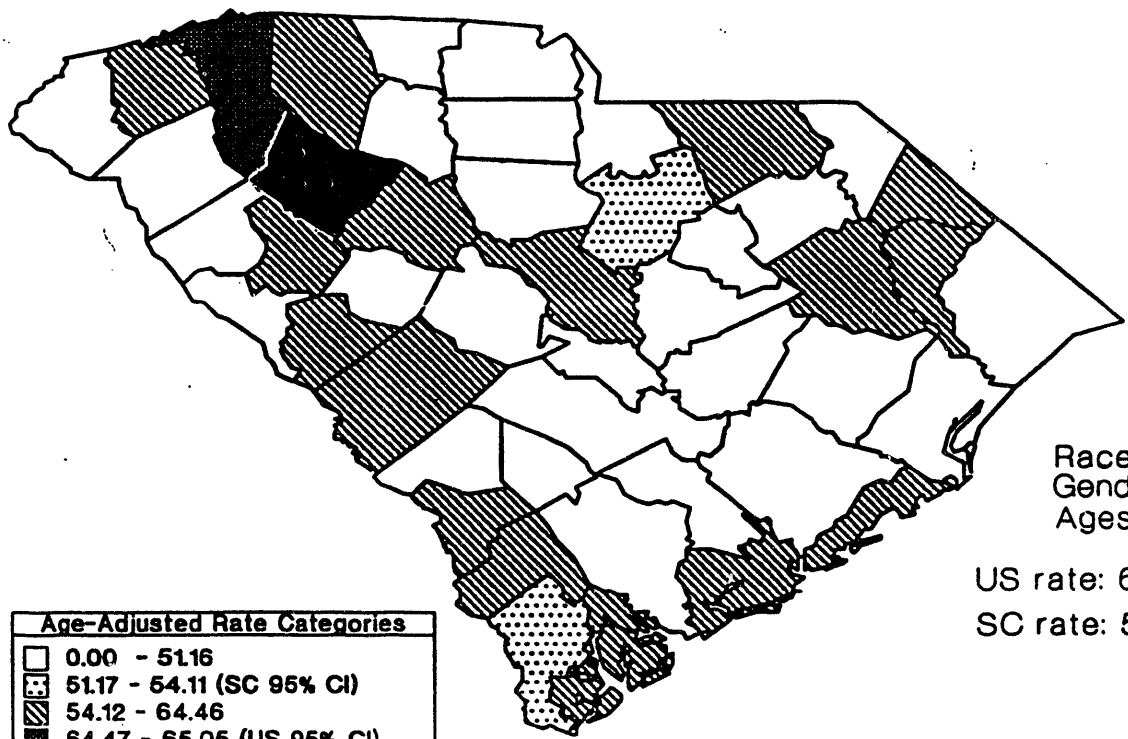
Race: White
Gender: Male
Ages: All

US rate: 56.90, 1.96 sd = 0.09
SC rate: 65.07, 1.96 sd = 1.03

Rates adjusted to 1970 US population.

Figure 34:

Cancer Mortality in SC
Lung, Trachea and Pleura
Average Annual Age Adjusted Rates for 1953 - 1987



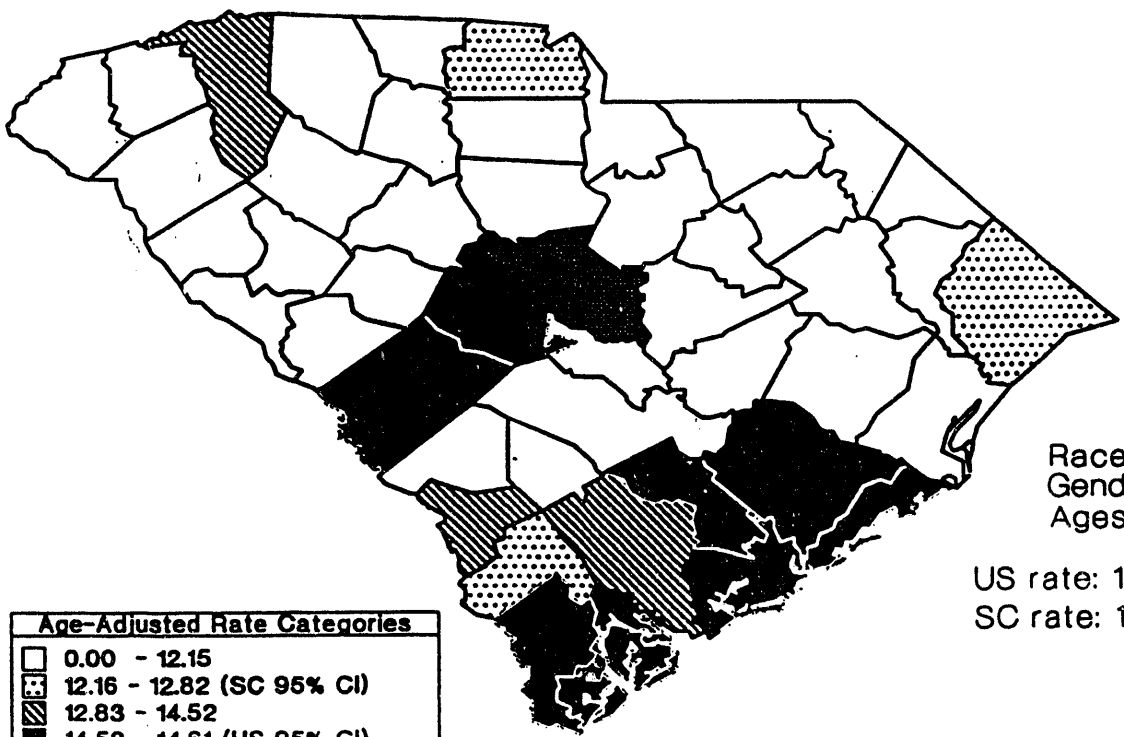
Race: NonWhite
Gender: Male
Ages: All

US rate: 64.76, 1.96 sd = 0.29
SC rate: 52.64, 1.96 sd = 1.47

Rates adjusted to 1970 US population.

Figure 35:

Cancer Mortality in SC
Lung, Trachea and Pleura
Average Annual Age-Adjusted Rates for 1953 - 1987



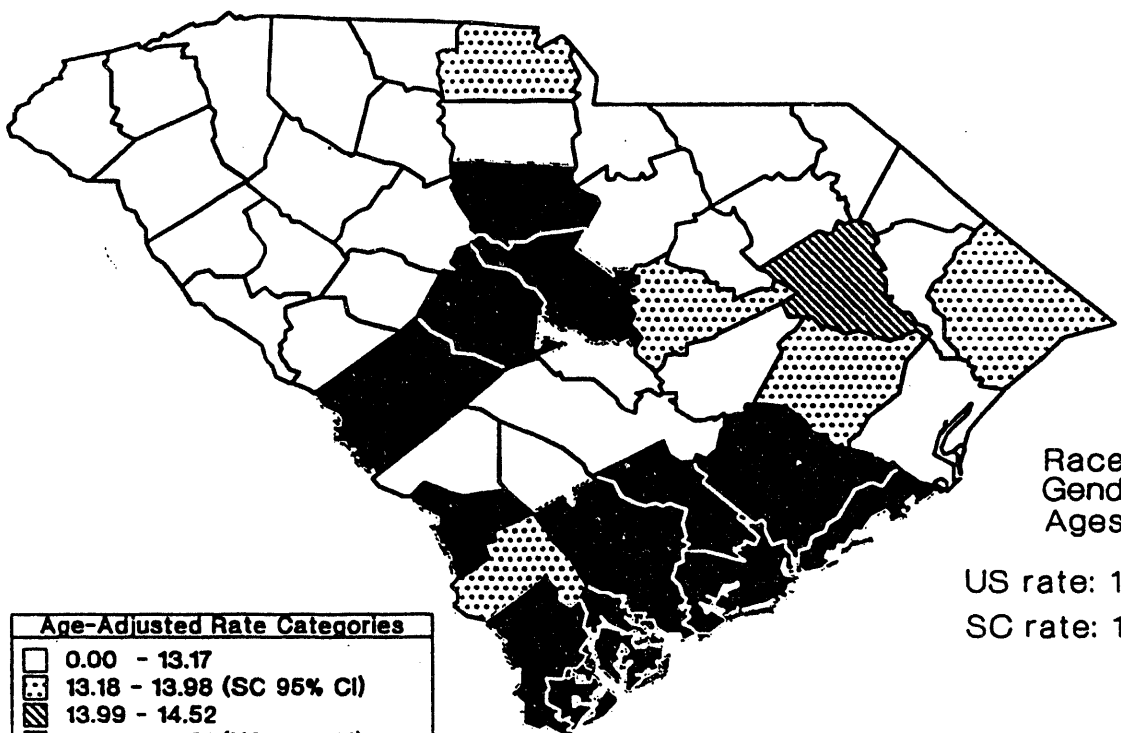
Race: All
Gender: Female
Ages: All

US rate: 14.57, 1.96 sd = 0.04
SC rate: 12.49, 1.96 sd = 0.33

Rates adjusted to 1970 US population

Figure 36:

Cancer Mortality in SC
Lung, Trachea and Pleura
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 13.17
- 13.18 - 13.98 (SC 95% CI)
- 13.99 - 14.52
- 14.53 - 14.61 (US 95% CI)
- › 14.61

Race: White
Gender: Female
Ages: All

US rate: 14.57, 1.96 sd = 0.04
SC rate: 13.58, 1.96 sd = 0.40

Rates adjusted to 1970 US population.

Figure 37:

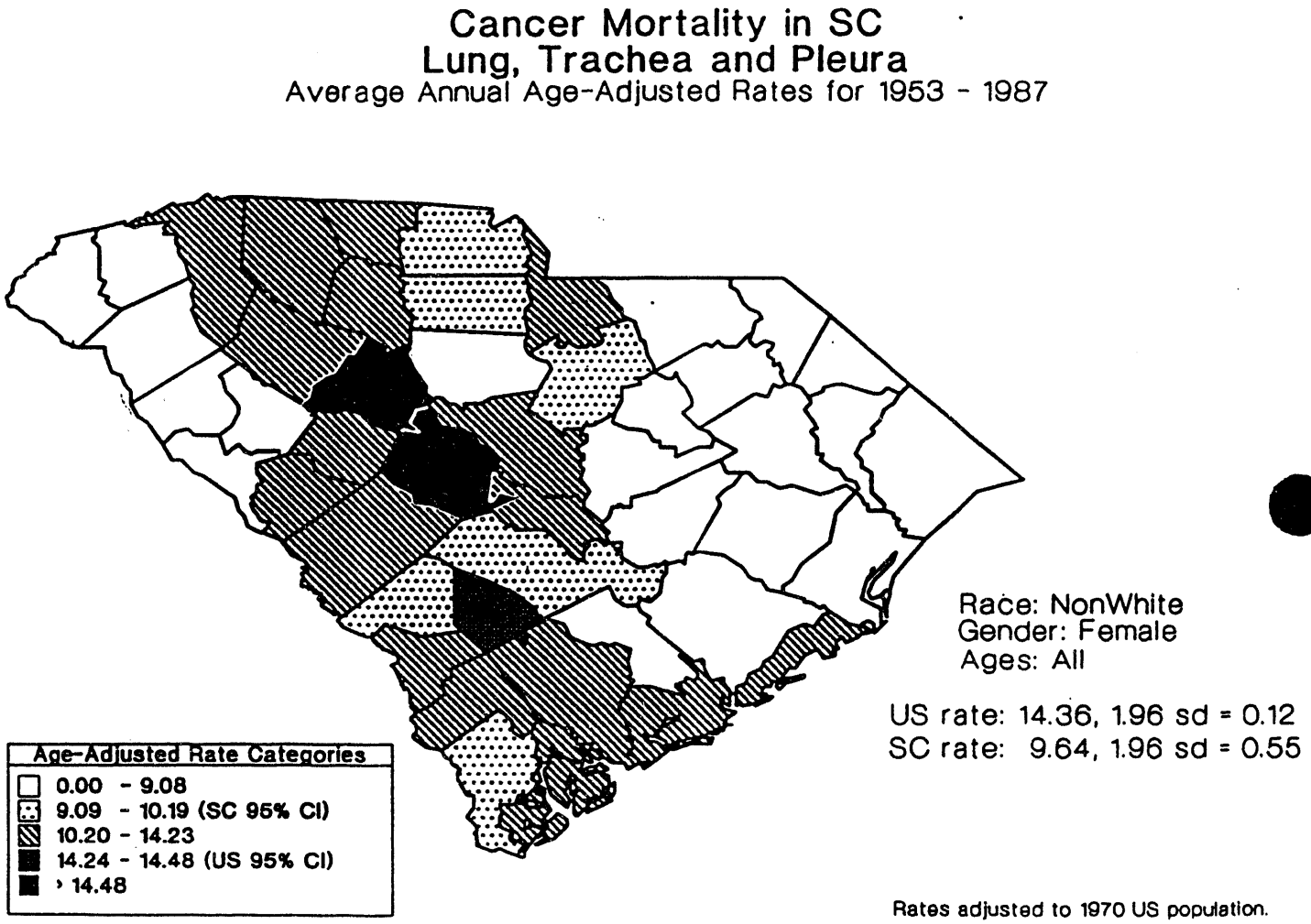
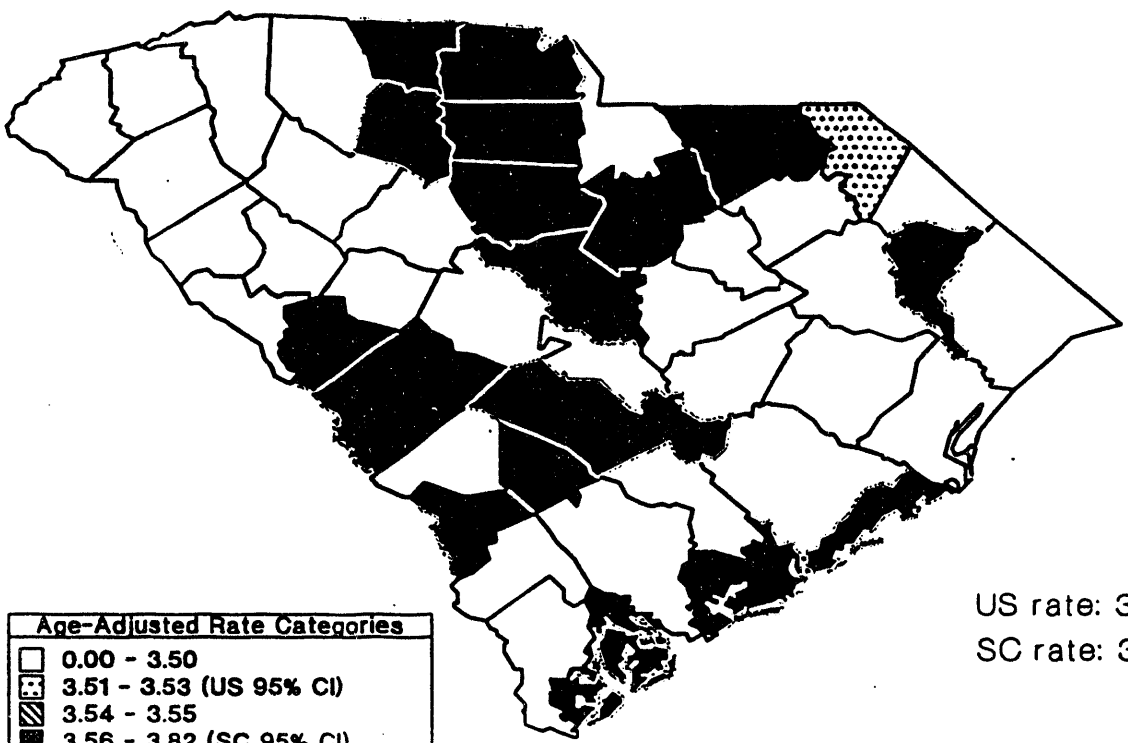

Cancer Mortality in SC
Lung, Trachea and Pleura
Average Annual Age-Adjusted Rates for 1953 - 1987
Age-Adjusted Rate Categories
0.00 - 9.08
9.09 - 10.19 (SC 95% CI)
10.20 - 14.23
14.24 - 14.48 (US 95% CI)
› 14.48
Race: NonWhite
Gender: Female
Ages: All
US rate: 14.36, 1.96 sd = 0.12
SC rate: 9.64, 1.96 sd = 0.55
Rates adjusted to 1970 US population.

Figure 38:

Cancer Mortality in SC
Oral Cavity and Pharynx
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 3.50
- 3.51 - 3.53 (US 95% CI)
- 3.54 - 3.55
- 3.56 - 3.82 (SC 95% CI)
- > 3.82

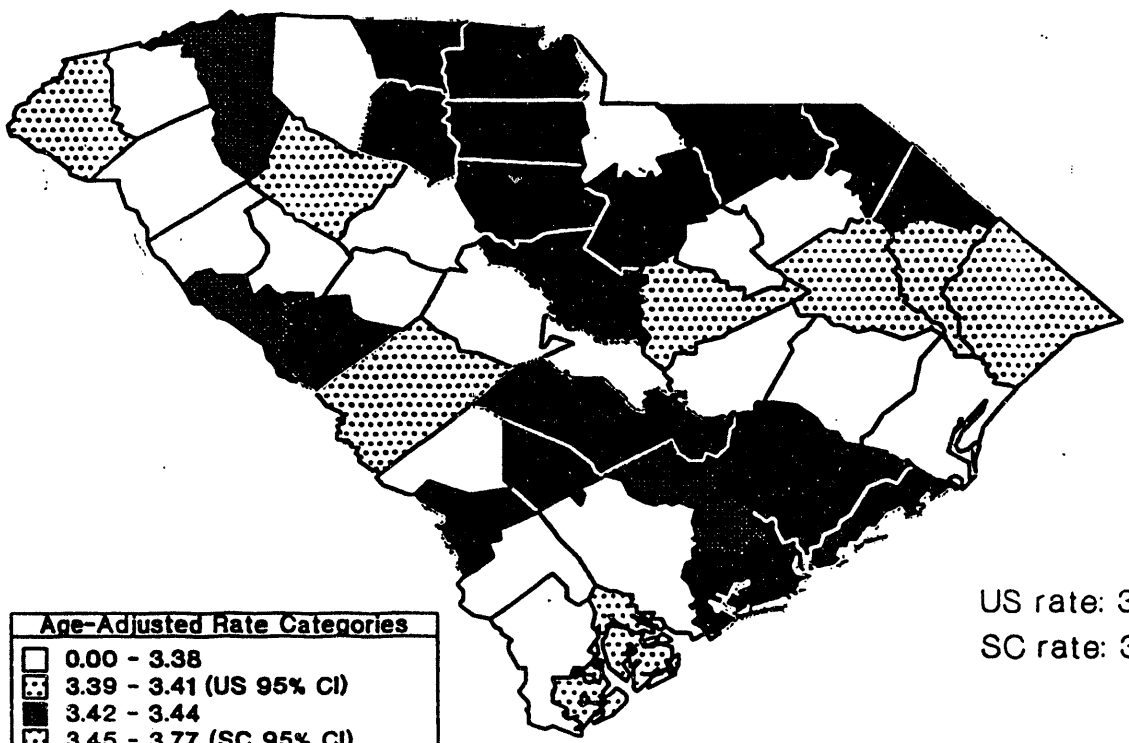
Race: All
Gender: All
Ages: All

US rate: 3.52, 1.96 sd = 0.01
SC rate: 3.69, 1.96 sd = 0.13

Rates adjusted to 1970 US population

Figure 39:

Cancer Mortality in SC
Oral Cavity and Pharynx
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 3.38
- 3.39 - 3.41 (US 95% CI)
- 3.42 - 3.44
- 3.45 - 3.77 (SC 95% CI)
- › 3.77

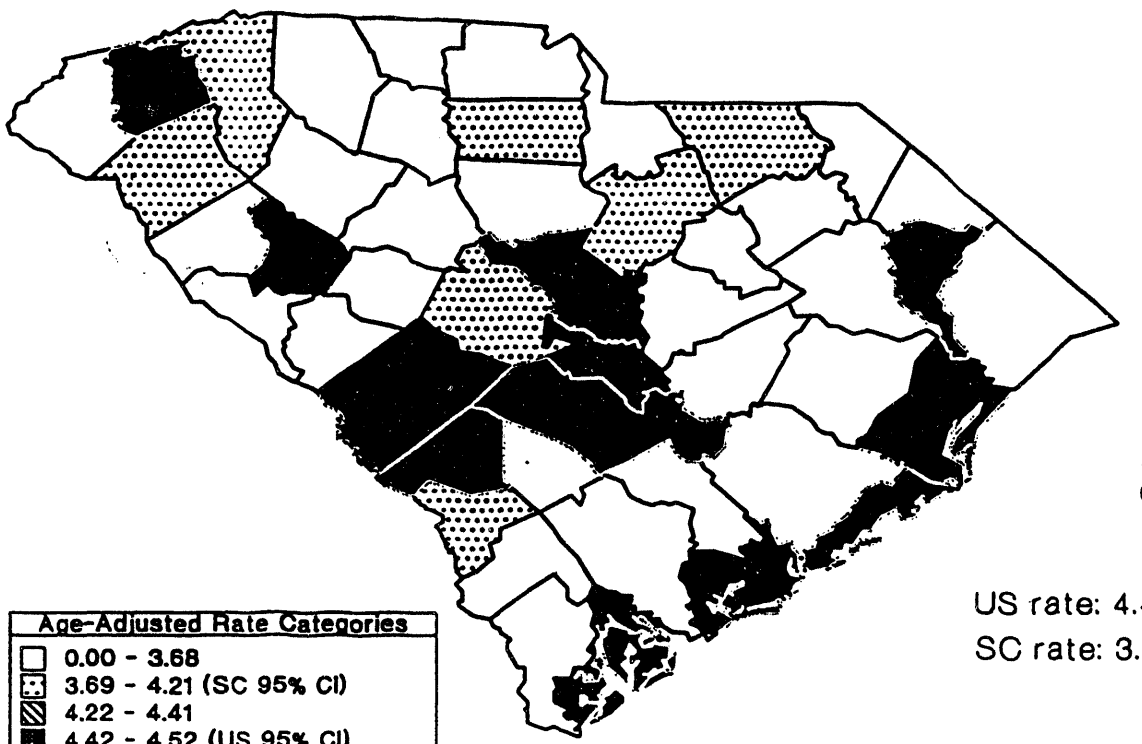
Race: White
Gender: All
Ages: All

US rate: 3.40, 1.96 sd = 0.01
SC rate: 3.61, 1.96 sd = 0.16

Rates adjusted to 1970 US population.

Figure 40:

Cancer Mortality in SC
Oral Cavity and Pharynx
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 3.68
- 3.69 - 4.21 (SC 95% CI)
- 4.22 - 4.41
- 4.42 - 4.52 (US 95% CI)
- › 4.52

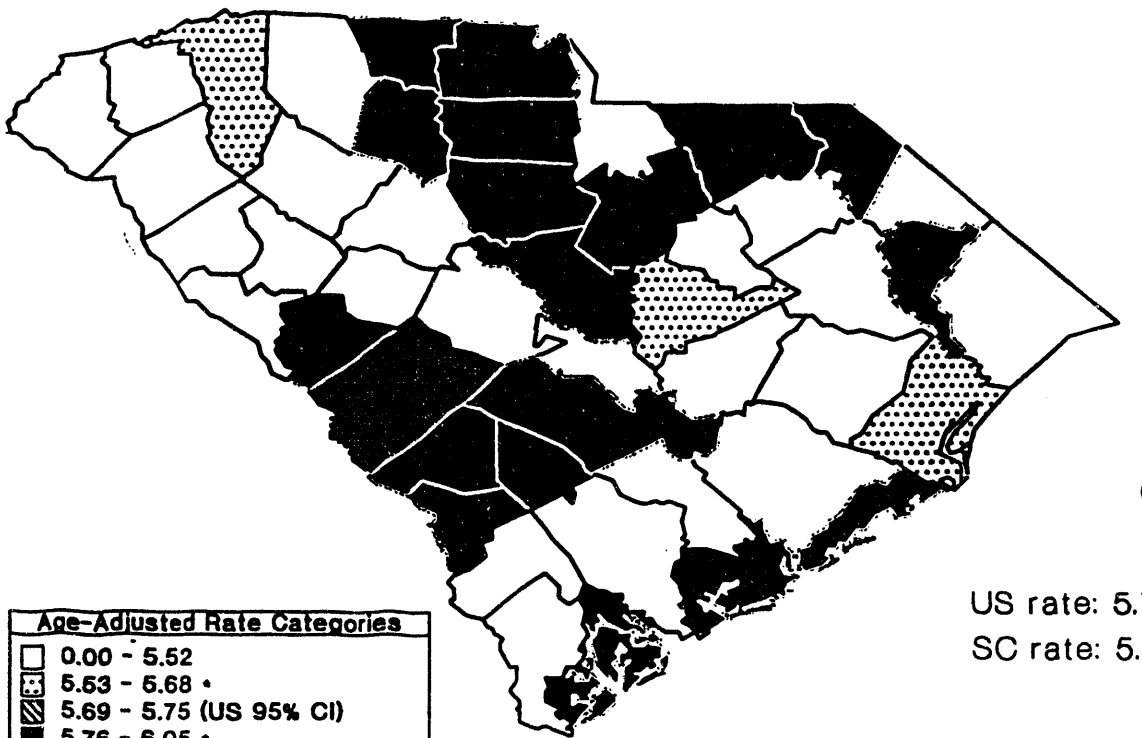
Race: Nonwhite
Gender: All
Ages: All

US rate: 4.47, 1.96 sd = 0.05
SC rate: 3.95, 1.96 sd = 0.26

Rates adjusted to 1970 US population.

Figure 41:

Cancer Mortality in SC
Oral Cavity and Pharynx
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 5.52
- 5.53 - 5.68 *
- 5.69 - 5.75 (US 95% CI)
- 5.76 - 6.05 *
- > 6.05

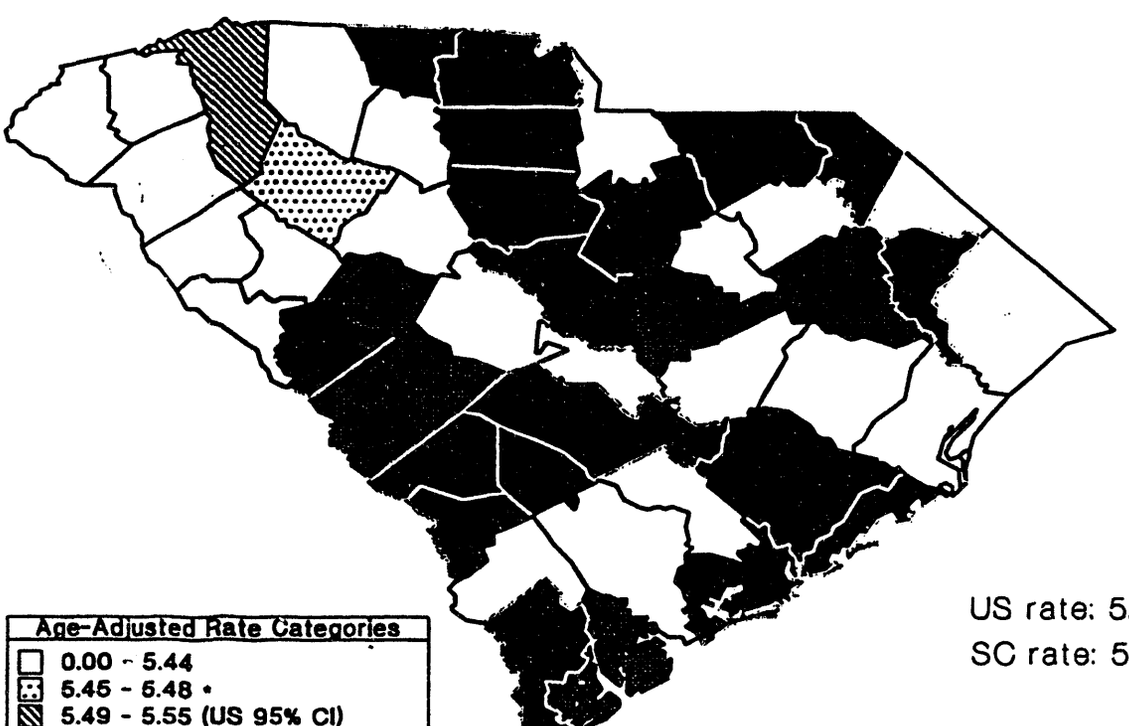
Race: All
Gender: Male
Ages: All

US rate: 5.72, 1.96 sd = 0.03
SC rate: 5.79, 1.96 sd = 0.26

Rates adjusted to 1970 US population.
* (5.53, 6.05) SC 95% CI

Figure 42:

Cancer Mortality in SC
Oral Cavity and Pharynx
Average Annual Age-Adjusted Rates for 1953 - 1987



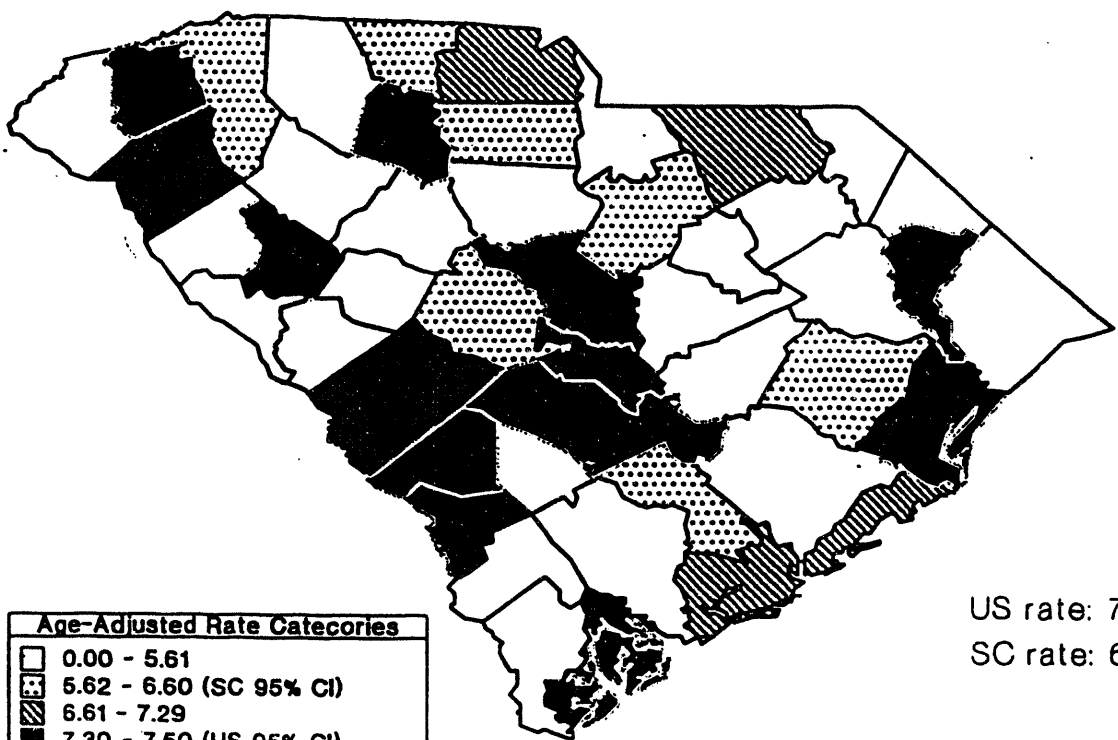
Race: White
Gender: Male
Ages: All

US rate: 5.52, 1.96 sd = 0.03
SC rate: 5.76, 1.96 sd = 0.31

Rates adjusted to 1970 US population.
* (5.45, 6.07) SC 95% CI

Figure 43:

Cancer Mortality in SC
Oral Cavity and Pharynx
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Catecories
- 0.00 - 5.61
- 5.62 - 6.60 (SC 95% CI)
- 6.61 - 7.29
- 7.30 - 7.50 (US 95% CI)
- › 7.50

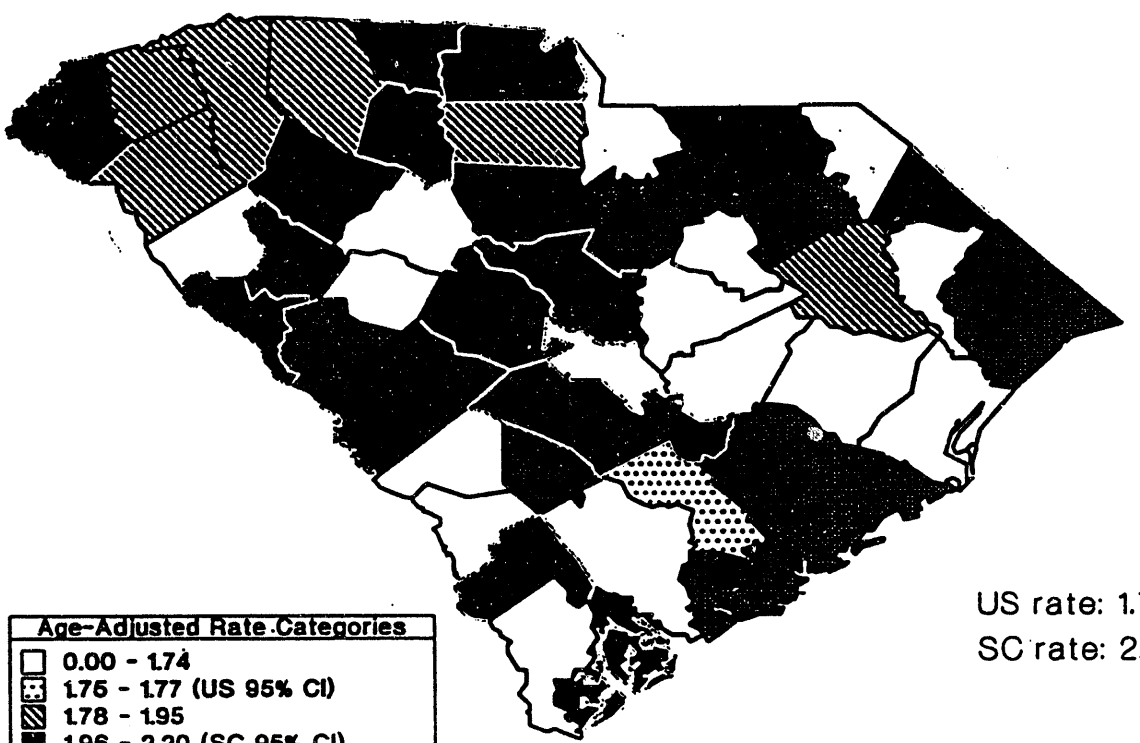
Race: NonWhite
Gender: Male
Ages: All

US rate: 7.40, 1.96 sd = 0.10
SC rate: 6.11, 1.96 sd = 0.49

Rates adjusted to 1970 US population.

Figure 44:

Cancer Mortality in SC
Oral Cavity and Pharynx
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 1.74
- 1.75 - 1.77 (US 95% CI)
- 1.78 - 1.95
- 1.96 - 2.20 (SC 95% CI)
- › 2.20

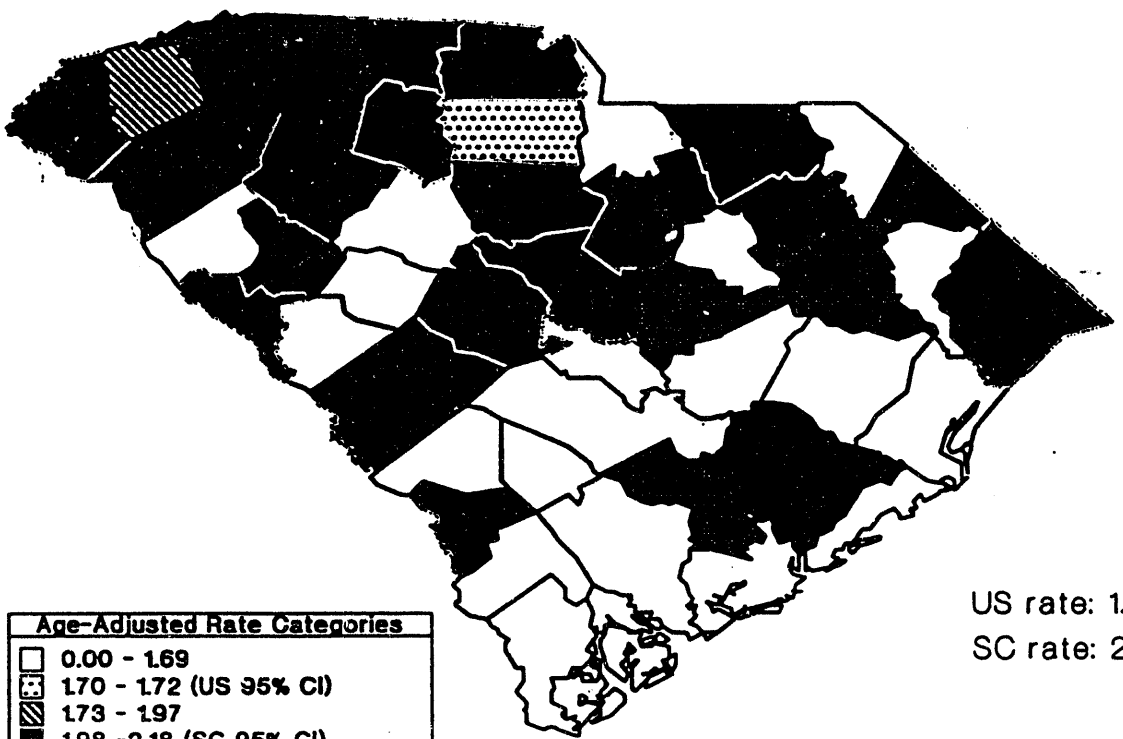
Race: All
Gender: Female
Ages: All

US rate: 1.76, 1.96 sd = 0.01
SC rate: 2.09, 1.96 sd = 0.13

Rates adjusted to 1970 US population

Figure 45:

Cancer Mortality in SC
Oral Cavity and Pharynx
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 1.69
- 1.70 - 1.72 (US 95% CI)
- 1.73 - 1.97
- 1.98 -2.18 (SC 95% CI)
- › 2.18

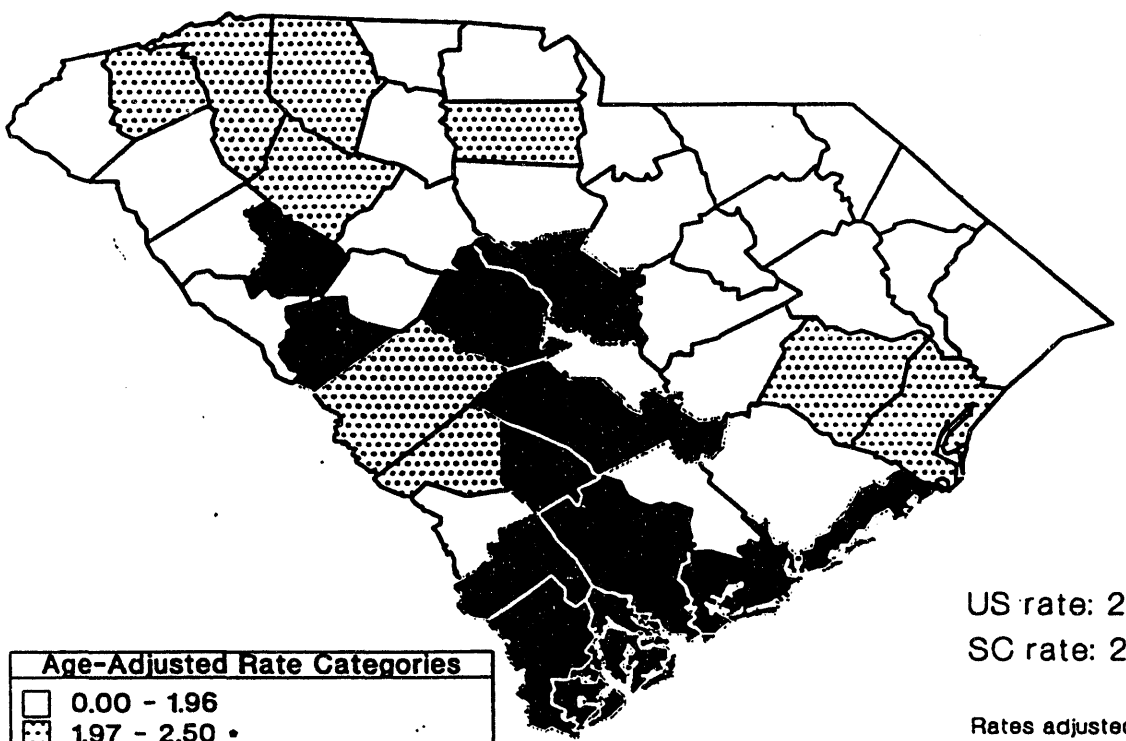
Race: White
Gender: Female
Ages: All

US rate: 1.71, 1.96 sd = 0.01
SC rate: 2.03, 1.96 sd = 0.15

Rates adjusted to 1970 US population.

Figure 46:

Cancer Mortality in SC
Oral Cavity and Pharynx
Average Annual Age-Adjusted Rates for 1953 - 1987



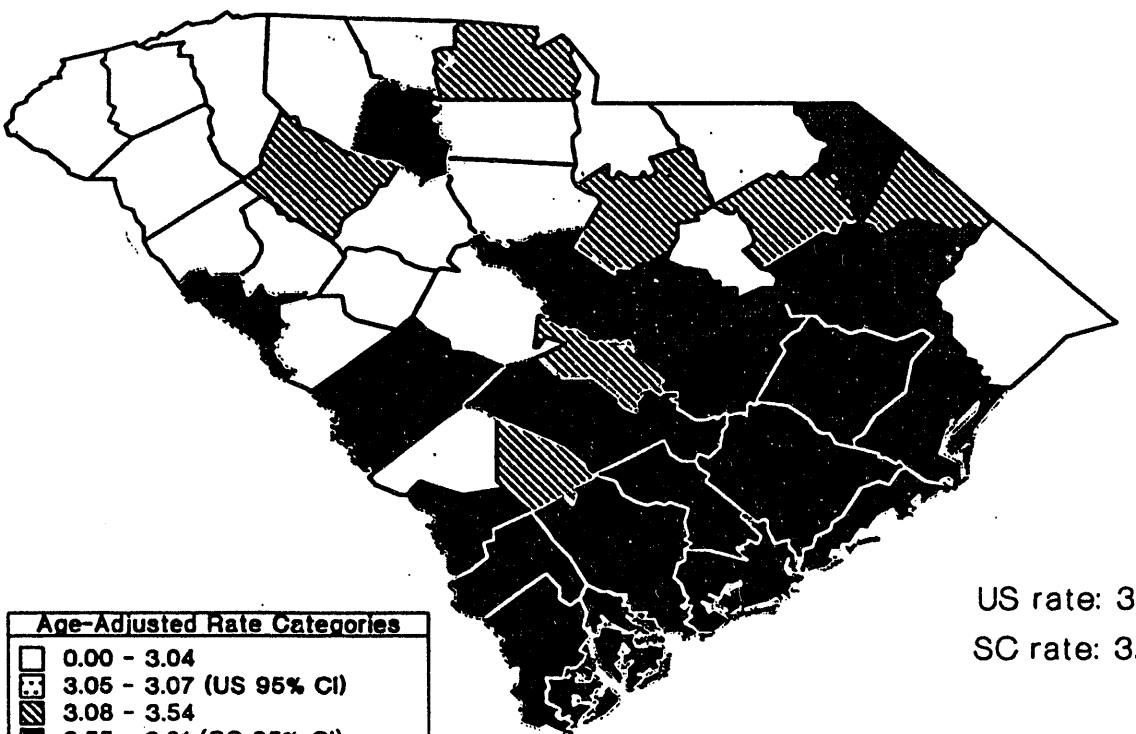
Race: NonWhite
Gender: Female
Ages: All

US rate: 2.02, 1.96 sd = 0.05
SC rate: 2.25, 1.96 sd = 0.26

Rates adjusted to 1970 US population.
• (1.97, 2.07) US 95% CI
• (1.99, 2.51) SC 95% CI

Figure 47:

Cancer Mortality in SC
Esophagus
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 3.04
- 3.05 - 3.07 (US 95% CI)
- 3.08 - 3.54
- 3.55 - 3.81 (SC 95% CI)
- › 3.81

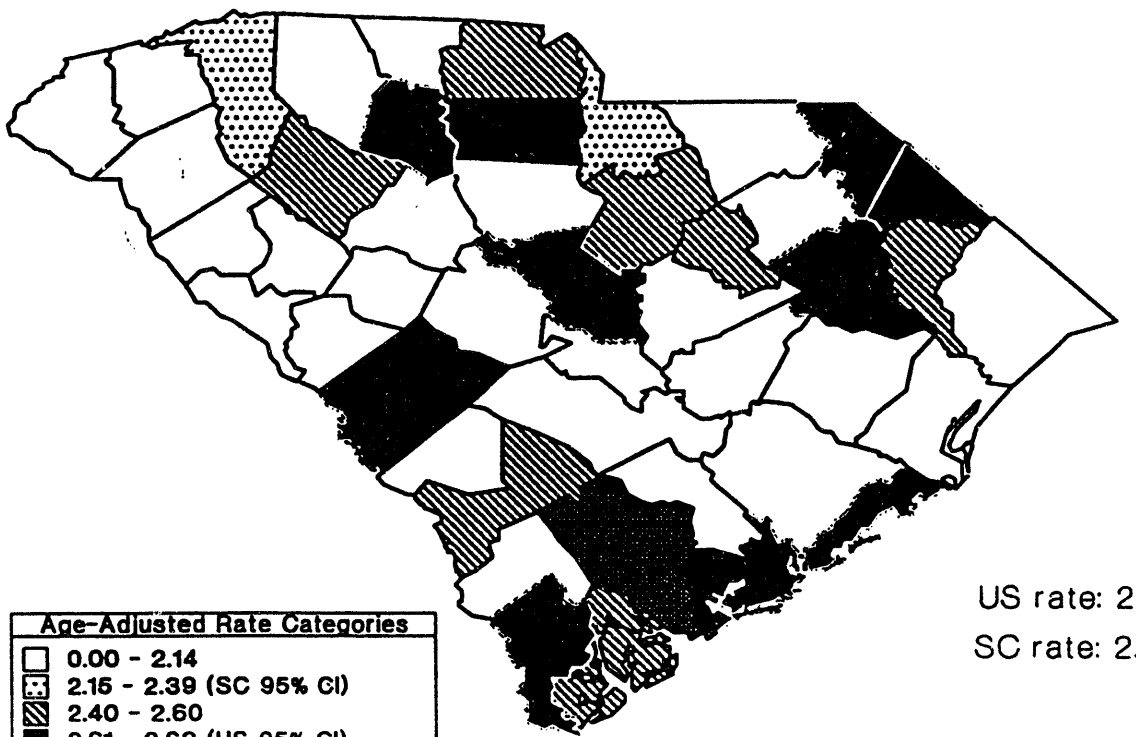
Race: All
Gener: All
Ages: All

US rate: 3.06, 1.96 sd = 0.01
SC rate: 3.68, 1.96 sd = 0.13

Rates adjusted to 1970 US population.

Figure 48:

Cancer Mortality in SC
Esophagus
Average Annual Age-Adjusted Rates for 1953 - 1987



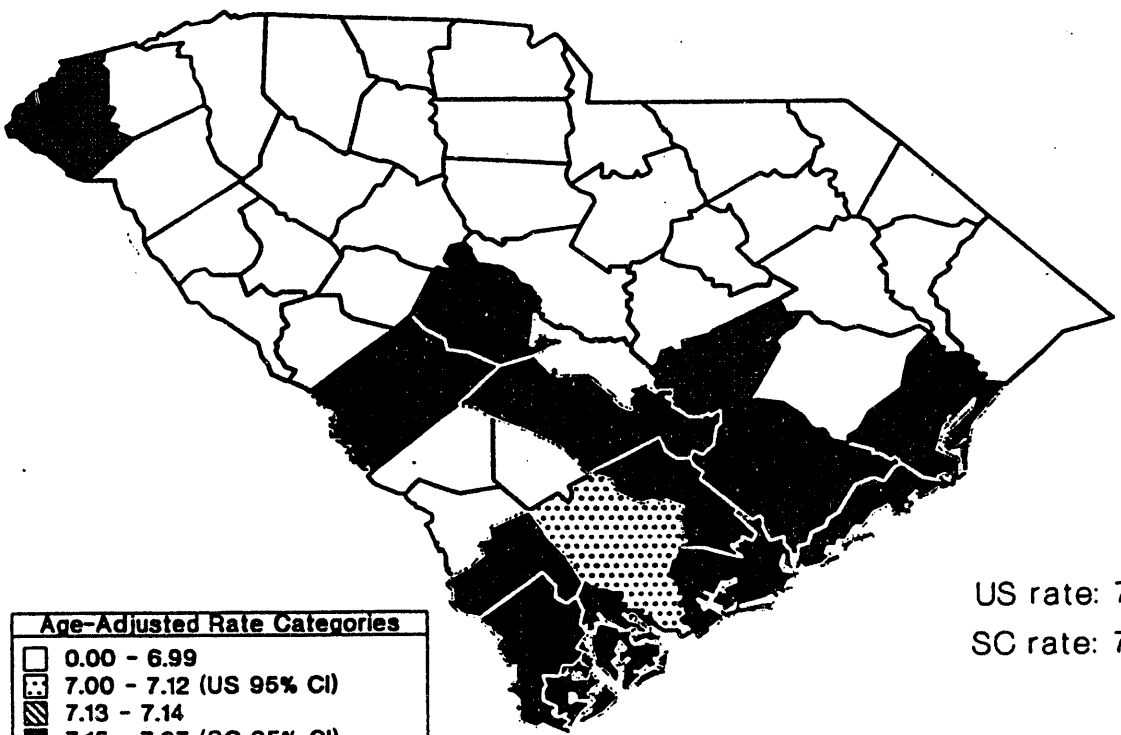
Race: White
Gener: All
Ages: All

US rate: 2.62, 1.96 sd = 0.01
SC rate: 2.27, 1.96 sd = 0.12

Rates adjusted to 1970 US population

Figure 49:

Cancer Mortality in SC
Esophagus
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 6.99
- 7.00 - 7.12 (US 95% CI)
- 7.13 - 7.14
- 7.15 - 7.87 (SC 95% CI)
- › 7.87

Race: Nonwhite
Gener: All
Ages: All

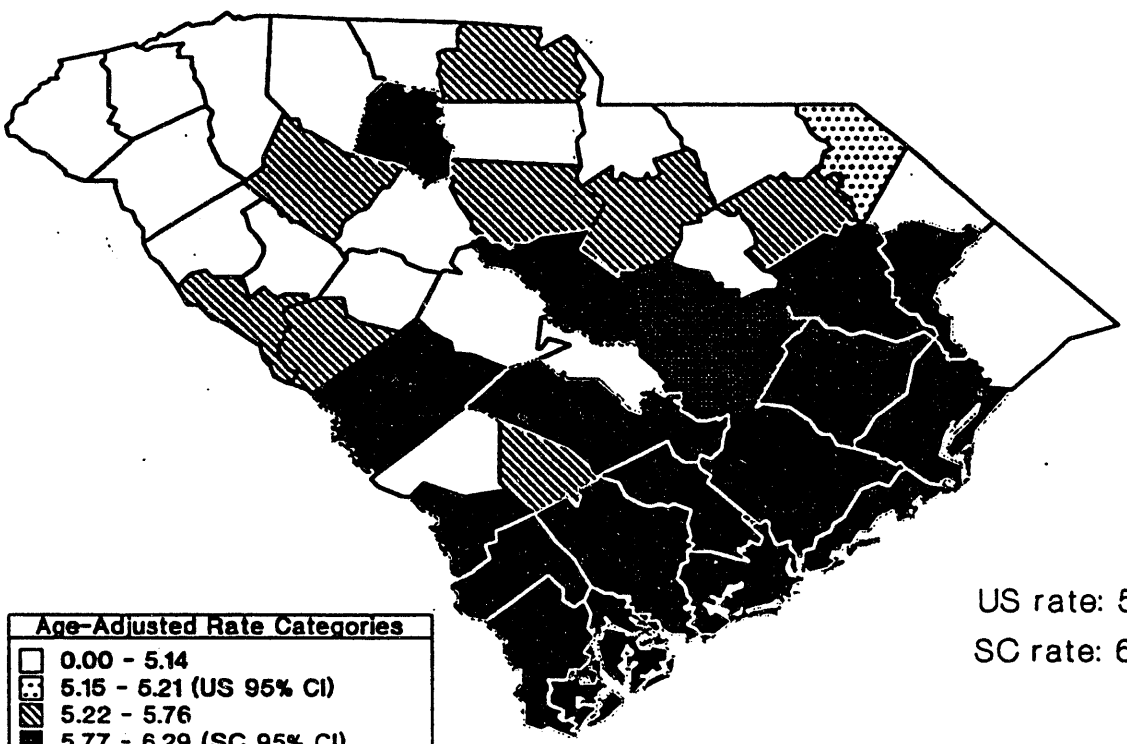
US rate: 7.06, 1.96 sd = 0.06

SC rate: 7.51, 1.96 sd = 0.36

Rates adjusted to 1970 US population.

Figure 50:

Cancer Mortality in SC
Esophagus
Average Annual Age-Adjusted Rates for 1953 - 1987



Race: All
Gener: Male
Ages: All

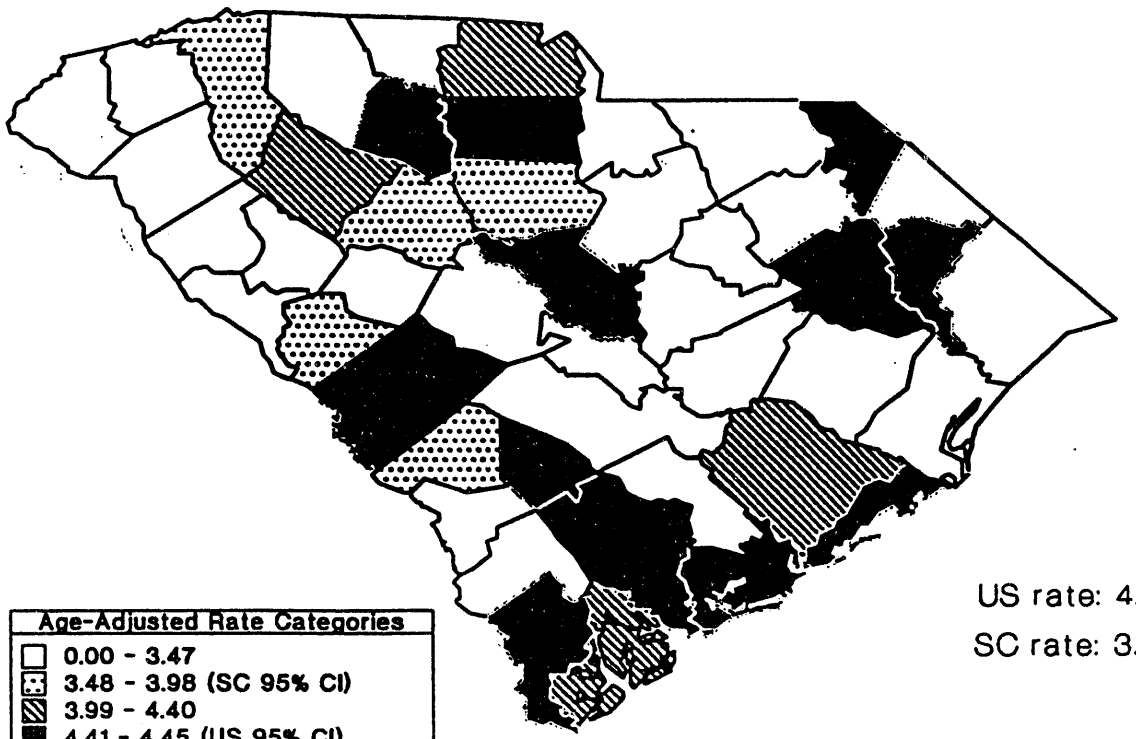
US rate: 5.18, 1.96 sd = 0.03

SC rate: 6.03, 1.96 sd = 0.26

Rates adjusted to 1970 US population.

Figure 51:

Cancer Mortality in SC
Esophagus
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 3.47
- 3.48 - 3.98 (SC 95% CI)
- 3.99 - 4.40
- 4.41 - 4.45 (US 95% CI)
- › 4.45

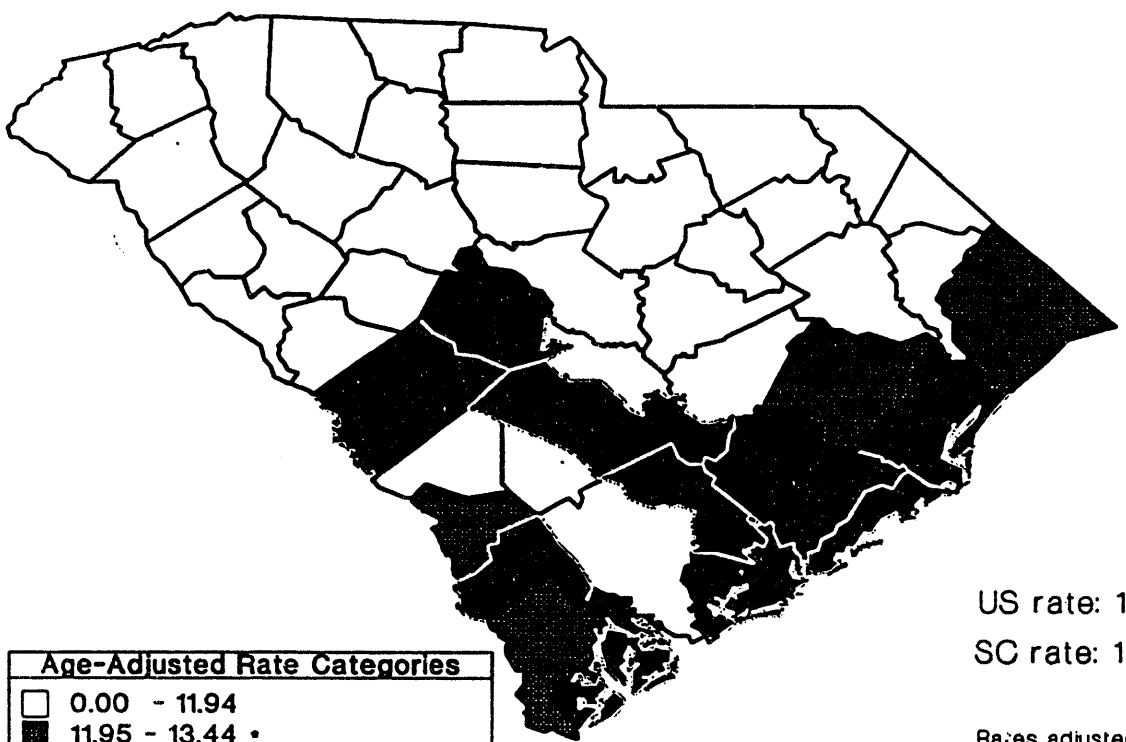
Race: White
Gener: Male
Ages: All

US rate: 4.43, 1.96 sd = 0.02
SC rate: 3.73, 1.96 sd = 0.25

Rates adjusted to 1970 US population.

Figure 52:

Cancer Mortality in SC
Esophagus
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 11.94
- 11.95 - 13.44 *
- > 13.44

Race: NonWhite
Gener: Male
Ages: All

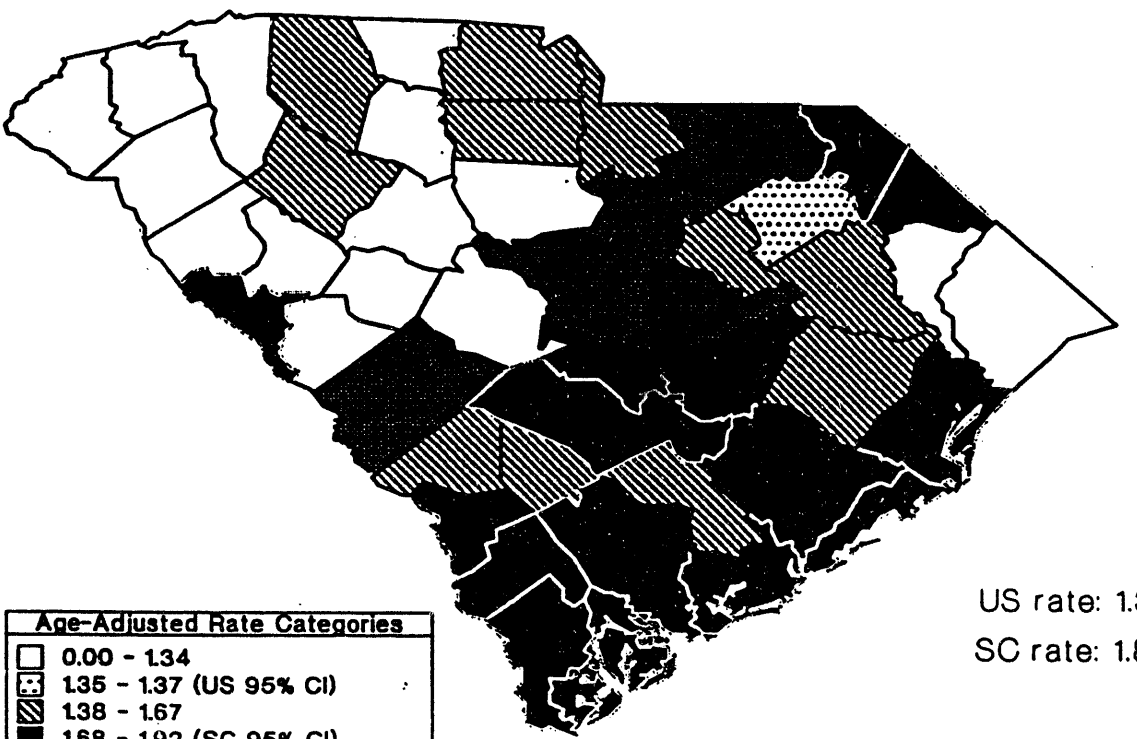
US rate: 12.07, 1.96 sd = 0.12

SC rate: 12.72, 1.96 sd = 0.72

Rates adjusted to 1970 US population.
* (11.95, 12.19) US 95% CI
(12.00, 13.44) SC 95% CI

Figure 53:

Cancer Mortality in SC
Esophagus
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 1.34
- 1.35 - 1.37 (US 95% CI)
- 1.38 - 1.67
- 1.68 - 1.92 (SC 95% CI)
- > 1.92

Race: All
Gener: Female
Ages: All

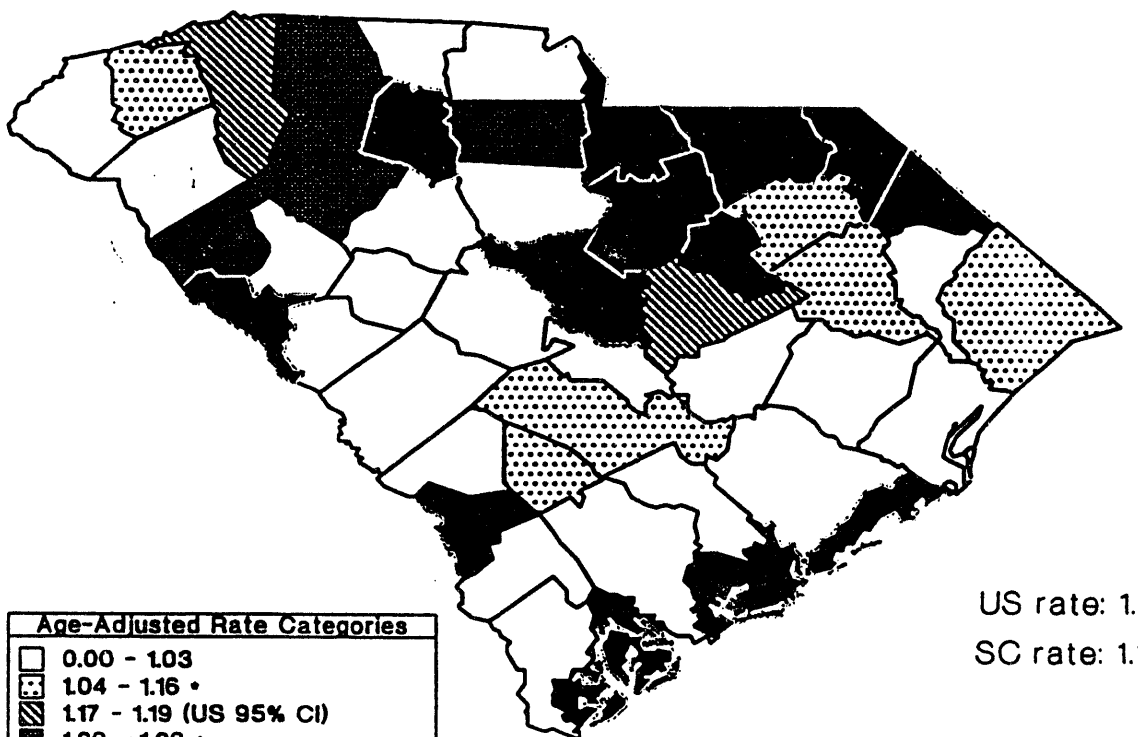
US rate: 1.36, 1.96 sd = 0.01

SC rate: 1.80, 1.96 sd = 0.12

Rates adjusted to 1970 US population.

Figure 54:

Cancer Mortality in SC
Esophagus
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 1.03
- 1.04 - 1.16 *
- 1.17 - 1.19 (US 95% CI)
- 1.20 - 1.28 *
- > 1.28

Race: White
Gener: Female
Ages: All

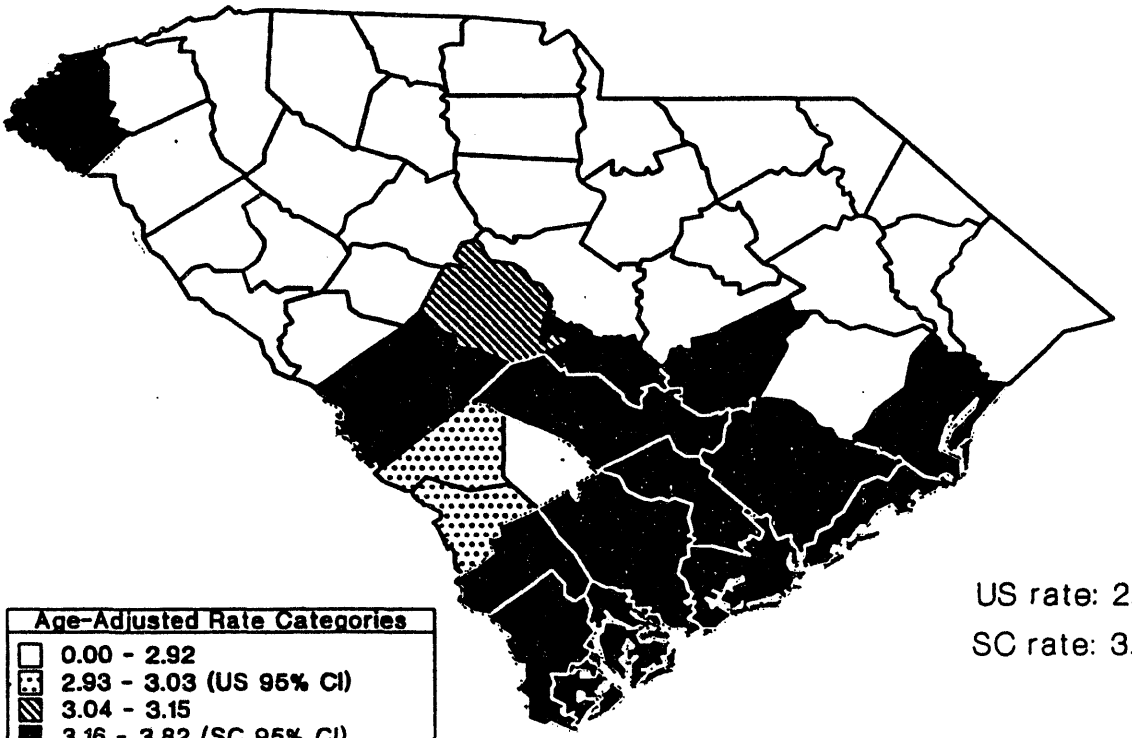
US rate: 1.18, 1.96 sd = 0.01

SC rate: 1.16, 1.96 sd = 0.12

Rates adjusted to 1970 US population.
* (1.04, 1.28) SC 95% CI

Figure 55:

Cancer Mortality in SC
Esophagus
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 2.92
- 2.93 - 3.03 (US 95% CI)
- 3.04 - 3.15
- 3.16 - 3.82 (SC 95% CI)
- › 3.82

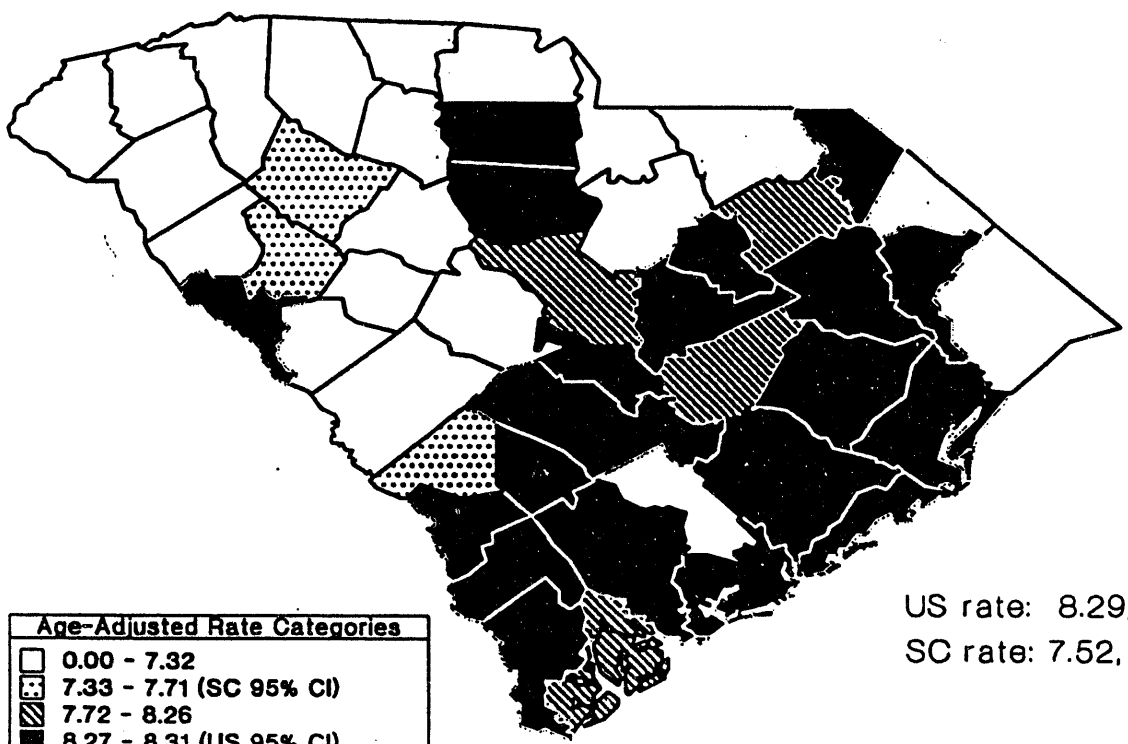
Race: NonWhite
Gener: Female
Ages: All

US rate: 2.97, 1.96 sd = 0.06
SC rate: 3.49, 1.96 sd = 0.33

Rates adjusted to 1970 US population.

Figure 56:

Cancer Mortality in SC
Stomach
Average Annual Age-Adjusted Rates for 1953 - 1987



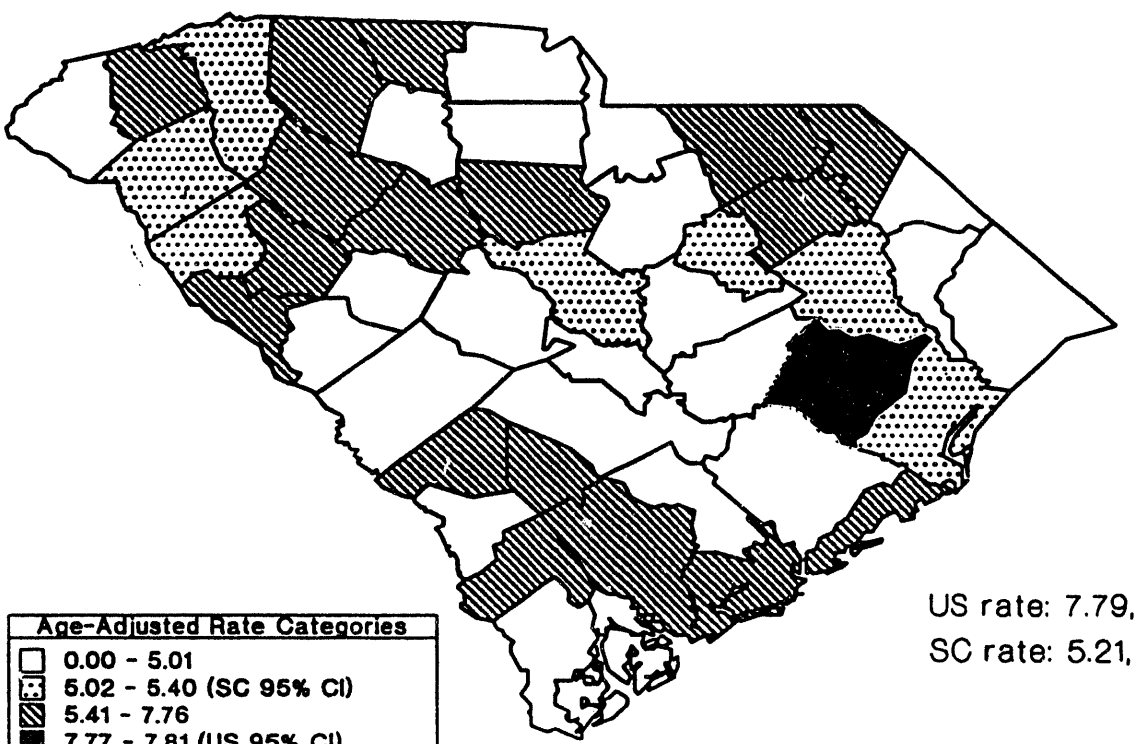
Race: All
Gender: All
Ages: All

US rate: 8.29, 1.96 sd = 0.02
SC rate: 7.52, 1.96 sd = 0.19

Rates adjusted to 1970 US population.

Figure 57:

Cancer Mortality in SC
Stomach
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 5.01
- 5.02 - 5.40 (SC 95% CI)
- 5.41 - 7.76
- 7.77 - 7.81 (US 95% CI)
- › 7.81

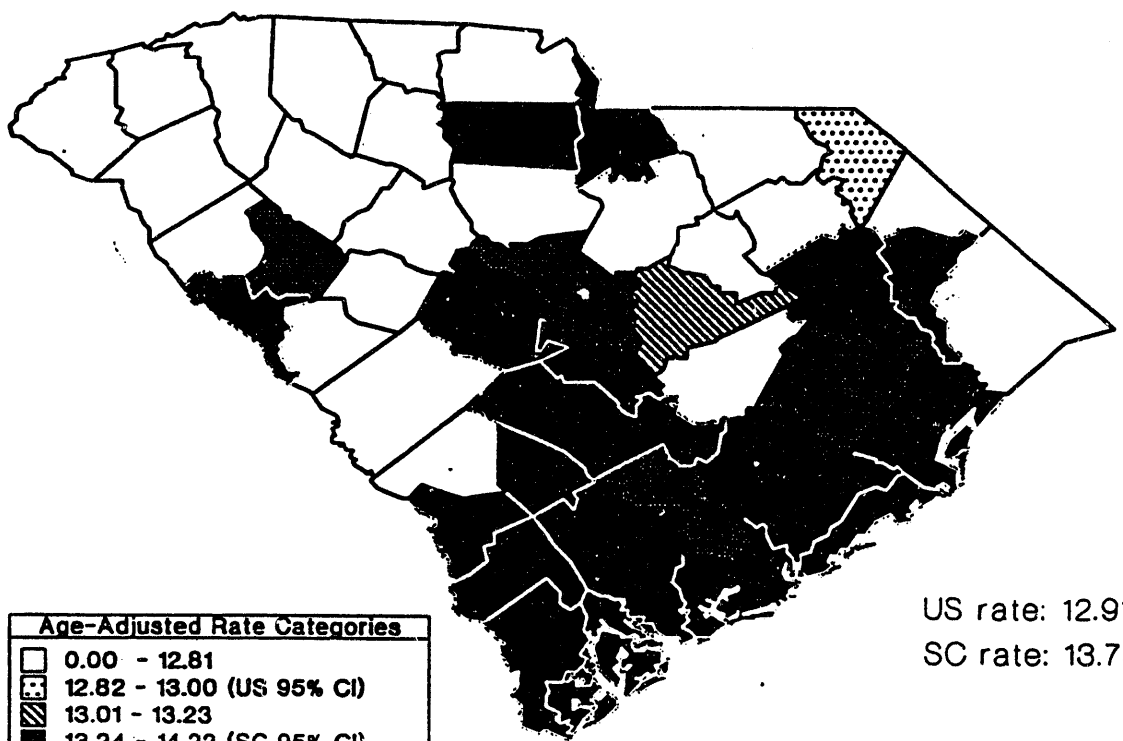
Race: White
Gender: All
Ages: All

US rate: 7.79, 1.96 sd = 0.02
SC rate: 5.21, 1.96 sd = 0.19

Rates adjusted to 1970 US population.

Figure 58:

Cancer Mortality in SC
Stomach
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 12.81
- 12.82 - 13.00 (US 95% CI)
- 13.01 - 13.23
- 13.24 - 14.22 (SC 95% CI)
- › 20.35

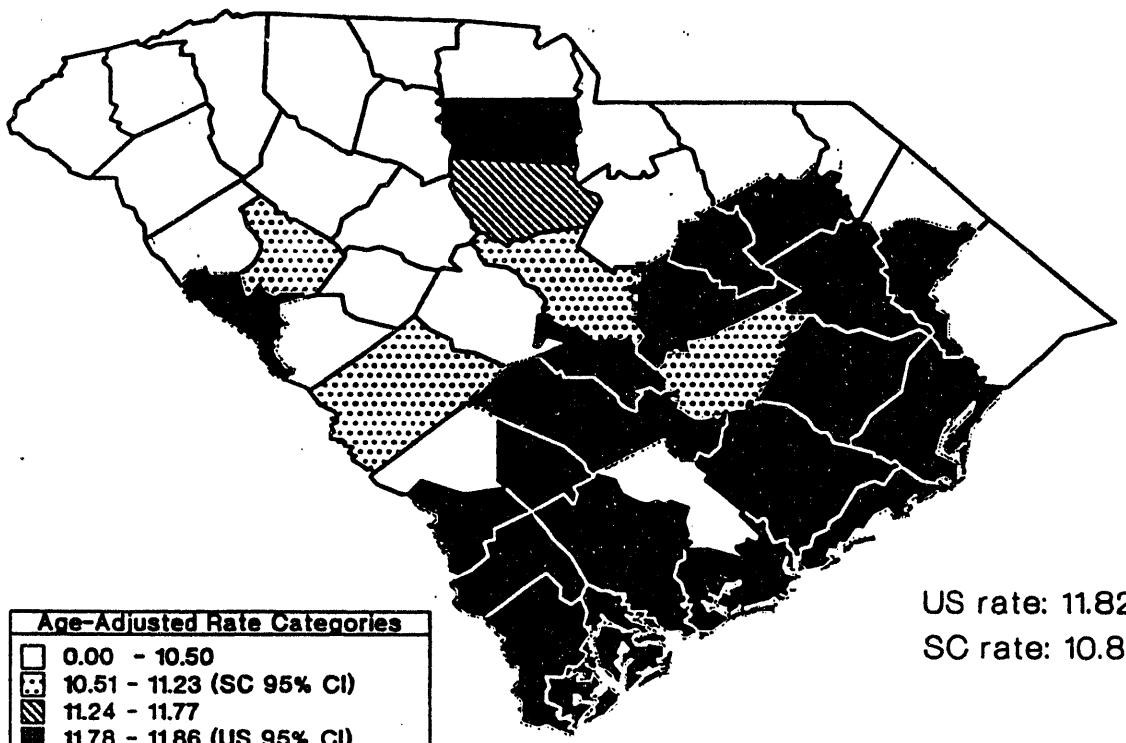
Race: NonWhite
Gender: All
Ages: All

US rate: 12.91, 1.96 sd = 0.09
SC rate: 13.73, 1.96 sd = 0.49

Rates adjusted to 1970 US population.

Figure 59:

Cancer Mortality in SC
Stomach
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 10.50
- 10.51 - 11.23 (SC 95% CI)
- 11.24 - 11.77
- 11.78 - 11.86 (US 95% CI)
- > 11.86

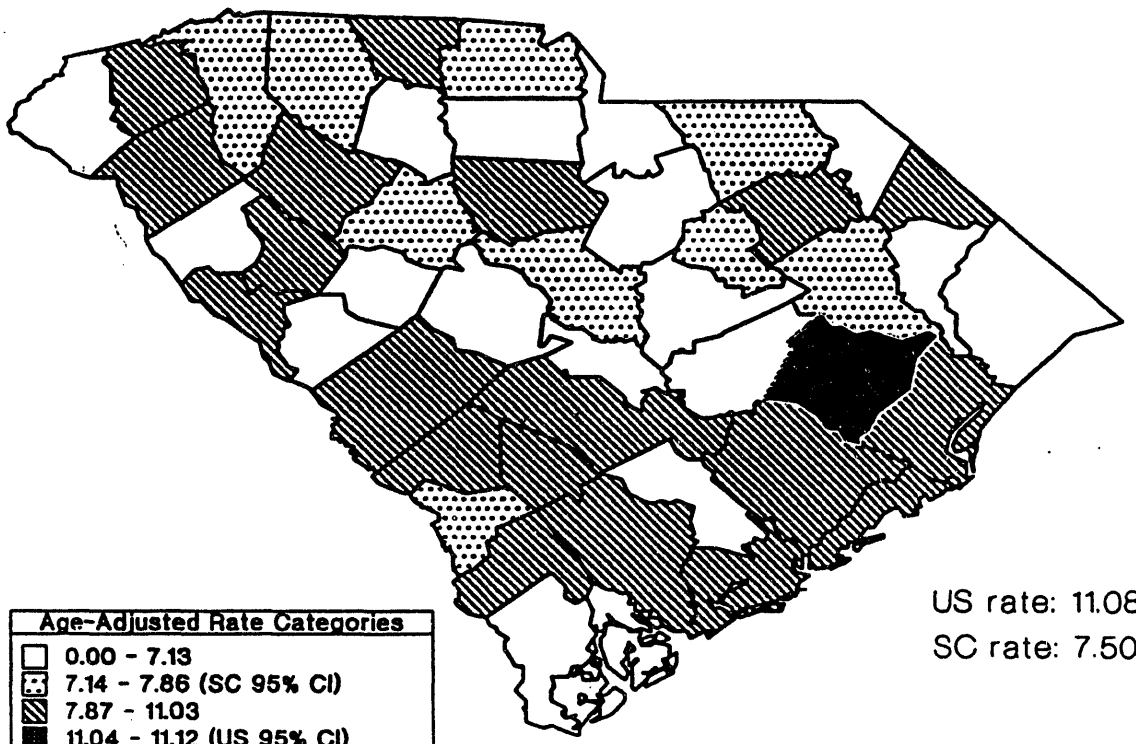
Race: All
Gender: Male
Ages: All

US rate: 11.82, 1.96 sd = 0.04
SC rate: 10.87, 1.96 sd = 0.36

Rates adjusted to 1970 US population.

Figure 60:

Cancer Mortality in SC
Stomach
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 7.13
- 7.14 - 7.86 (SC 95% CI)
- 7.87 - 11.03
- 11.04 - 11.12 (US 95% CI)
- › 11.12

Race: White
Gender: Male
Ages: All

US rate: 11.08, 1.96 sd = 0.04
SC rate: 7.50, 1.96 sd = 0.36

Rates adjusted to 1970 US population

Figure 61:

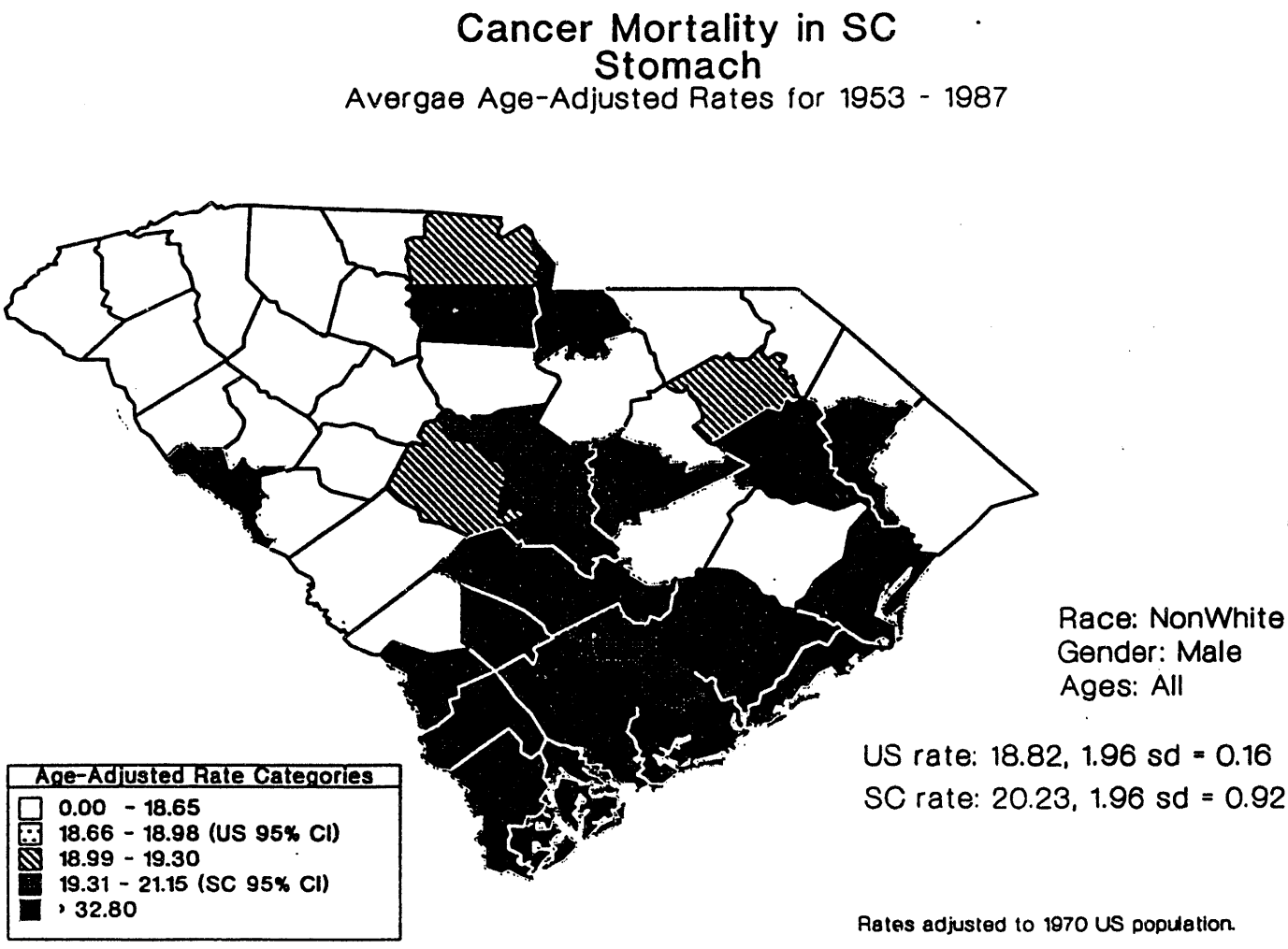
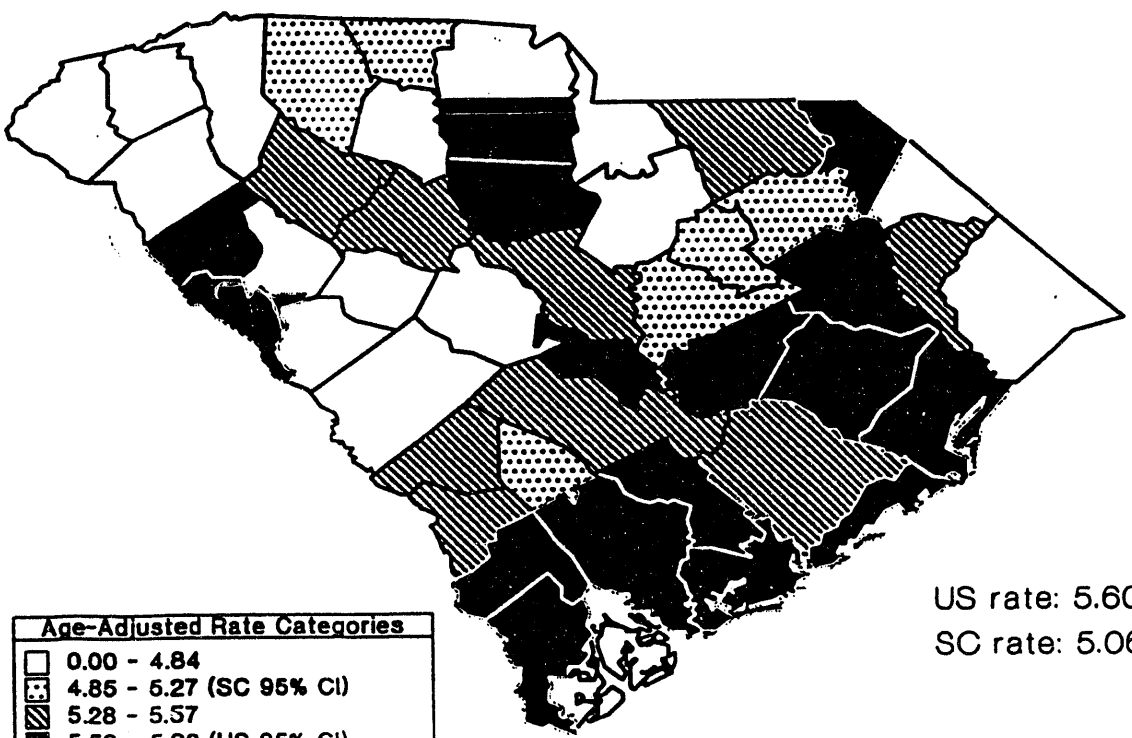

Cancer Mortality in SC
Stomach
Avergae Age-Adjusted Rates for 1953 - 1987
Age-Adjusted Rate Categories
0.00 - 18.65
18.66 - 18.98 (US 95% CI)
18.99 - 19.30
19.31 - 21.15 (SC 95% CI)
› 32.80
Race: NonWhite
Gender: Male
Ages: All
US rate: 18.82, 1.96 sd = 0.16
SC rate: 20.23, 1.96 sd = 0.92
Rates adjusted to 1970 US population.

Figure 62:

Cancer Mortality in SC
Stomach
Average Annual Age-adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 4.84
- 4.85 - 5.27 (SC 95% CI)
- 5.28 - 5.57
- 5.58 - 5.62 (US 95% CI)
- › 5.62

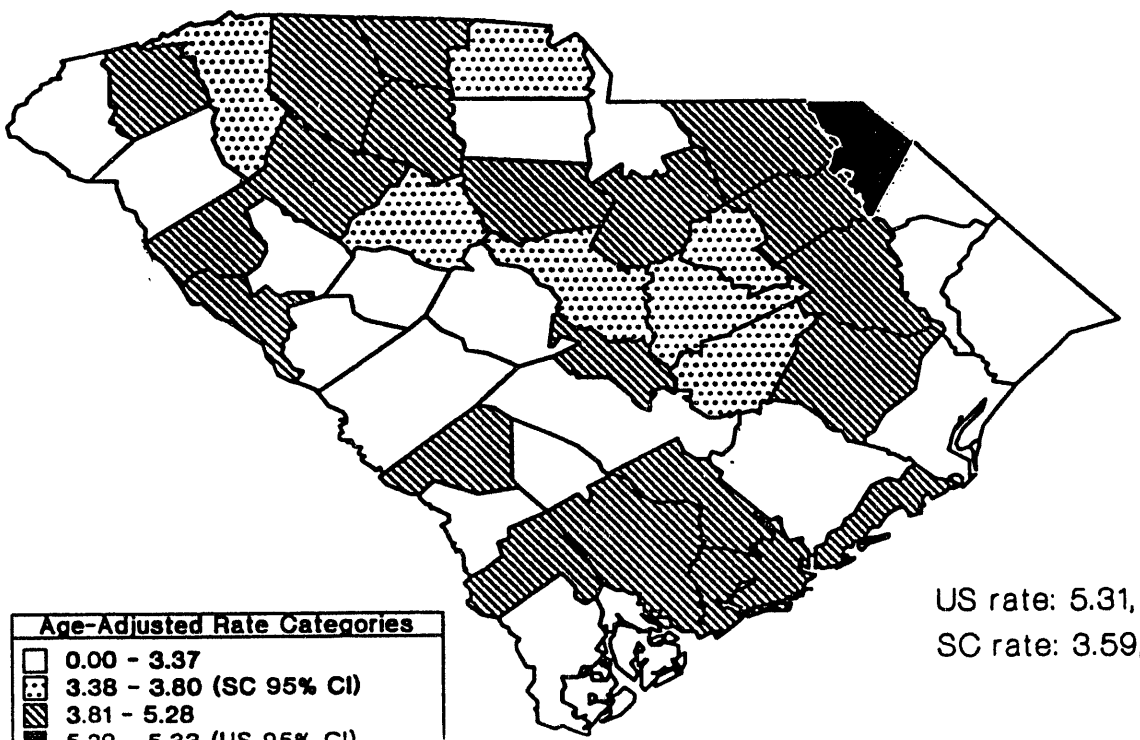
Race: All
Gender: Female
Ages: All

US rate: 5.60, 1.96 sd = 0.02
SC rate: 5.06, 1.96 sd = 0.21

Rates adjusted to 1970 US population.

Figure 63:

Cancer Mortality in SC
Stomach
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 3.37
- 3.38 - 3.80 (SC 95% CI)
- 3.81 - 5.28
- 5.29 - 5.33 (US 95% CI)
- › 5.33

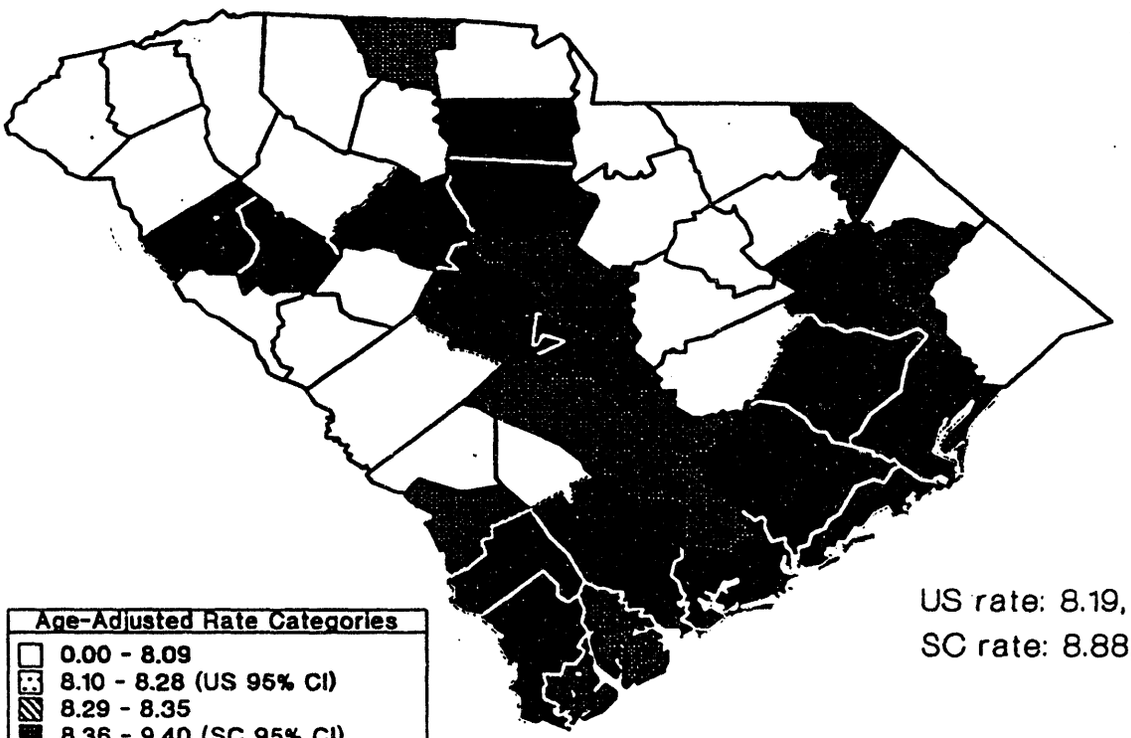
Race: White
Gender: Female
Ages: All

US rate: 5.31, 1.96 sd = 0.02
SC rate: 3.59, 1.96 sd = 0.21

Rates adjusted to 1970 US population.

Figure 64:

Cancer Mortality in SC
Stomach
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 8.09
- 8.10 - 8.28 (US 95% CI)
- 8.29 - 8.35
- 8.36 - 9.40 (SC 95% CI)
- › 9.40

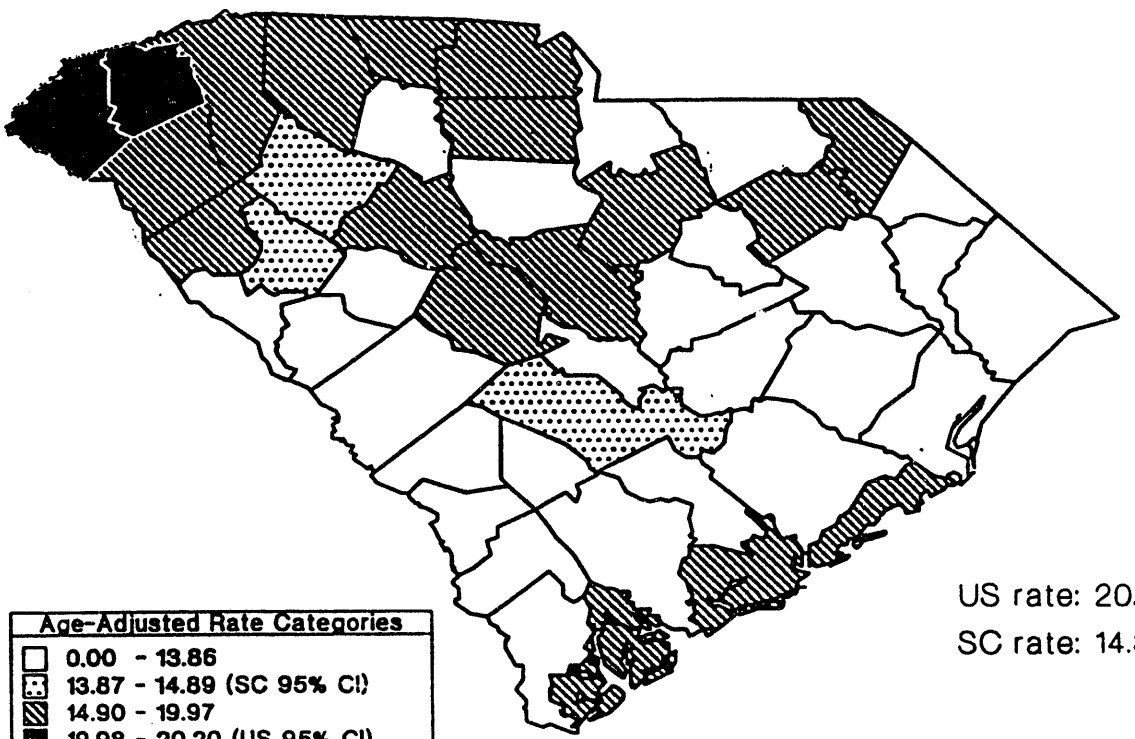
Race: NonWhite
Gender: Female
Ages: All

US rate: 8.19, 1.96 sd = 0.09
SC rate: 8.88, 1.96 sd = 0.52

Rates adjusted to 1970 US population.

Figure 67:

Cancer Mortality in SC
Colorectal
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 13.86
- 13.87 - 14.89 (SC 95% CI)
- 14.90 - 19.97
- 19.98 - 20.20 (US 95% CI)
- › 20.20

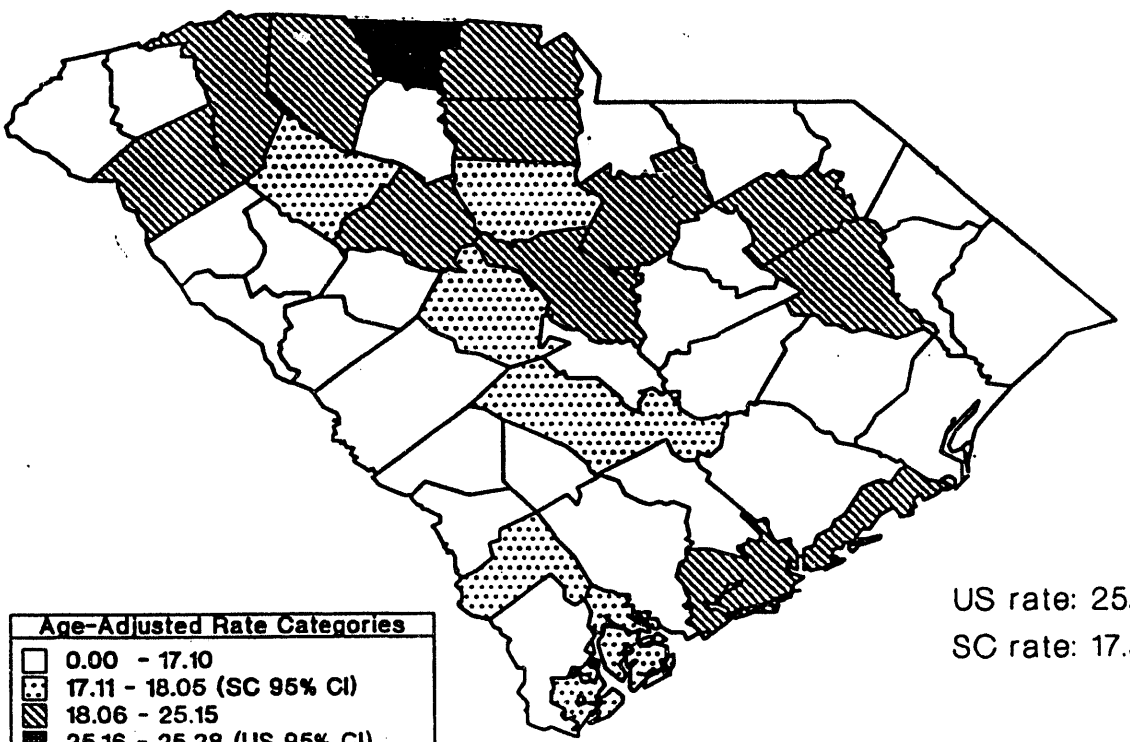
Race: Nonwhite
Gender: All
Ages: All

US rate: 20.09, 1.96 sd = 0.11
SC rate: 14.38, 1.96 sd = 0.51

Rates adjusted to 1970 US population.

Figure 68:

Cancer Mortality in SC
Colorectal
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 17.10
- 17.11 - 18.05 (SC 95% CI)
- 18.06 - 25.15
- 25.16 - 25.28 (US 95% CI)
- › 25.28

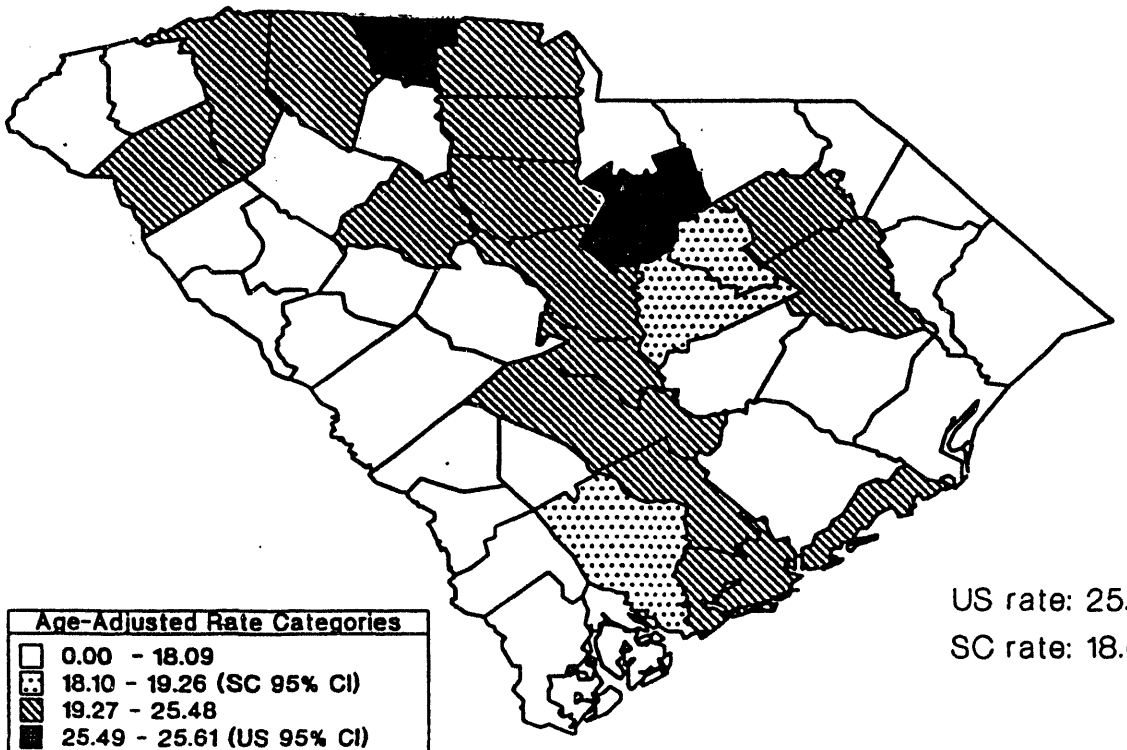
Race: All
Gender: Male
Ages: All

US rate: 25.22, 1.96 sd = 0.06
SC rate: 17.58, 1.96 sd = 0.47

Rates adjusted to 1970 US population.

Figure 69:

Cancer Mortality in SC
Colorectal
Average Annual Age-Adjusted Rates for 1953 - 1987



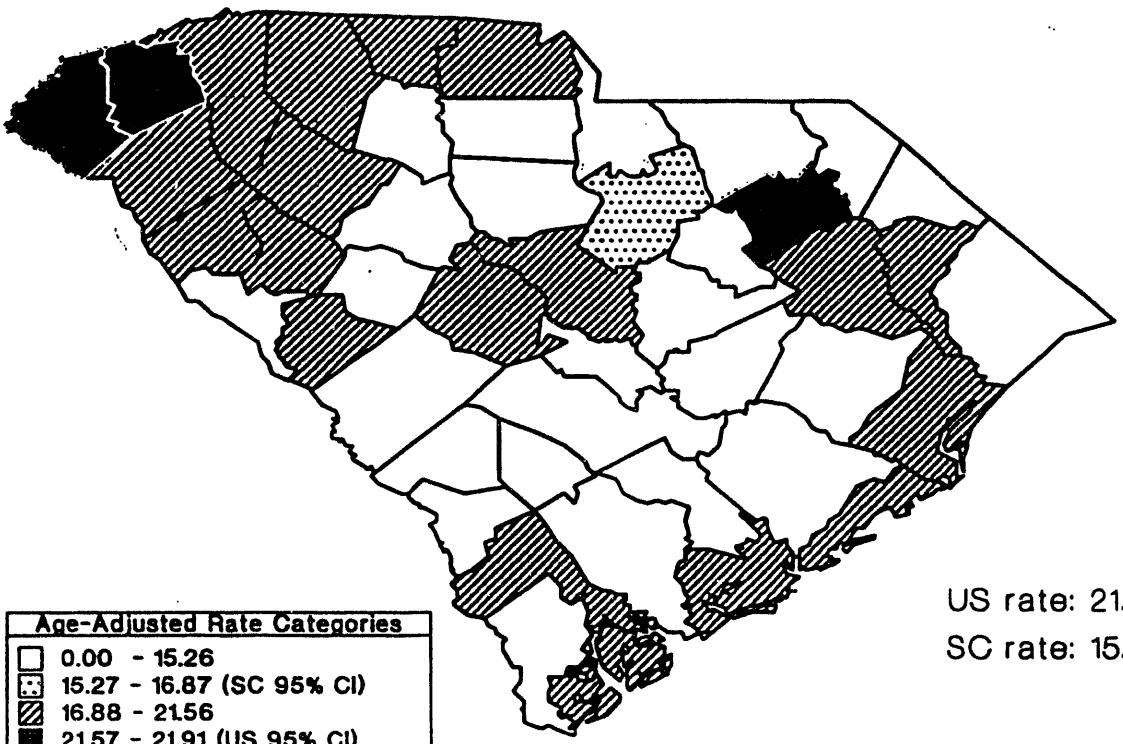
Race: White
Gender: Male
Ages: All

US rate: 25.55, 1.96 sd = 0.06
SC rate: 18.68, 1.96 sd = 0.58

Rates adjusted to 1970 US population.

Figure 70:

Cancer Mortality in SC
Colorectal
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 15.26
- 15.27 - 16.87 (SC 95% CI)
- 16.88 - 21.56
- 21.57 - 21.91 (US 95% CI)
- › 21.91

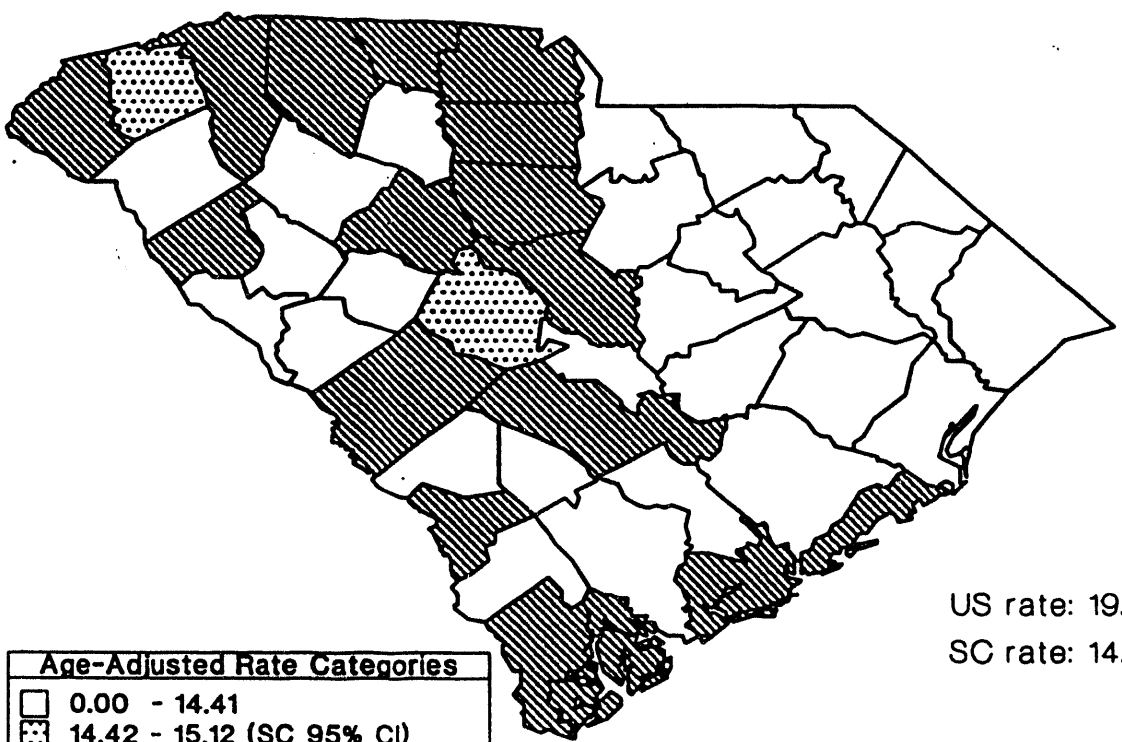
Race: NonWhite
Gender: Male
Ages: All

US rate: 21.74, 1.96 sd = 0.17
SC rate: 15.07, 1.96 sd = 0.80

Rates adjusted to 1970 US population.

Figure 71:

Cancer Mortality in SC
Colorectal
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 14.41
- 14.42 - 15.12 (SC 95% CI)
- 15.13 - 17.85 •

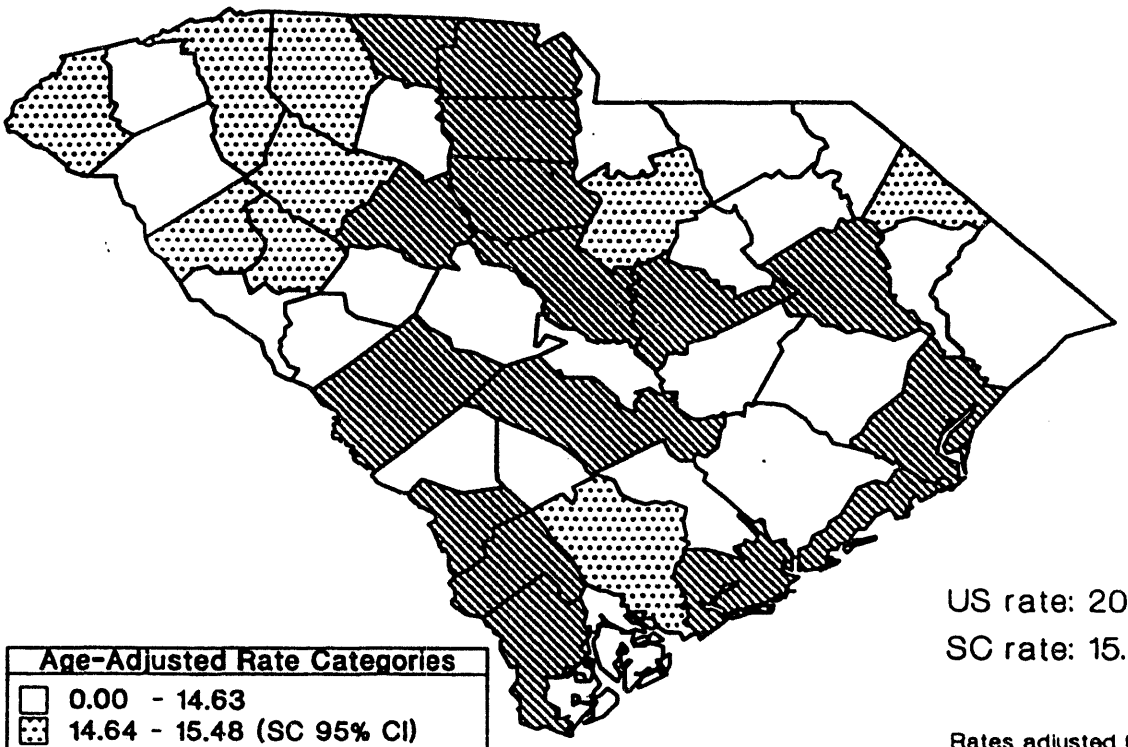
Race: All
Gender: Female
Ages: All

US rate: 19.98, 1.96 sd = 0.04
SC rate: 14.77, 1.96 sd = 0.35

Rates adjusted to 1970 US population.
• (19.94, 20.02) US 95% CI

Figure 72:

Cancer Mortality in SC
Colorectal
Average Annual Age- Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 14.63
- 14.64 - 15.48 (SC 95% CI)
- 15.49 - 19.42 *

Race: White
Gender: Female
Ages: All

US rate: 20.04, 1.96 sd = 0.05
SC rate: 15.06, 1.96 sd = 0.42

Rates adjusted to 1970 US population.
* (19.99, 20.09) US 95% CI

Figure 73:

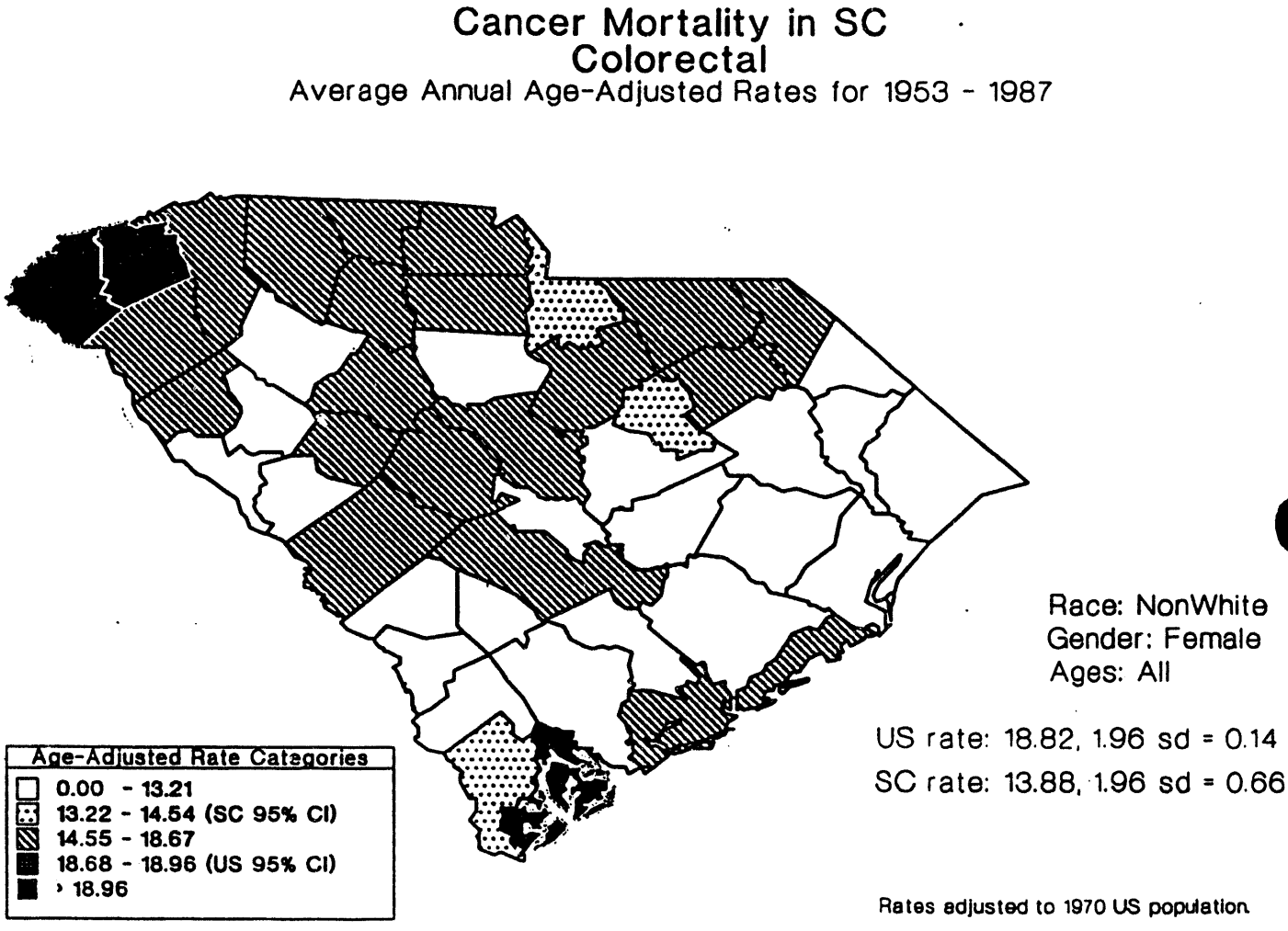
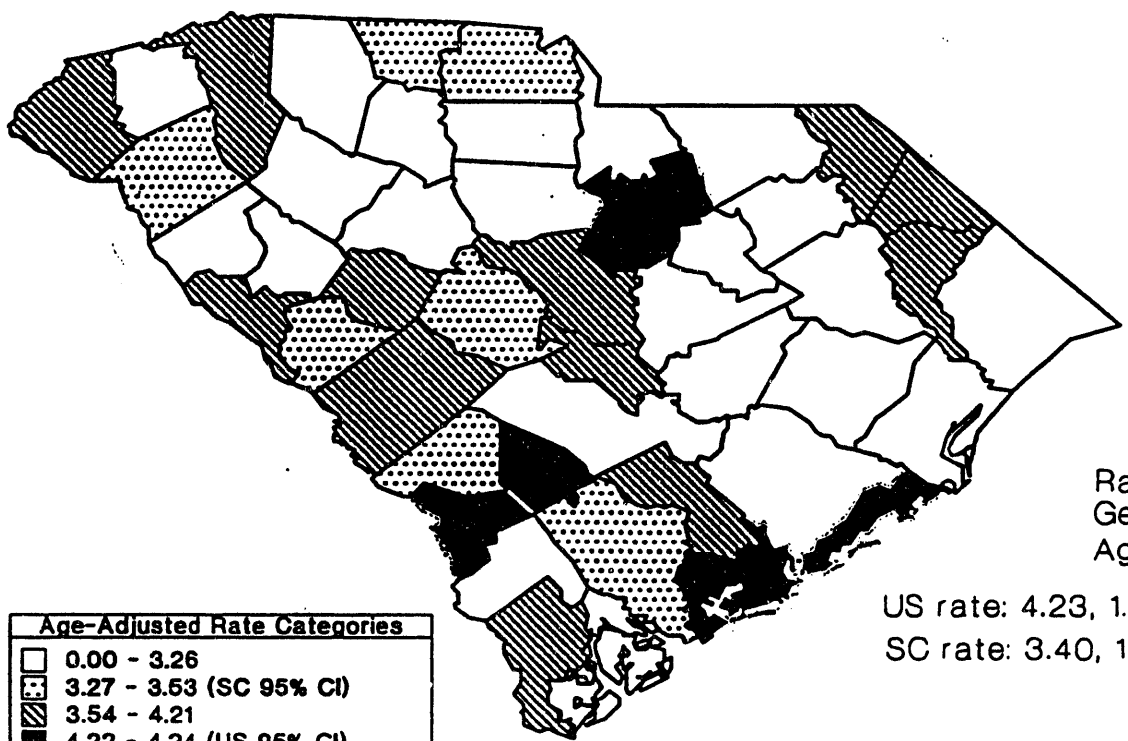

Cancer Mortality in SC
Colorectal
Average Annual Age-Adjusted Rates for 1953 - 1987
Age-Adjusted Rate Categories
0.00 - 13.21
13.22 - 14.54 (SC 95% CI)
14.55 - 18.67
18.68 - 18.96 (US 95% CI)
› 18.96
Race: NonWhite
Gender: Female
Ages: All
US rate: 18.82, 1.96 sd = 0.14
SC rate: 13.88, 1.96 sd = 0.66
Rates adjusted to 1970 US population

Figure 74:

Cancer Mortality in SC
Bladder
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 3.26
- 3.27 - 3.53 (SC 95% CI)
- 3.54 - 4.21
- 4.22 - 4.24 (US 95% CI)
- › 4.24

Race: All
Gender: All
Ages: All

US rate: 4.23, 1.96 sd = 0.01
SC rate: 3.40, 1.96 sd = 0.13

Rates adjusted to 1970 US population.

Figure 75:

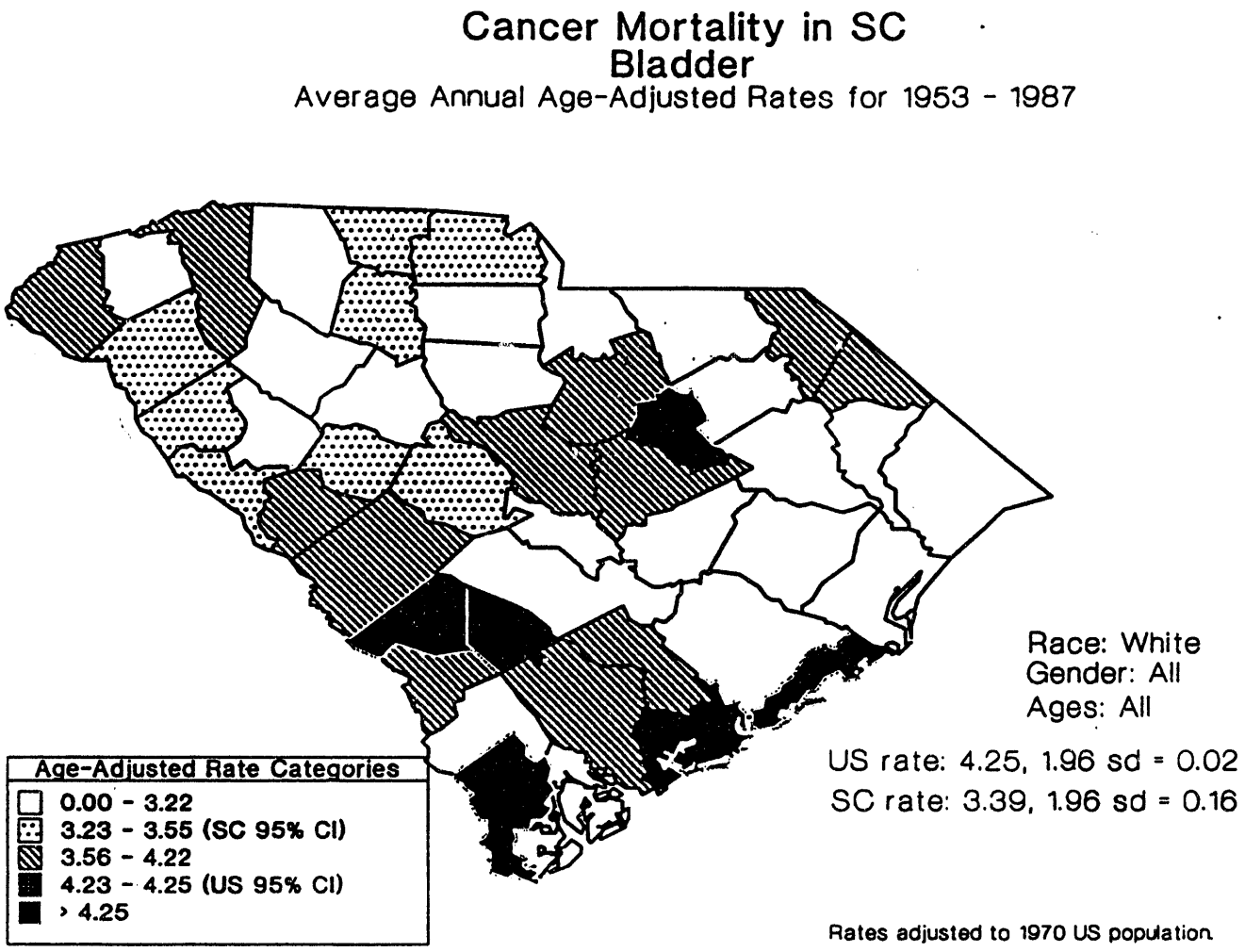
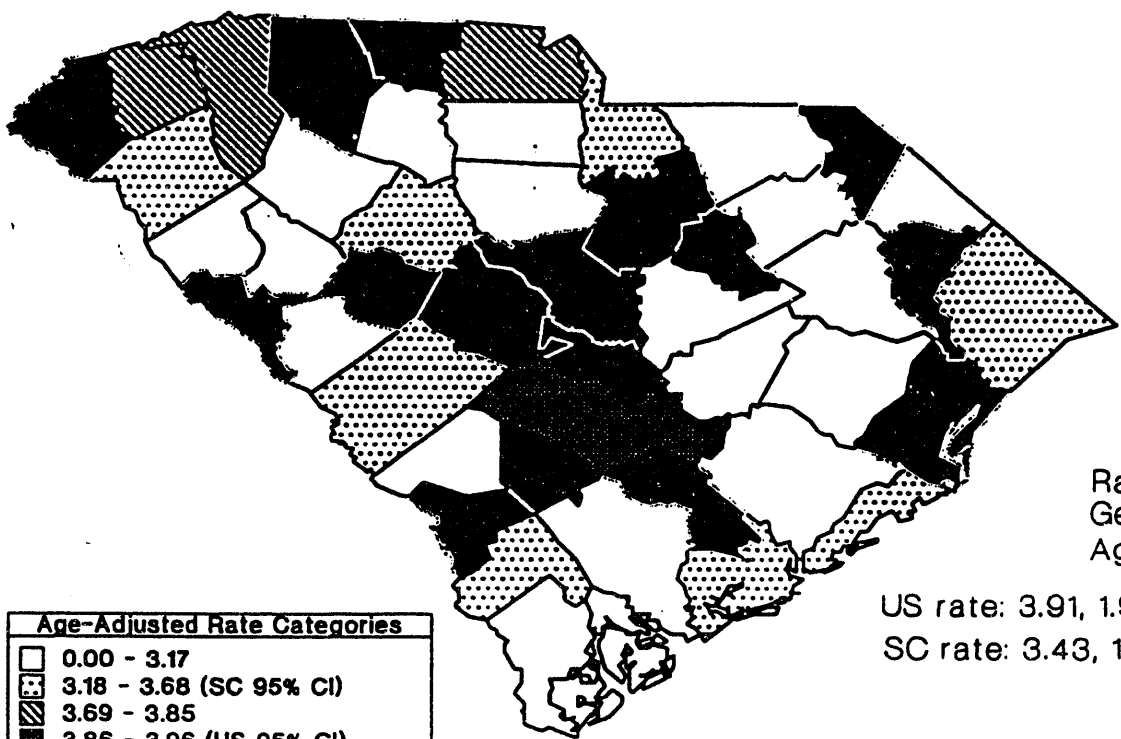

Cancer Mortality in SC
Bladder
Average Annual Age-Adjusted Rates for 1953 - 1987
Age-Adjusted Rate Categories
0.00 - 3.22
3.23 - 3.55 (SC 95% CI)
3.56 - 4.22
4.23 - 4.25 (US 95% CI)
> 4.25
Race: White
Gender: All
Ages: All
US rate: 4.25, 1.96 sd = 0.02
SC rate: 3.39, 1.96 sd = 0.16
Rates adjusted to 1970 US population

Figure 76:

Cancer Mortality in SC
Bladder
Average Annual Age-Adjusted Rates for 1953 -1987



Age-Adjusted Rate Categories
- 0.00 - 3.17
- 3.18 - 3.68 (SC 95% CI)
- 3.69 - 3.85
- 3.86 - 3.96 (US 95% CI)
- › 3.96

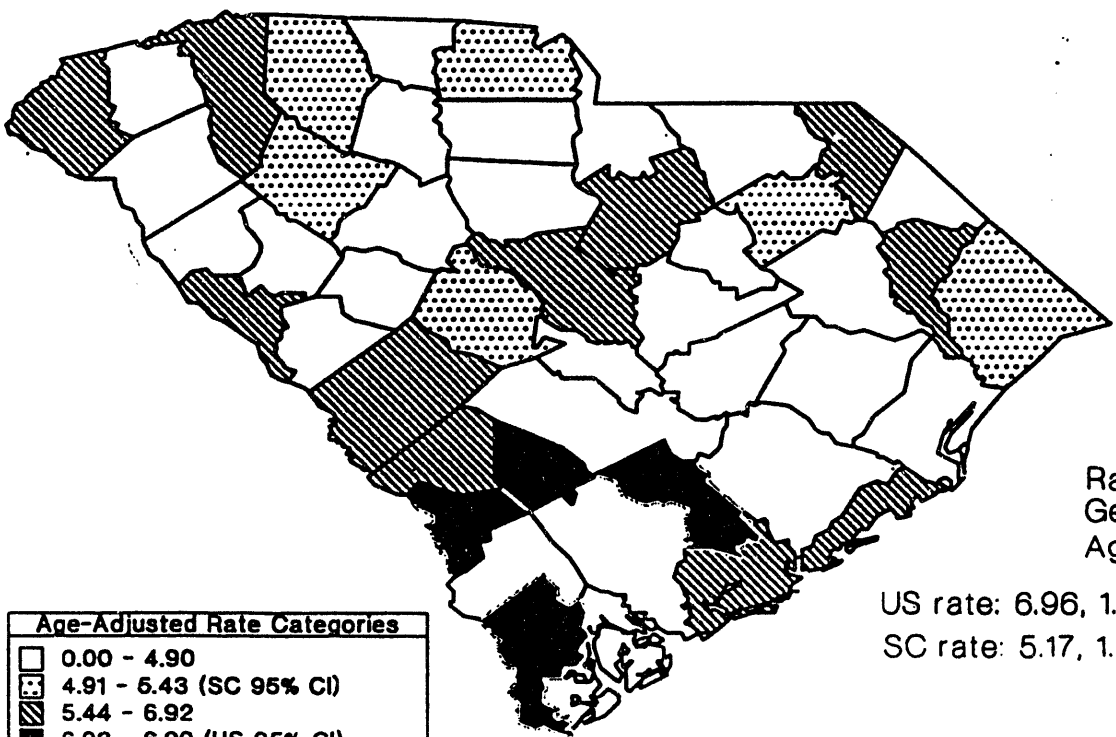
Race: Nonwhite
Gender: All
Ages: All

US rate: 3.91, 1.96 sd = 0.05
SC rate: 3.43, 1.96 sd = 0.25

Rates adjusted to 1970 US population.

Figure 77:

Cancer Mortality in SC
Bladder
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 4.90
- 4.91 - 5.43 (SC 95% CI)
- 5.44 - 6.92
- 6.93 - 6.99 (US 95% CI)
- › 6.99

Race: All
Gender: Male
Ages: All

US rate: 6.96, 1.96 sd = 0.03
SC rate: 5.17, 1.96 sd = 0.26

Rates adjusted to 1970 US population.

Figure 78:

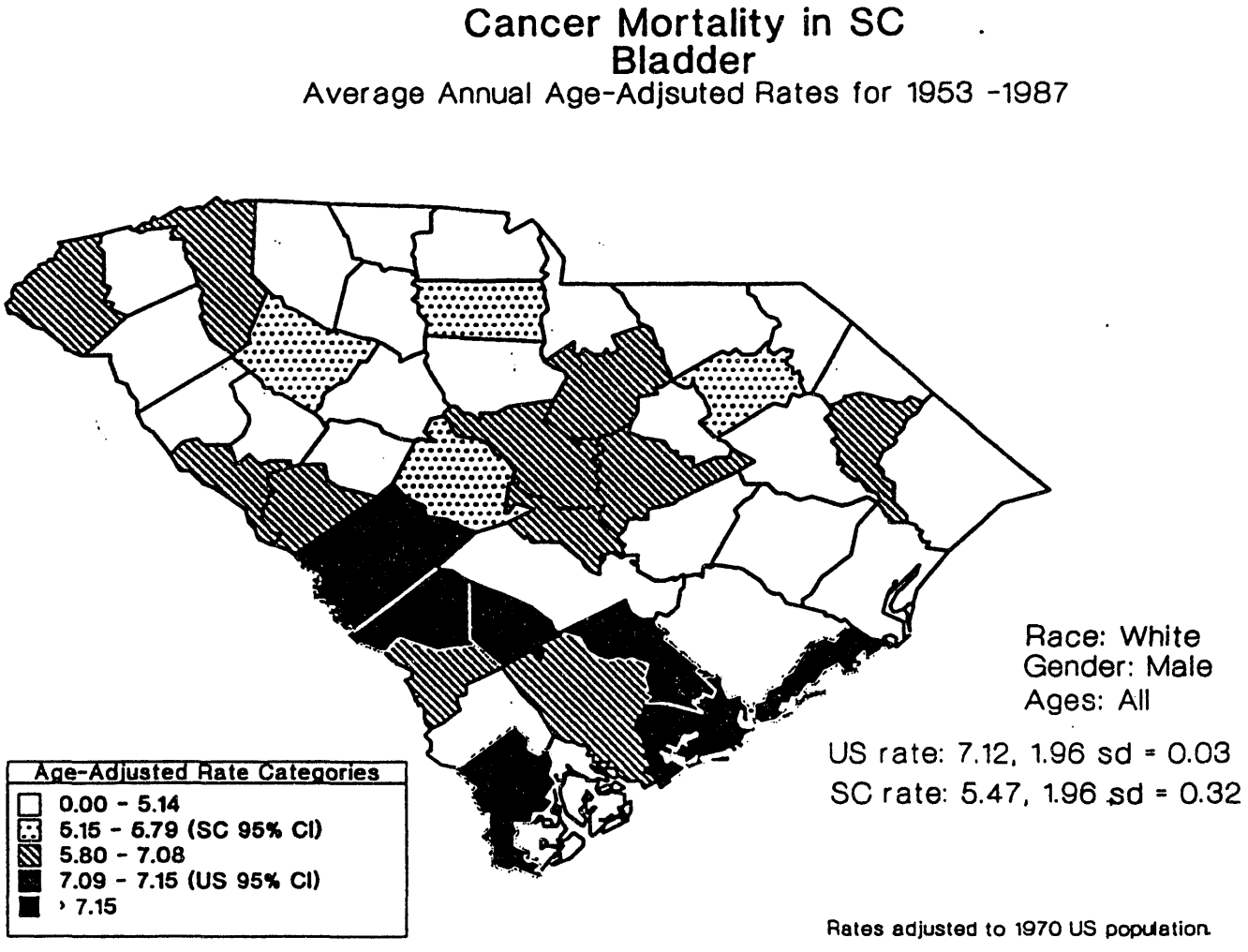
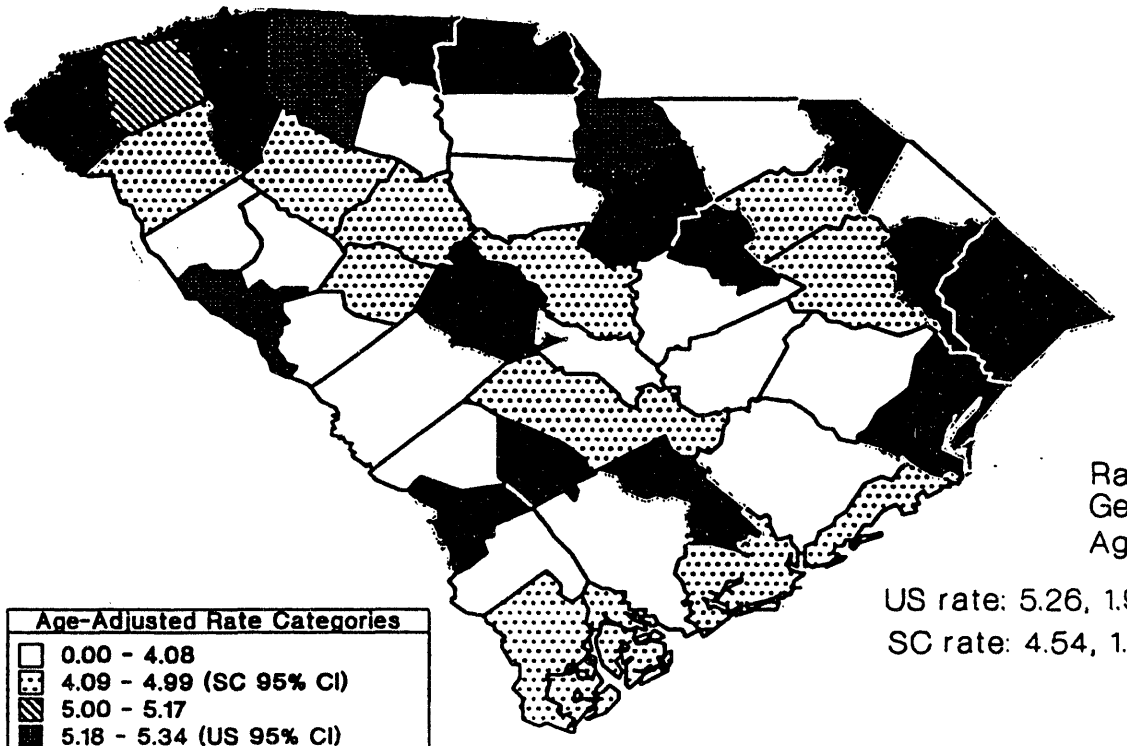

Cancer Mortality in SC
Bladder
Average Annual Age-Adjsuted Rates for 1953 -1987
Age-Adjusted Rate Categories
0.00 - 5.14
5.15 - 6.79 (SC 95% CI)
5.80 - 7.08
7.09 - 7.15 (US 95% CI)
› 7.15
Race: White
Gender: Male
Ages: All
US rate: 7.12, 1.96 sd = 0.03
SC rate: 5.47, 1.96 sd = 0.32
Rates adjusted to 1970 US population

Figure 79:

Cancer Mortality in SC
Bladder
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 4.08
- 4.09 - 4.99 (SC 95% CI)
- 5.00 - 5.17
- 5.18 - 5.34 (US 95% CI)
- › 5.34

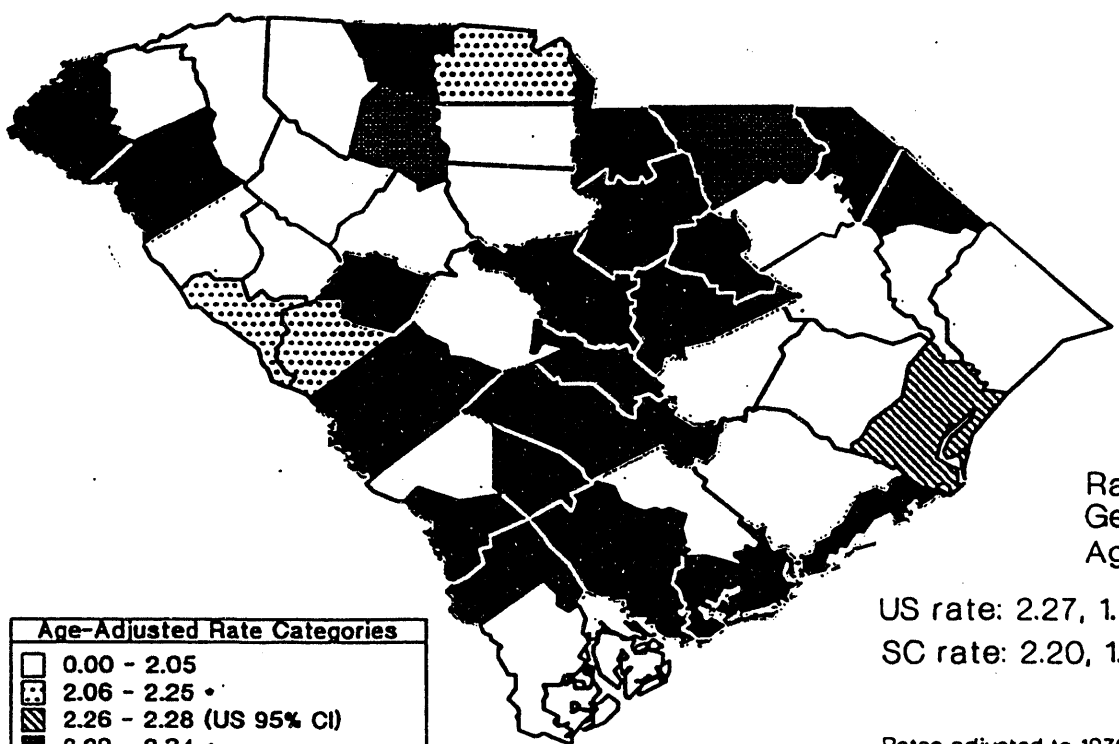
Race: NonWhite
Gender: Male
Ages: All

US rate: 5.26, 1.96 sd = 0.08
SC rate: 4.54, 1.96 sd = 0.45

Rates adjusted to 1970 US population

Figure 80:

Cancer Mortality in SC
Bladder
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 2.05
- 2.06 - 2.25 *
- 2.26 - 2.28 (US 95% CI)
- 2.29 - 2.34 *
- > 2.34

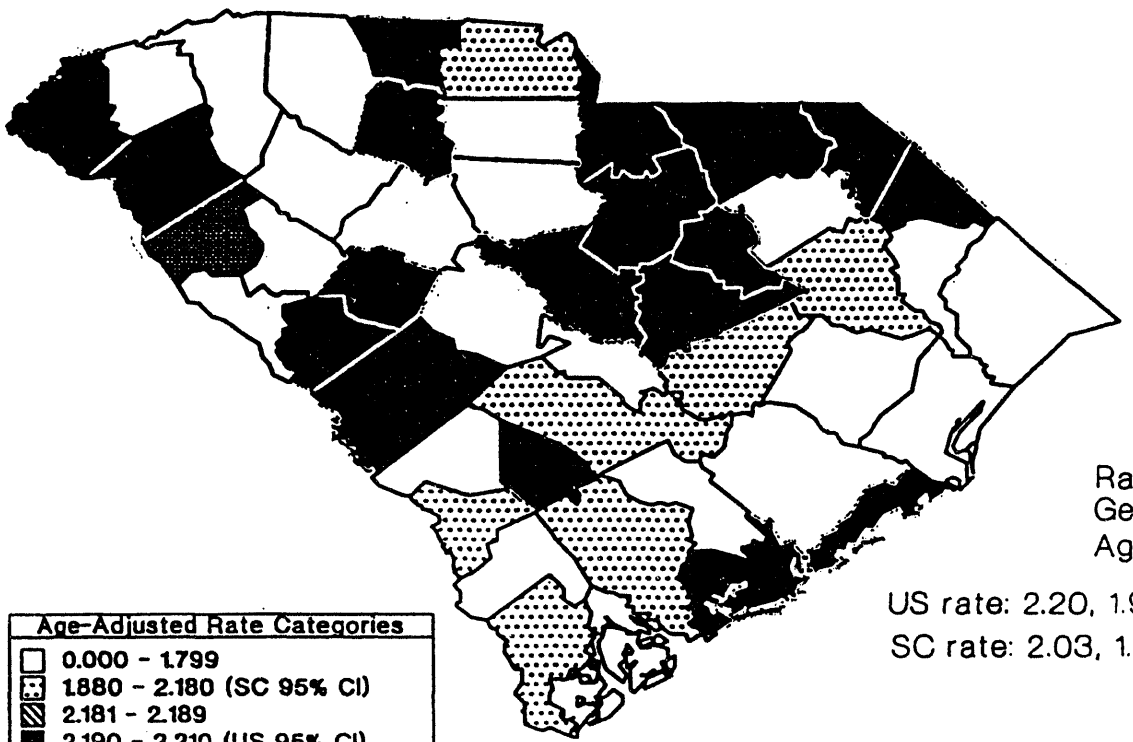
Race: All
Gender: Female
Ages: All

US rate: 2.27, 1.96 sd = 0.01
SC rate: 2.20, 1.96 sd = 0.14

Rates adjusted to 1970 US population.
* (2.06, 2.34) SC 95% CI

Figure 81:

Cancer Mortality in SC
Bladder
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.000 - 1.799
- 1.880 - 2.180 (SC 95% CI)
- 2.181 - 2.189
- 2.190 - 2.210 (US 95% CI)
- › 2.210

Race: White
Gender: Female
Ages: All

US rate: 2.20, 1.96 sd = 0.01
SC rate: 2.03, 1.96 sd = 0.15

Rates adjusted to 1970 US population

Figure 82:

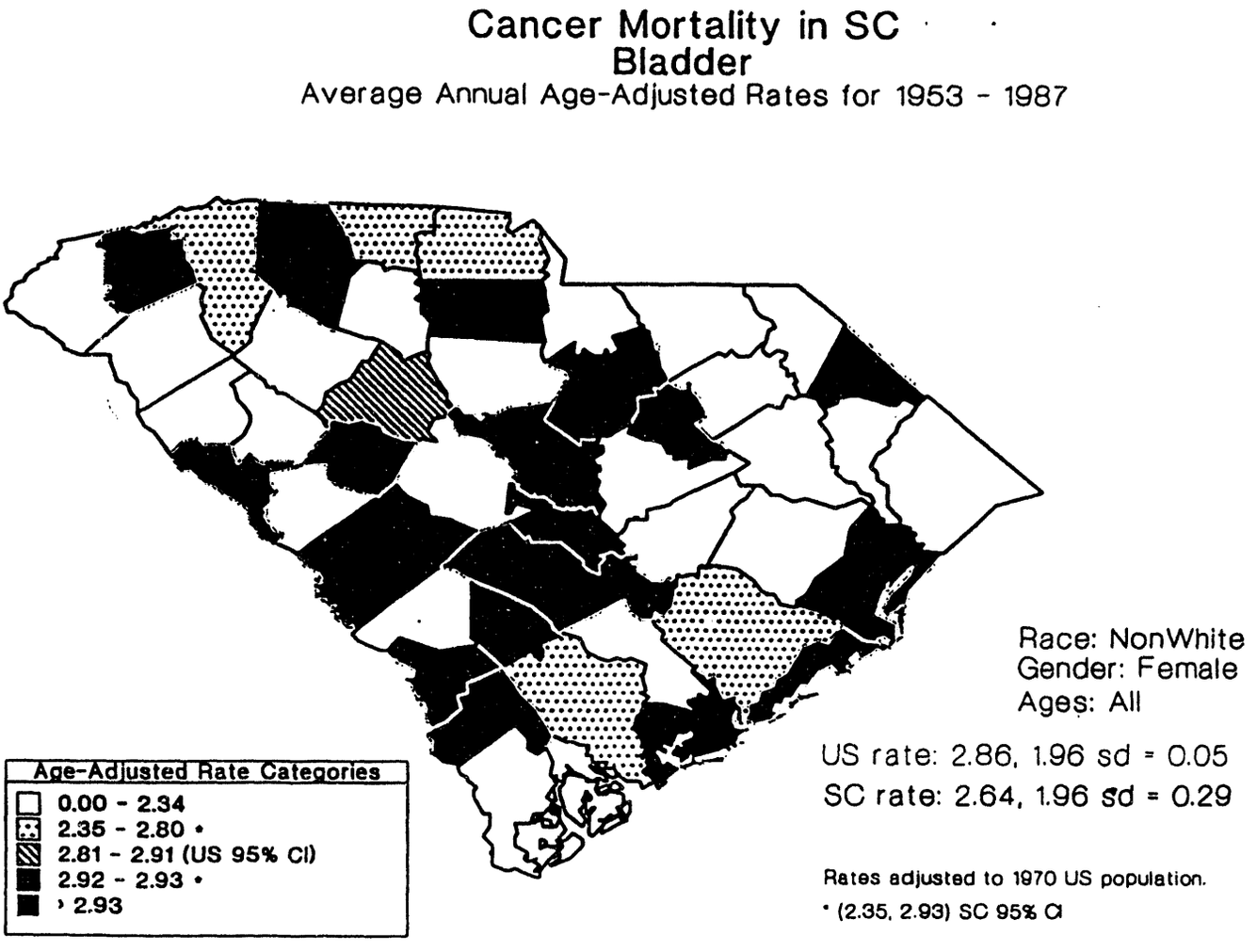
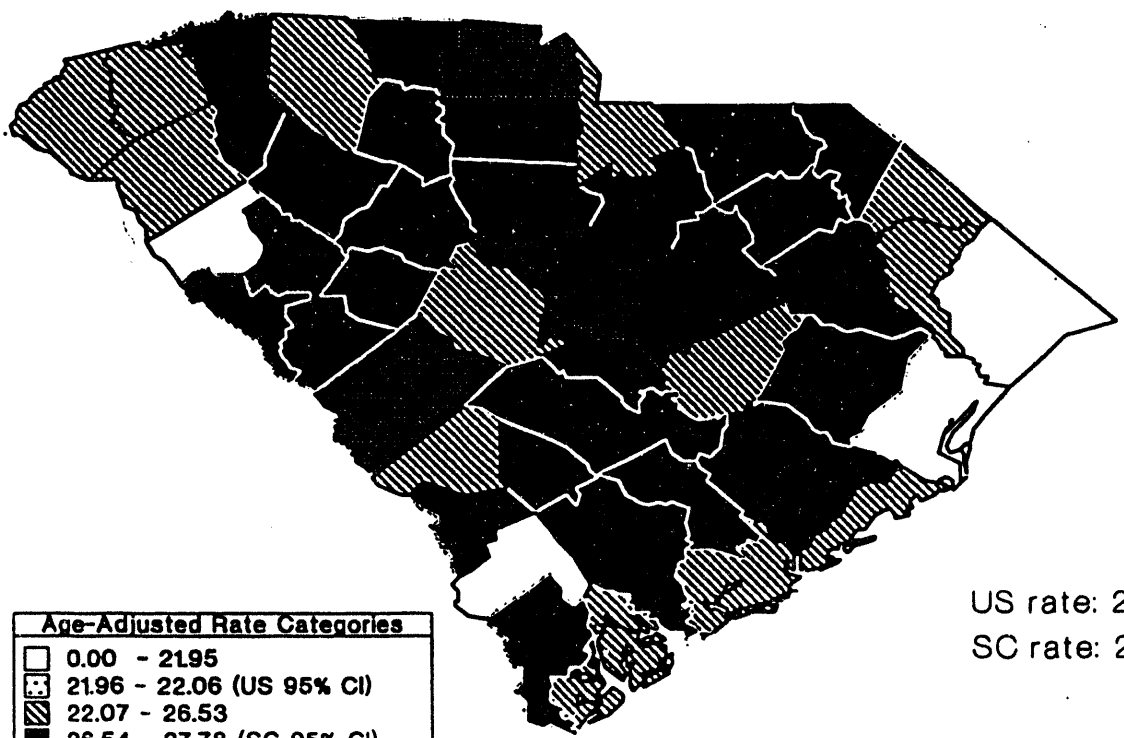

Cancer Mortality in SC
Bladder
Average Annual Age-Adjusted Rates for 1953 - 1987
Age-Adjusted Rate Categories
0.00 - 2.34
2.35 - 2.80 •
2.81 - 2.91 (US 95% CI)
2.92 - 2.93 •
› 2.93
Race: NonWhite
Gender: Female
Ages: All
US rate: 2.86, 1.96 sd = 0.05
SC rate: 2.64, 1.96 sd = 0.29
Rates adjusted to 1970 US population.
• (2.35, 2.93) SC 95% CI

Figure 83:

Cancer Mortality in SC
Prostate
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 21.95
- 21.96 - 22.06 (US 95% CI)
- 22.07 - 26.53
- 26.54 - 27.78 (SC 95% CI)
- › 22.78

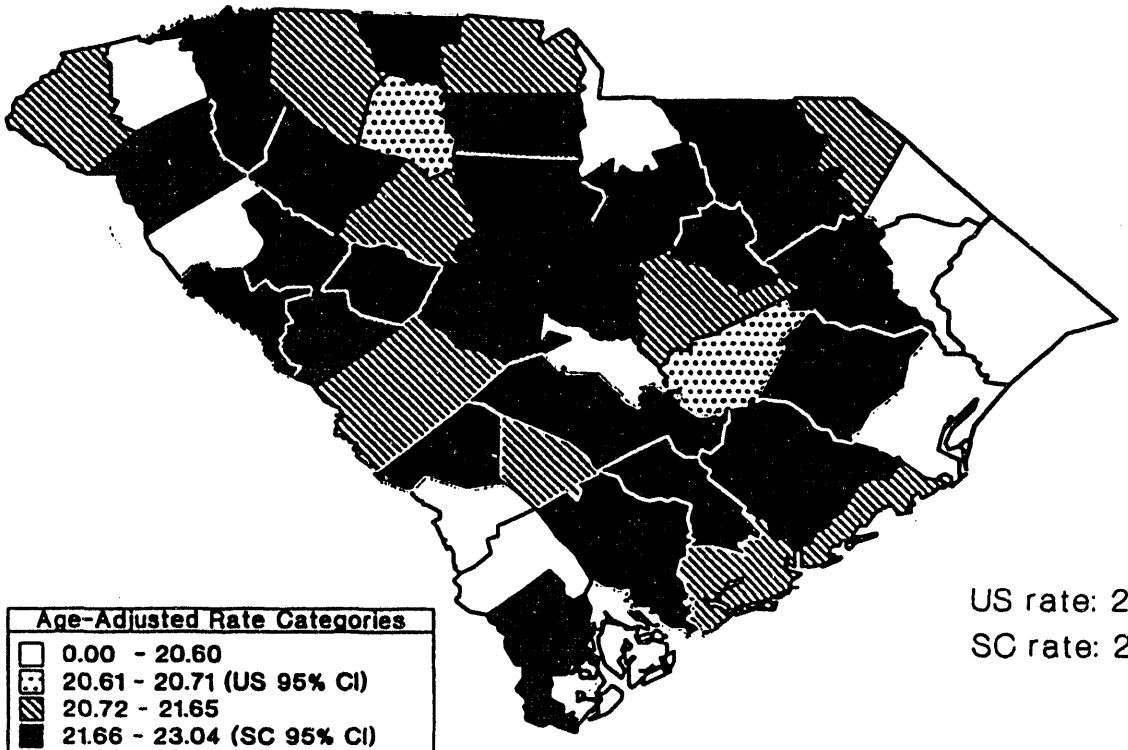
Race: All
Gender: Male
Ages: All

US rate: 22.01, 1.96 sd = 0.05
SC rate: 27.16, 1.96 sd = 0.62

Rates adjusted to 1970 US population.

Figure 84:

Cancer Mortality in SC
Prostate
Average Annual Age-Adjusted Rates for 1953 - 1987



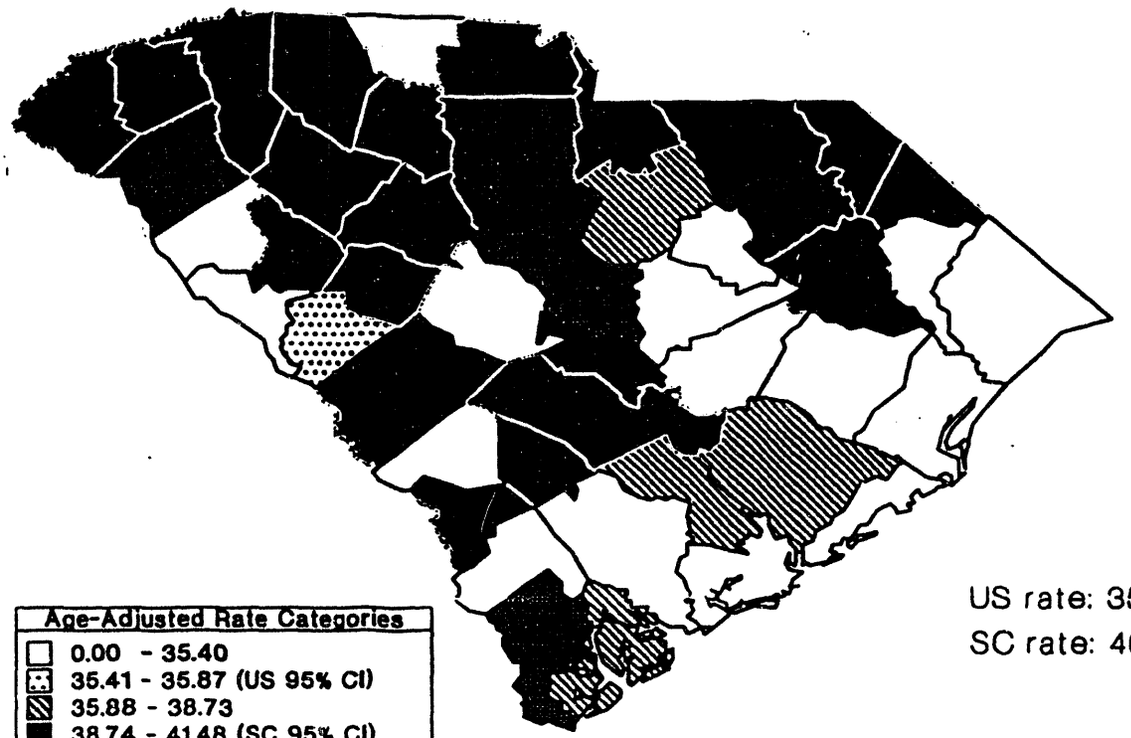
Race: White
Gender: Male
Ages: All

US rate: 20.66, 1.96 sd = 0.05
SC rate: 22.35, 1.96 sd = 0.69

Rates adjusted to 1970 US population

Figure 85:

Cancer Mortality in SC
Prostate
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 35.40
- 35.41 - 35.87 (US 95% CI)
- 35.88 - 38.73
- 38.74 - 41.48 (SC 95% CI)
- › 41.48

Race: NonWhite
Gender: Male
Ages: All

US rate: 35.64, 1.96 sd = 0.23
SC rate: 40.11, 1.96 sd = 1.37

Rates adjusted to 1970 US population.

Figure 86:

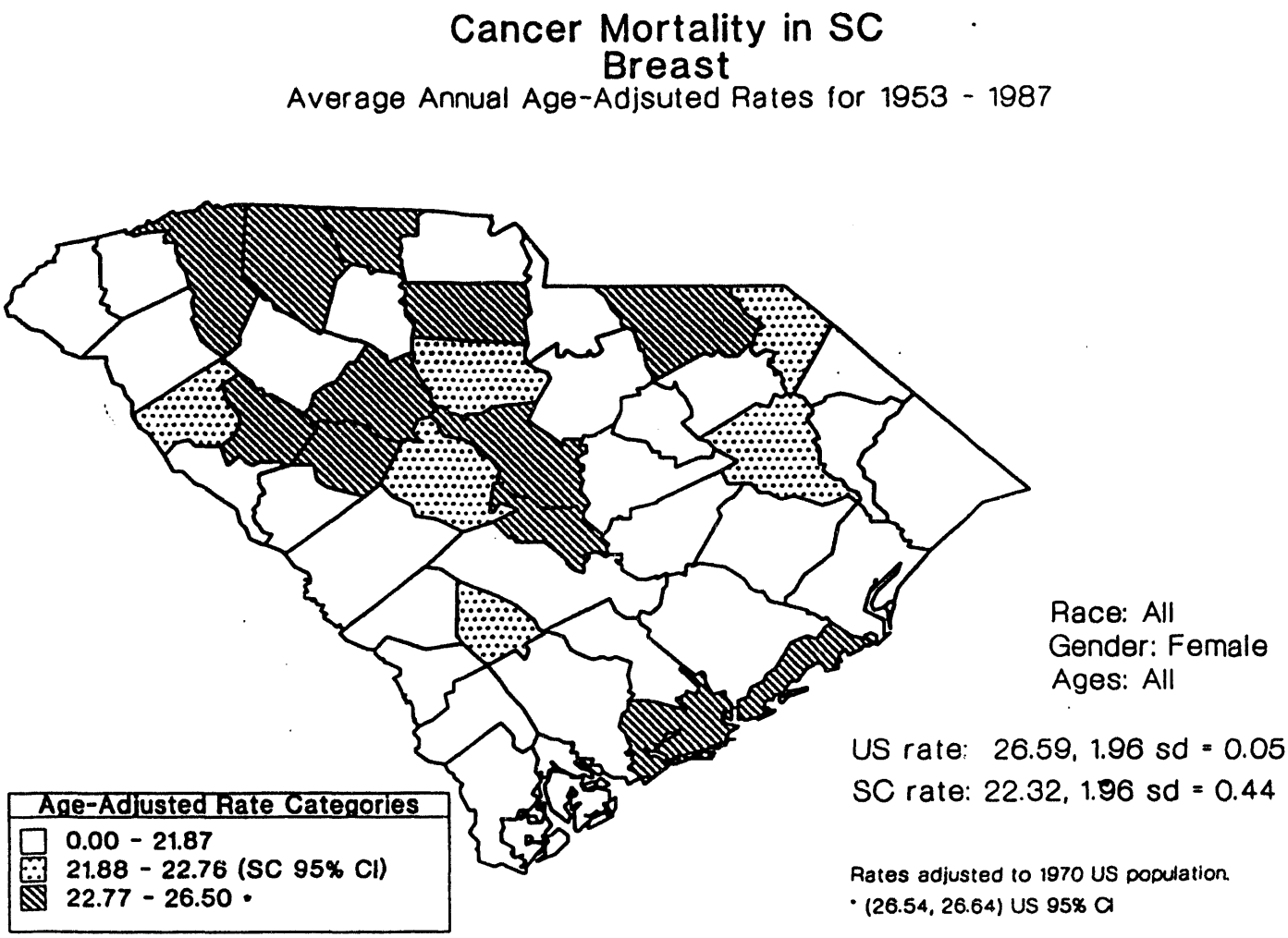
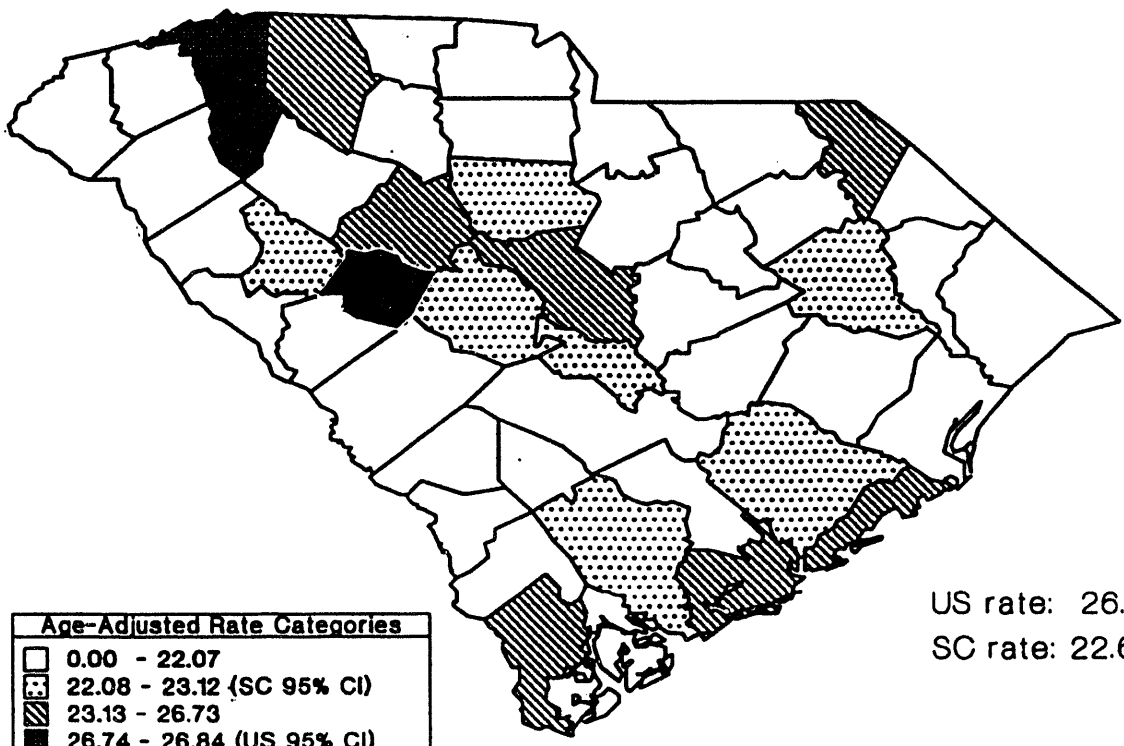

Cancer Mortality in SC
Breast
Average Annual Age-Adjsuted Rates for 1953 - 1987
Age-Adjusted Rate Categories
0.00 - 21.87
21.88 - 22.76 (SC 95% CI)
22.77 - 26.50 •
Race: All
Gender: Female
Ages: All
US rate: 26.59, 1.96 sd = 0.05
SC rate: 22.32, 1.96 sd = 0.44
Rates adjusted to 1970 US population.
• (26.54, 26.64) US 95% CI

Figure 87:

Cancer Mortality in SC
Breast
Average Annual Age-Adjusted Rates for 1953 - 1987



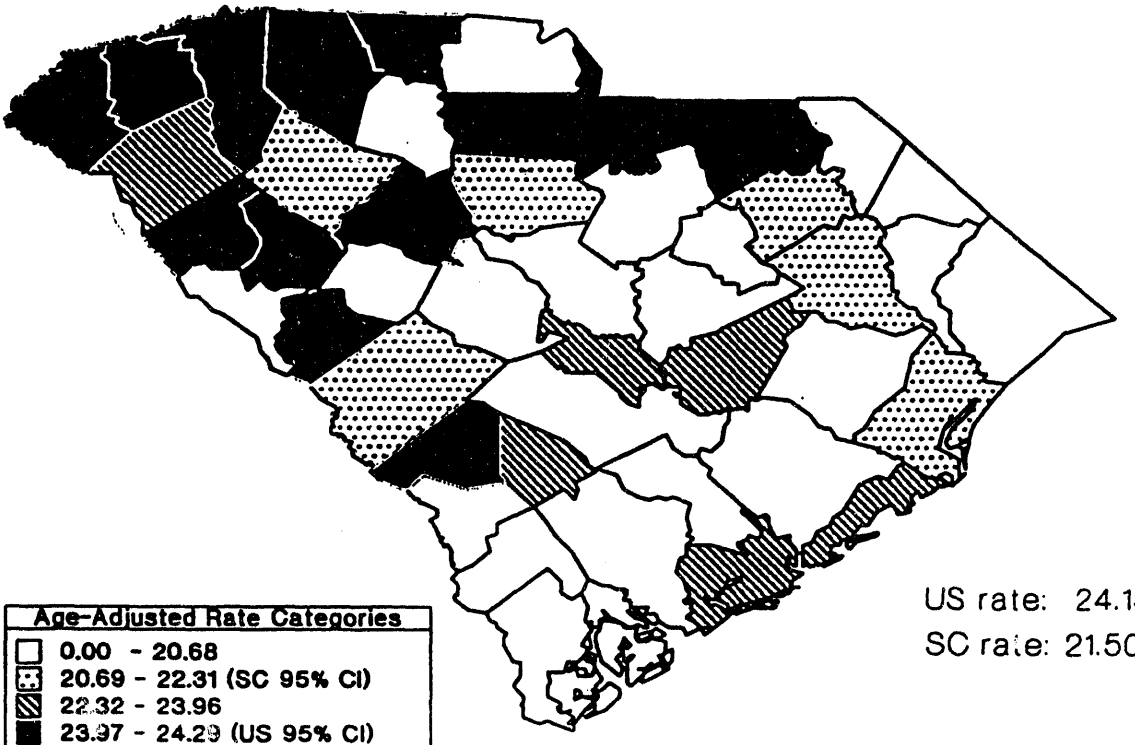
Race: White
Gender: Female
Ages: All

US rate: 26.79, 1.96 sd = 0.05
SC rate: 22.60, 1.96 sd = 0.52

Rates adjusted to 1970 US population

Figure 88:

Cancer Mortality in SC
Breast
Average Annual Age-Adjusted Rates for 1953 - 1987



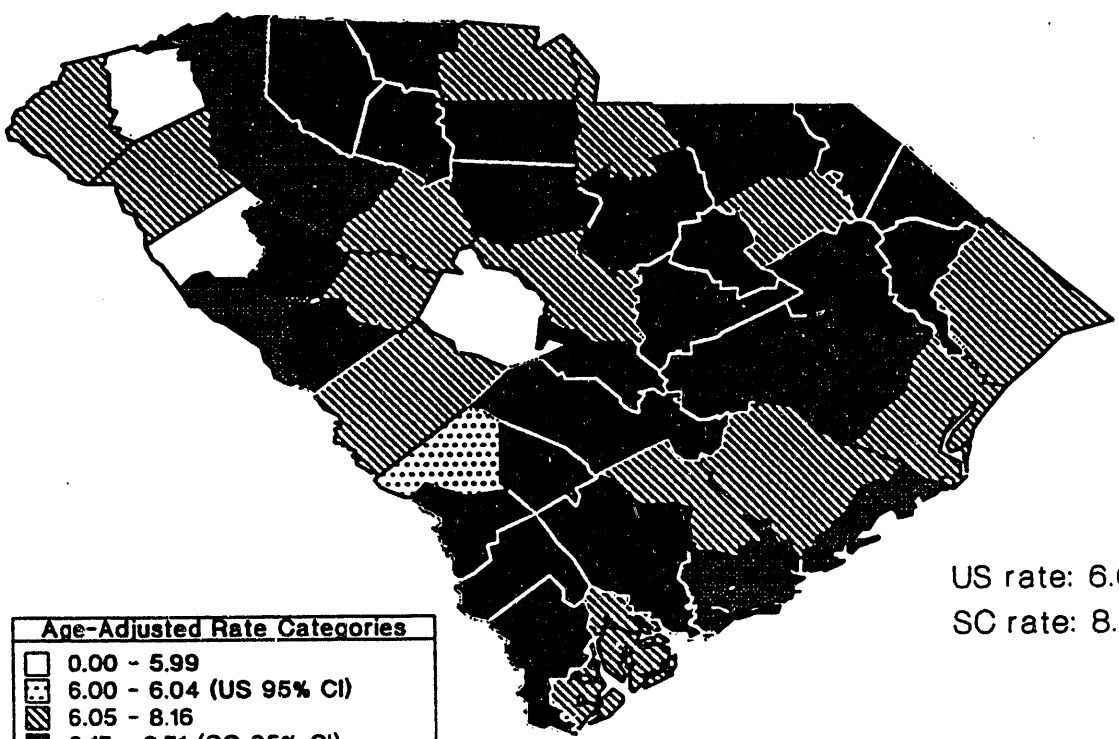
Race: NonWhite
Gender: Female
Ages: All

US rate: 24.13, 1.96 sd = 0.16
SC rate: 21.50, 1.96 sd = 0.81

Rates adjusted to 1970 US population.

Figure 89:

Cancer Mortality in SC
Cervix Uteri
Average Annual Age-Adjusted Rates for 1953 -1987



Age-Adjusted Rate Categories
- 0.00 - 5.99
- 6.00 - 6.04 (US 95% CI)
- 6.05 - 8.16
- 8.17 - 8.71 (SC 95% CI)
- › 8.71

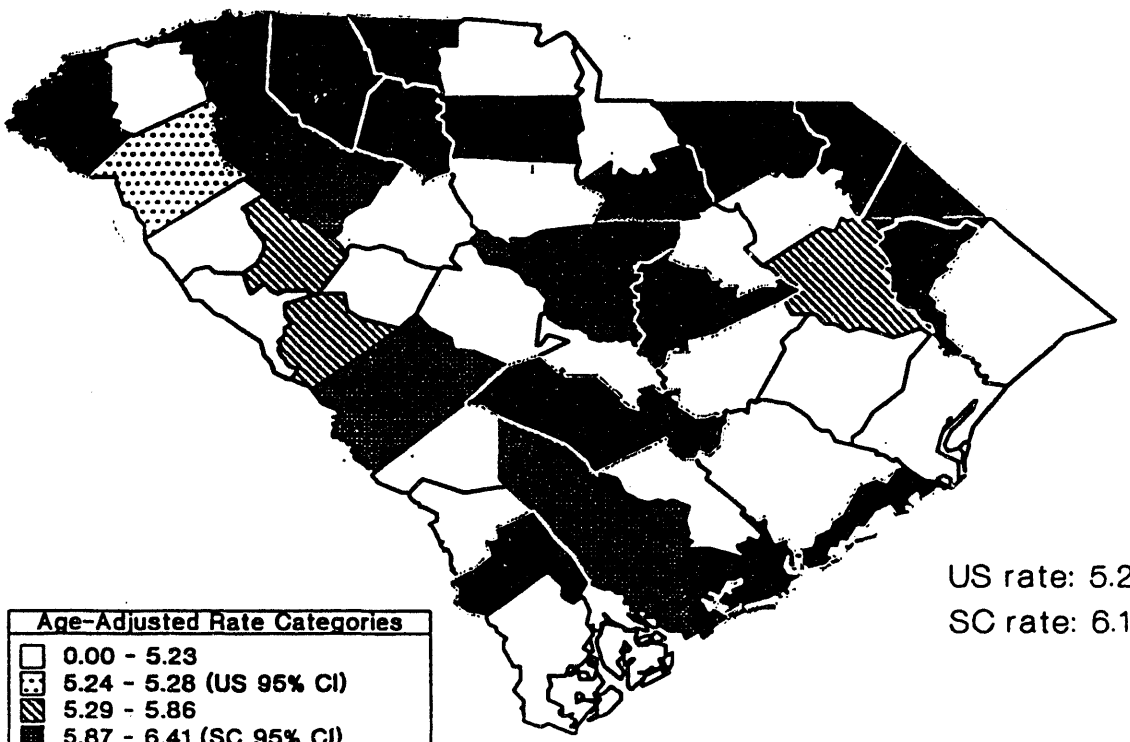
Race: All
Gender: Female
Ages: All

US rate: 6.02, 1.96 sd = 0.02
SC rate: 8.44, 1.96 sd = 0.27

Rates adjusted to 1970 US population

Figure 90:

Cancer Mortality in SC
Cervix Uteri
Average Annual Age Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 5.23
- 5.24 - 5.28 (US 95% CI)
- 5.29 - 5.86
- 5.87 - 6.41 (SC 95% CI)
- › 6.41

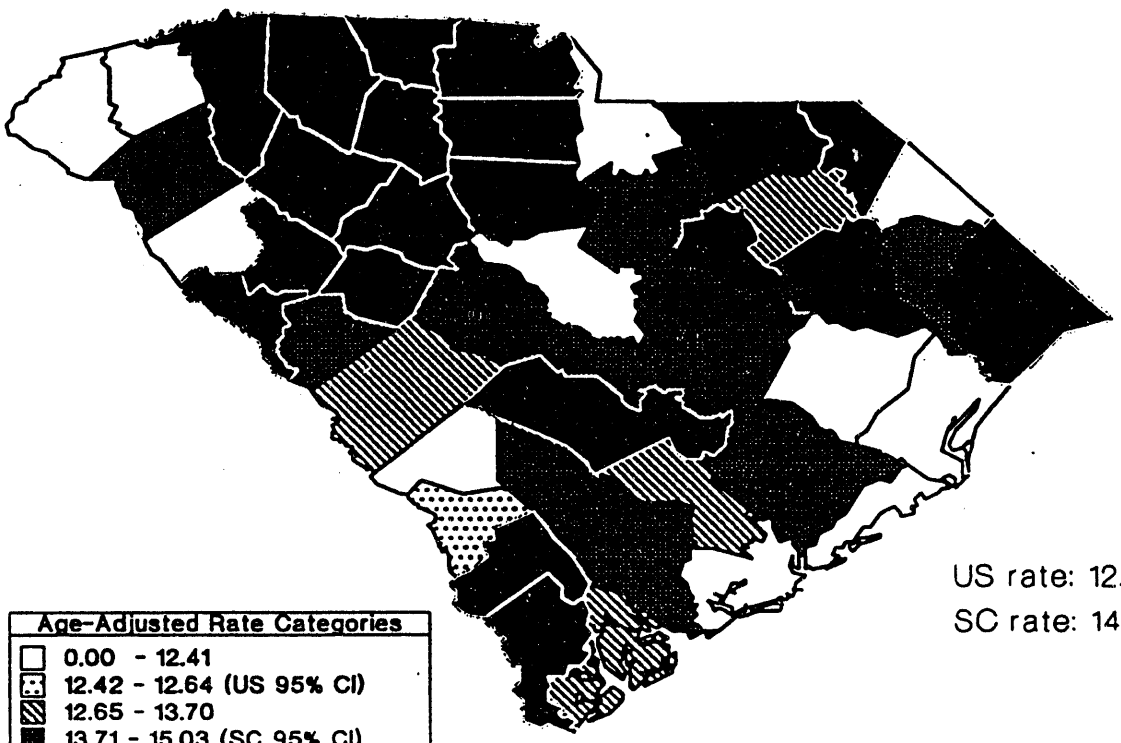
Race: White
Gender: Female
Ages: All

US rate: 5.26, 1.96 sd = 0.02
SC rate: 6.14, 1.96 sd = 0.27

Rates adjusted to 1970 US population.

Figure 91:

Cancer Mortality in SC
Cervix Uteri
Average Annual Age-Adjusted Rates for 1953 - 1987



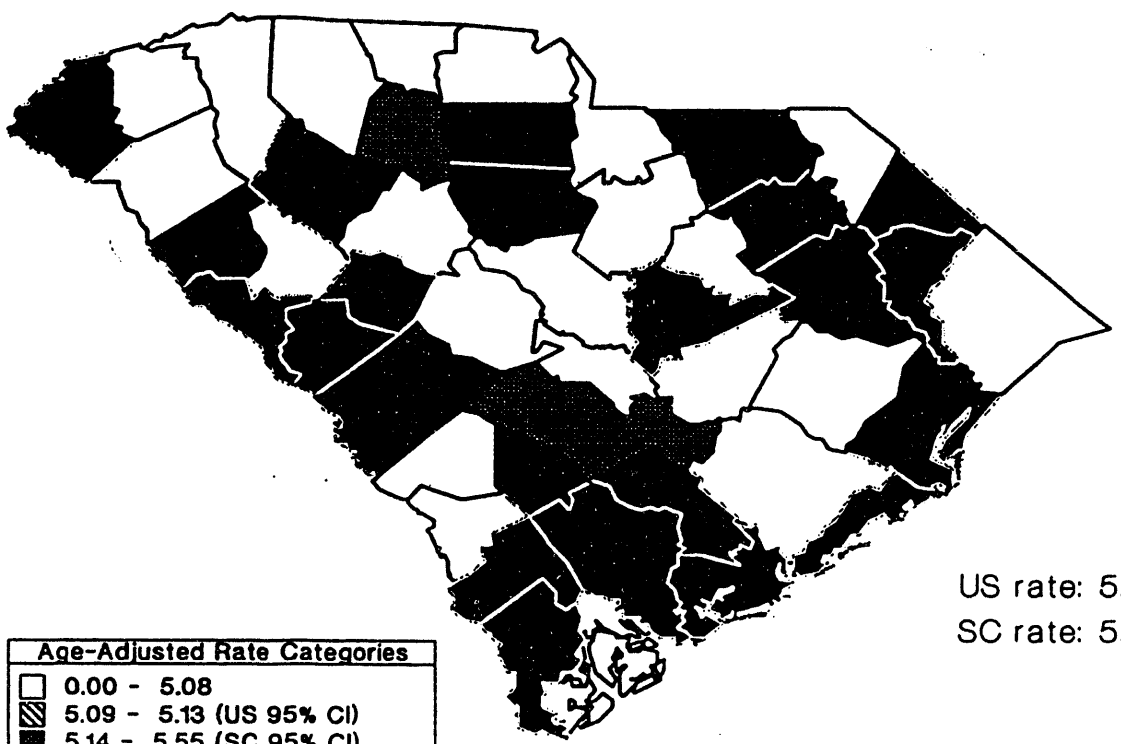
Race: NonWhite
Gender: Female
Ages: All

US rate: 12.53, 1.96 sd = 0.11
SC rate: 14.37, 1.96 sd = 0.66

Rates adjusted to 1970 US population.

Figure 92:

Cancer Mortality in SC
Corpus Uteri
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 5.08
- 5.09 - 5.13 (US 95% CI)
- 5.14 - 5.55 (SC 95% CI)
- 5.55 - 10.68

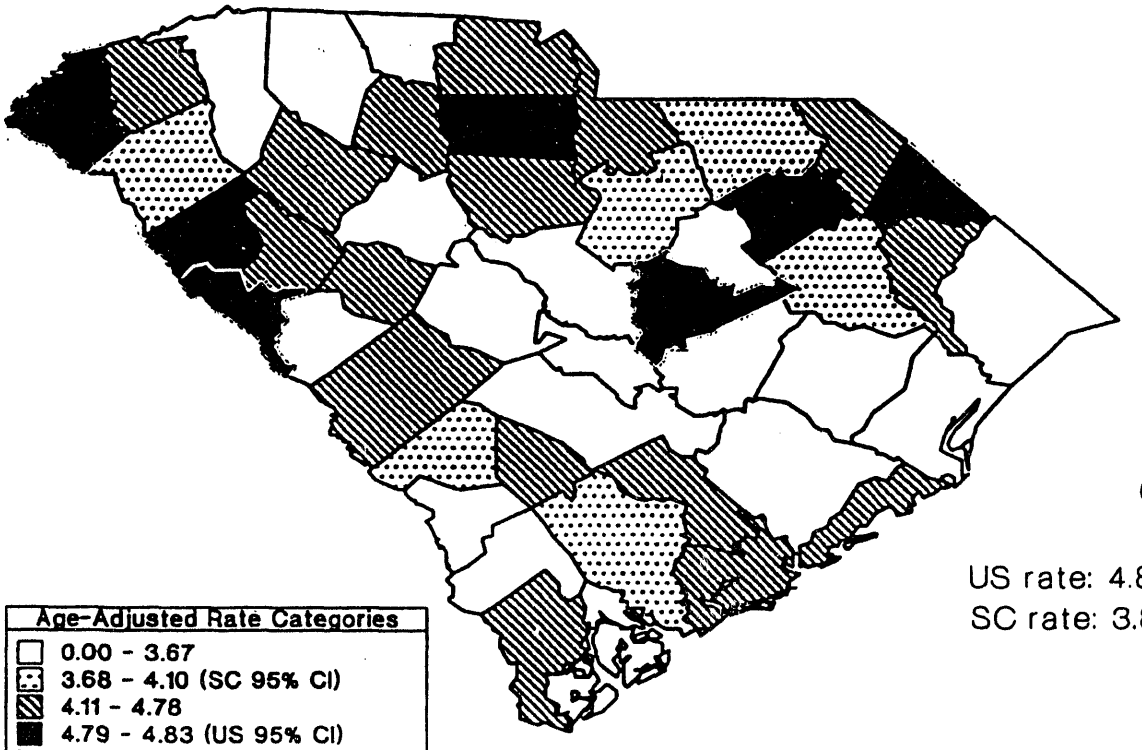
Race: All
Gender: Female
Ages: All

US rate: 5.11, 1.96 sd = 0.02
SC rate: 5.34, 1.96 sd = 0.21

Rates adjusted to 1970 US population

Figure 93:

Cancer Mortality in SC
Corpus Uteri
Average Annual Age-Adjusted Rates for 1953 - 1987



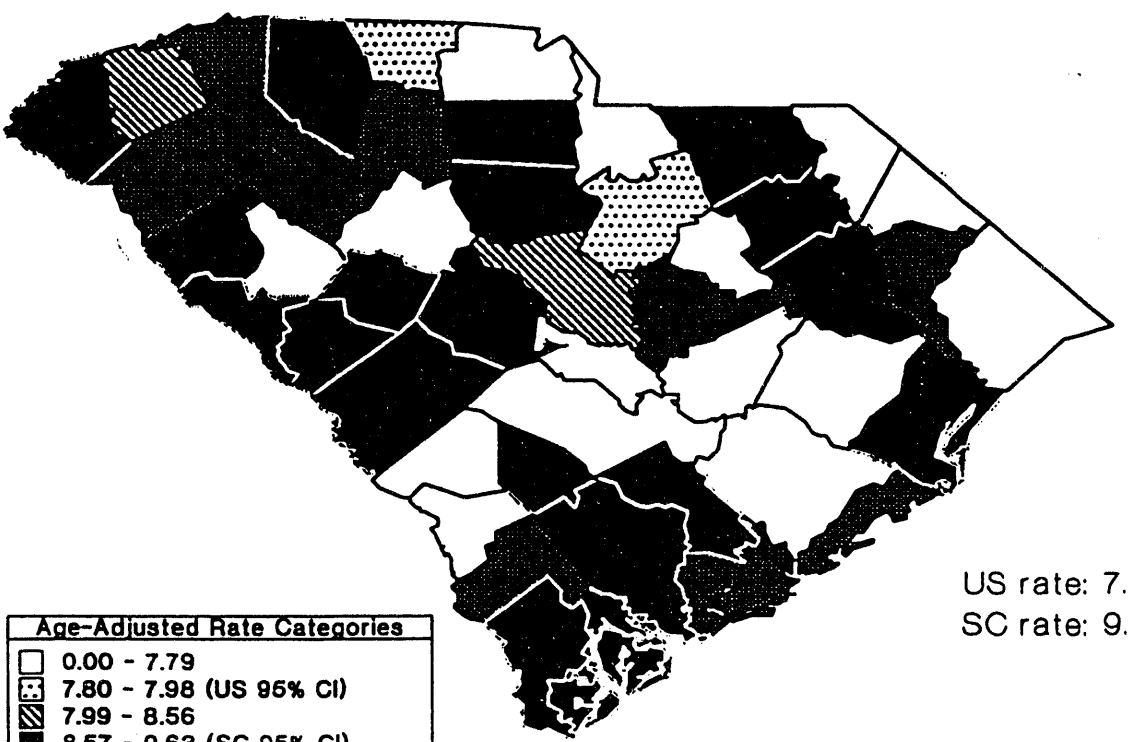
Race: White
Gender: Female
Ages: All

US rate: 4.81, 1.96 sd = 0.02
SC rate: 3.89, 1.96 sd = 0.21

Rates adjusted to 1970 US population

Figure 94:

Cancer Mortality in SC
Corpus Uteri
Average Annual Age-Adjusted Rates for 1953 - 1987



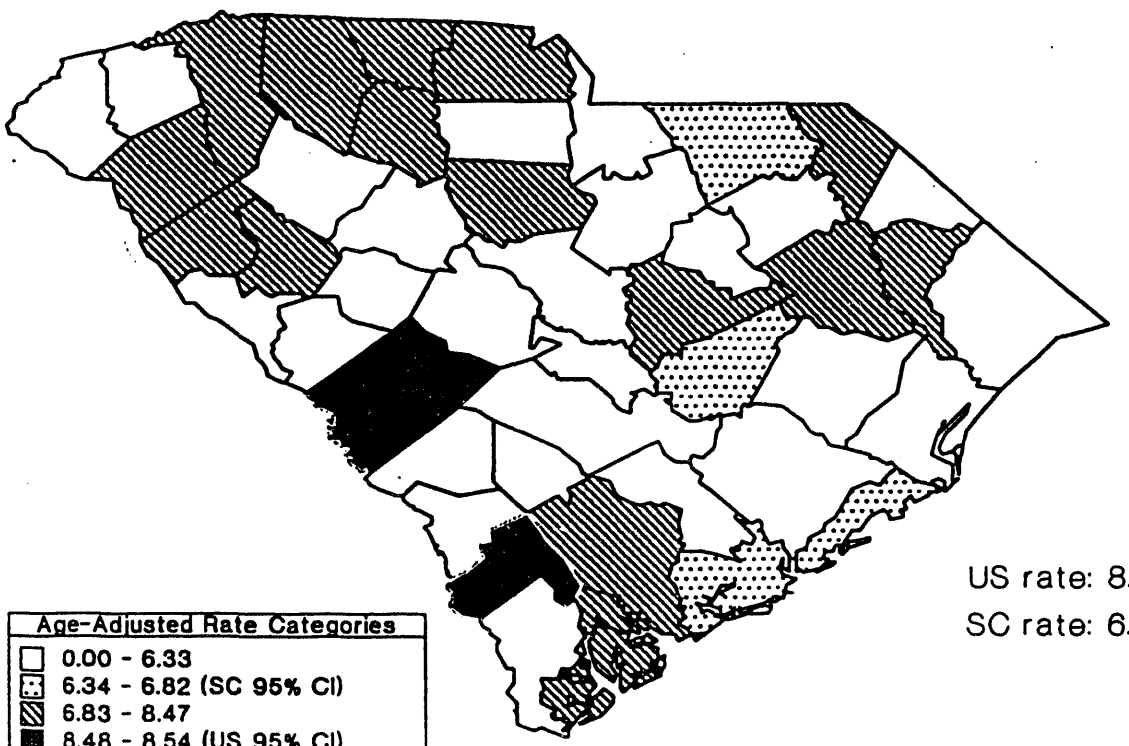
Race: NonWhite
Gender: Female
Ages: All

US rate: 7.89, 1.96 sd = 0.09
SC rate: 9.10, 1.96 sd = 0.53

Rates adjusted to 1970 US population.

Figure 95:

Cancer Mortality in SC
Ovary
Average Annual Age-Adjusted Rates for 1953 - 1987



Race: All
Gender: Female
Ages: All

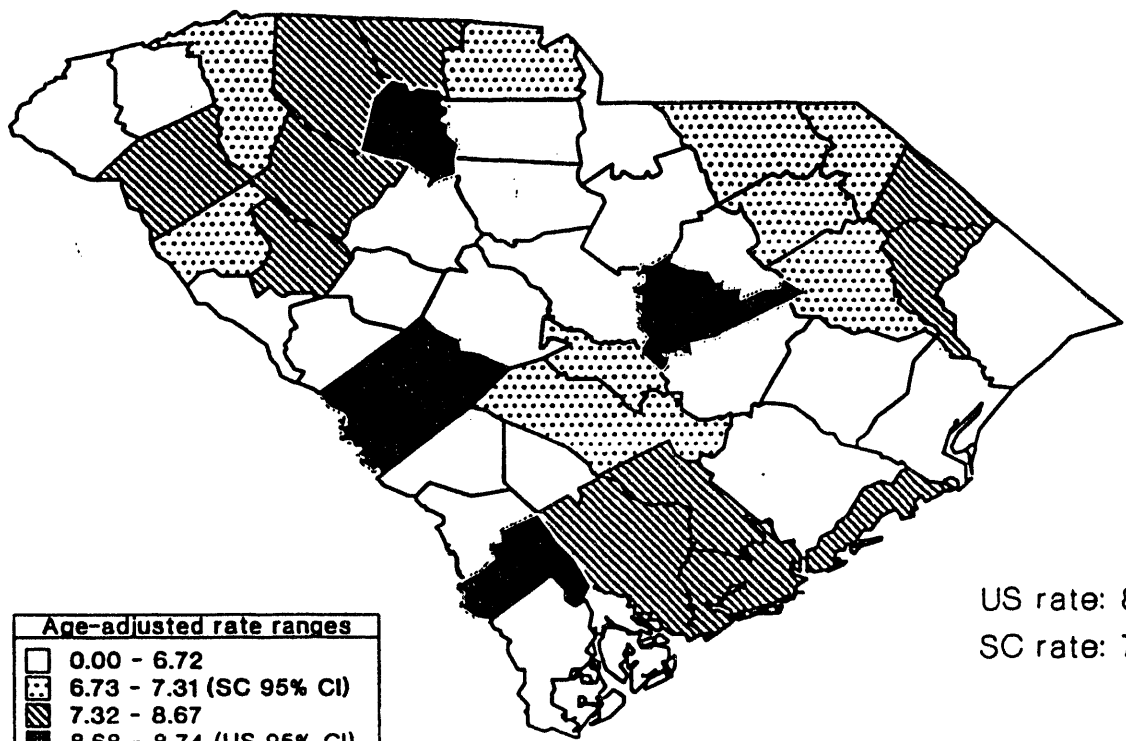
US rate: 8.51, 1.96 sd = 0.03

SC rate: 6.58, 1.96 sd = 0.24

Rates adjusted to 1970 US population.

Figure 96:

Cancer Mortality in SC
Ovary
age-adjusted rates, 1987



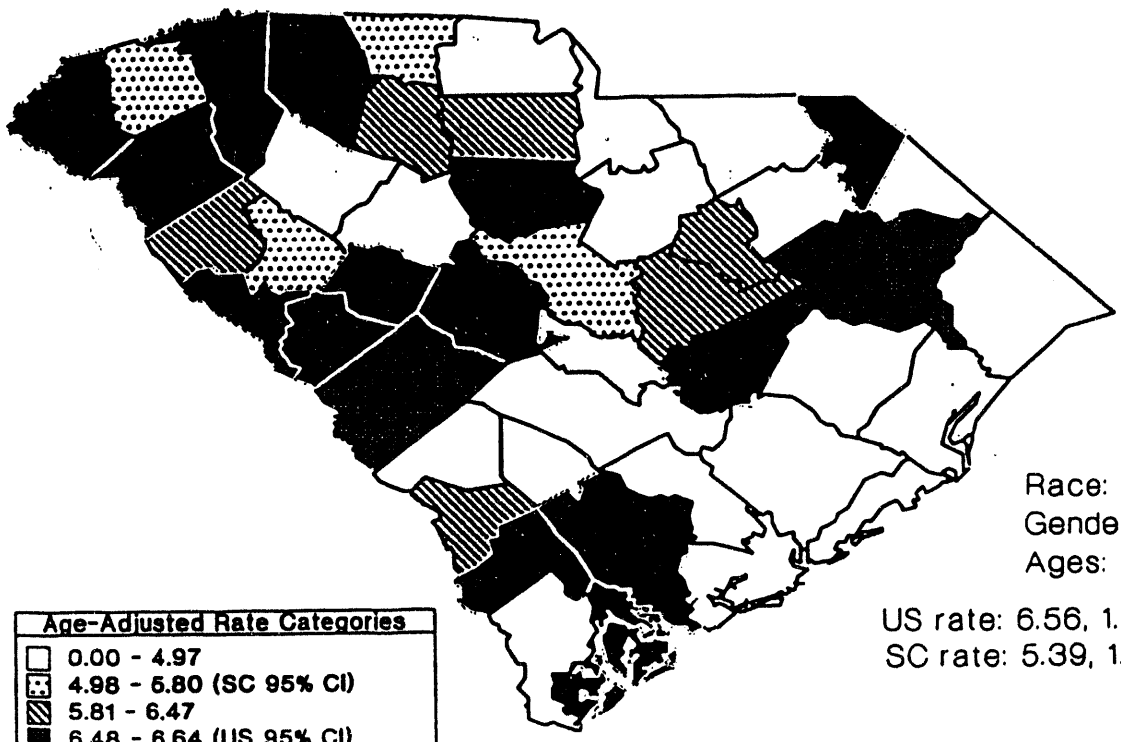
Race: White
Gender: Female
Ages: All

US rate: 8.71, 1.96 sd = 0.03
SC rate: 7.02, 1.96 sd = 0.29

Rates adjusted to 1970 US population

Figure 97:

Cancer Mortality in SC
Ovary
Average Annual Age-Adjusted Rates for 1953 - 1987



Age-Adjusted Rate Categories
- 0.00 - 4.97
- 4.98 - 5.80 (SC 95% CI)
- 5.81 - 6.47
- 6.48 - 6.64 (US 95% CI)
- › 6.64

Race: NonWhite
Gender: Female
Ages: All

US rate: 6.56, 1.96 sd = 0.08
SC rate: 5.39, 1.96 sd = 0.41

Rates adjusted to 1970 US population.

V. References

1. Caldwell GG. Twenty-two years of cancer cluster investigations at the Center for Disease Control. Am J Epidemiol 1990;132(suppl): S43-7.

2. Hoover R, Mason TJ, McKay FW, et al. Cancer by county: new resource for etiologic clues. Science 1975; 189: 1005-7.

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5. Walter SD. The analysis of regional patterns in health data. II. The power to detect environmental effects. Am J Epidemiol 1992; 136: 742-59.

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7. Chiang CL. Standard Error of the Age-Adjusted Death Rate. Vital Statistics Selected Reports 1961; 47, no. 9.

V. References

1. Caldwell GG. Twenty-two years of cancer cluster investigations at the Center for Disease Control. Am J Epidemiol 1990;132(suppl): S43-7.

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4. Walter SD. The analysis of regional patterns in health data. I. Distributional considerations. Am J Epidemiol 1992; 136: 730-41.

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6. Pommerenke FA, Sudhir S, Miller RW, Smart CR, McKay FW. State Cancer Control Map and Data Program. National Cancer Institute, Ceneters for Disease Control, American Cancer Society 1992; Test Version 8.4.

7. Chiang CL. Standard Error of the Age-Adjusted Death Rate. Vital Statistics Selected Reports 1961; 47, no. 9.

Guide to Poster Sessions and Exhibits

Symposium on Health Research and Needs to Ensure Environmental Justice

February 10-12, 1994
Crystal Gateway Marriott
Arlington, Virginia

II.61

Perceptions Of Risks in a Biracial Population Proximal to an Established Nuclear Production Facility. Daniel T. Lackland and John B. Dunbar, Medical University of South Carolina, Charleston, SC 29425

Public perception and knowledge regarding health and environmental hazards exposures are key considerations in risk assessment and analysis. Measurement of these attributes in defined populations is an essential component of the decision process regarding intervention and environmental cleanup and restoration as well as the identification of inequities in this process. A survey of the population residing in different geographic areas proximal (<50 miles, 50-100 miles, >150 miles) the Savannah River Site (SRS) was conducted to assess perceptions, attitudes, and knowledge. The randomly selected respondents were interviewed by telephone and accurately represented the demographic make-up of the population. Perceived risks and attitudes regarding environmental exposures and health varied by race and household income, as well as geographic proximity to SRS. Similarly, knowledge regarding health outcomes and risk factors varied among the respondents. These data document the public desire for study and accurate information, and suggest a need for better dissemination and a comprehensive community involvement in the decision making process involving environmental restoration.

ABSTRACT: Public perception and knowledge regarding health and environmental hazards exposures are key considerations in risk assessment and analysis. Measurement of these attributes in defined populations is an essential component of the decision process regarding intervention and environmental cleanup and restoration as well as the identification of inequities in this process. A survey of the population residing in different geographic areas proximal (<50 miles, 50-100 miles, >150 miles) the Savannah River Site (SRS) was conducted to assess perceptions, attitudes, and knowledge. The randomly selected respondents were interviewed by telephone and accurately represented the demographic make-up of the population. Perceived risks and attitudes regarding environmental exposures and health varied by race and household income, as well as geographic proximity to SRS. Similarly, knowledge regarding health outcomes and risk factors varied among the respondents. These data document the public desire for study and accurate information, and suggest a need for better dissemination and a comprehensive community involvement in the decision making process involving environmental restoration.

Environmental Hazards Assessment Program

One-Door Access System

Needs Assessment Report



FINAL

For The:

Medical University of South Carolina

June 30, 1994

Submitted by:

Coleman Research Corporation
Information Systems Division
6551 Loisdale Ct., Suite 800
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Table of Contents

1.0 Introduction 1
1.1 Purpose 1
1.2 Background 2
1.3 Terminology 3

2.0 Methodology 4
2.1 Needs Assessment Interviews 4
2.2 Needs Assessment Follow-Up Questionnaire 4
2.3 Evaluation of Current Information Resources and Processing Capabilities 9
2.4 Prototype Development and Demonstration 16

3.0 Needs Assessment 19
3.1 ODAS User Profile 19
3.1.1 MUSC/EHAP User Group 19
3.1.2 Rural Physicians 23
3.1.3 Other Universities 23
3.1.4 Commercial 24
3.1.5 Government 25
3.2 Current Information Resources and Processing Capabilities 25
3.2.1 MUSC Network Architecture 25
3.2.2 Academic and Research Computing Resources 26
3.2.3 Environmental Hazards Assessment Program Computing Resources. 28
3.2.4 MUSC Library Computing Resources 28
3.2.5 User Resources and Capabilities 31
3.2.5.1 MUSC/EHAP User Community 31
3.2.5.2 Other Universities 34
3.2.5.3 Commercial and Government 34
3.3 Information Resource and Processing Needs 34
3.3.1 Genetic Information/Genome Sequence Data 35
3.3.2 Toxicity Data/Toxic Substances 35
3.3.3 Chemical Substances, Profiles/Analytical Chemistry 36
3.3.4 Epidemiology and Human Exposure Data 36
3.3.5 Risk Assessment/Risk Analysis 36
3.3.6 Regulatory Data/Environmental Legislation 37
3.3.7 Material Safety Data Sheets 37

3.3.8 Hazardous Wastes/Waste Site Data/Emergency Response Information 37
3.3.9 Summary of Common ODAS Information Resource and Processing Needs 38

4.0 Conclusions 40
4.1 Recommendations 40
4.1.1 Prototype Evaluation and Enhancement 40
4.1.2 Incorporation of Unified Medical Language System Tools 41
4.1.3 ODAS Configuration Alternatives 43
4.1.4 ODAS Information Sources 45
4.1.5 ODAS Working Group 46
4.1.6 Data and Information System Needs External to the ODAS 47
4.2 Issues 48
4.2.1 Diversity of the User Community 49
4.2.2 Hardware and Software Costs 49
4.2.3 Information Access Costs 49
4.2.4 Text Searching Requirements 50
4.2.5 Evolution of Requirements 51

Appendix A 52
NEEDS ASSESSMENT INTERVIEW SUMMARIES 52

Appendix B 73
NATIONAL LIBRARY OF MEDICINE UNIFIED MEDICAL LANGUAGE SYSTEM 73

Appendix C 77
ACRONYM DEFINITIONS 77

List of Figures

Figure 2-1 Needs Assessment Approach 5

Figure 2-2 EHAP Information Needs Assessment Questionnaire 6

Figure 2-3 EHAP Information System Needs Assessment Follow-Up Questionnaire 10

Figure 2-4 Prototype Architecture 17

Figure 2-5 Prototype Concept 17

Figure 3-1 MUSC/EHAP Needs Assessment Interview Coverage 20

Figure 3-2 Potential Users of the One-Door Access System (ODAS) 21

Figure 3-3 Academic and Research Computing Resources 27

Figure 3-4 EHAP Computing Resources 29

Figure 3-5 MUSC Library Computing Resources 30

Figure 3-6 Summary of Information Requirements by MUSC Department 39

Figure 4-1 Alternative 1: Distributed Database Client Strategy 43

Figure 4-2 Alternative 2: Non-Distributed Database Client Strategy 44

1.0 Introduction

The Medical University of South Carolina's (MUSC) vision is to become the premier national resource for medical information and for environmental/health risk assessment. A key component to the success of the many missions of the Environmental Hazards Assessment Program (EHAP) is timely access to large volumes of data. The significant growth in the number of environmental/ health information systems that has occurred over the past few years has made data access challenging. Users often spend hours attempting to locate and retrieve required data. This study documents the results of the needs assessment effort conducted to determine the information access and processing requirements of EHAP.

1.1 Purpose

The goal of this study is to identify the requirements for the MUSC/EHAP One-Door Access System (ODAS). This includes both information access requirements and information processing requirements. Once the requirements have been identified, the study will summarize the common and unique access and processing needs of the various EHAP components.

The concept of the ODAS is to provide efficient access to a host of existing information resources, including commercial, academic, industrial, and government databases. The objective of the ODAS is to allow users to retrieve data from disparate databases residing on a variety of hardware and software platforms without knowing the interface of each individual system. The ODAS will differ from many of the other "search and retrieval" tools, in that it does not require users to specify the database to be searched prior to initiating a query. This is a key advantage, since users often do not know what databases contain information relative to their query.

The initial implementation of the ODAS will integrate a fixed set of databases. As new data resources are required, they will be evaluated for integration into the system. The key to the success of this system is the usefulness of the data that it accesses. Therefore, the requirements analysis task is crucial in determining the data needs of the various EHAP components.

In addition to identifying required data, the goal of this study is to investigate the desired methods of data access and the appropriate methods of processing the retrieved data. This requires an understanding of the MUSC/EHAP hardware, software, and communications resources. It also requires knowledge of the tools and data already available at MUSC.

1.2 Background

MUSC has increased its involvement in the environmental arena by instituting EHAP and dedicating itself to exploring and developing a new basis for risk assessment, risk management, and risk communication with a primary focus on human health. EHAP's mission is to develop an environmental program to ensure a healthy society in a healthy economic, political, and biological environment. Its contributions involve health care and health care professionals in education, research, and service.

A key EHAP objective is to establish an international computer network of approved data and informational support to develop a national basis for risk assessment, risk management, and risk communication. Using the EHAP information system as an entry platform, health professionals, students, and researchers will be able to access international databases containing information on health risk assessment. This needs assessment effort has been performed in support of this objective.

MUSC/EHAP includes many organizations with varying needs. Therefore, it is imperative that careful analysis be performed prior to implementing the one-door access solution. For this reason, the system is being developed using a phased approach. The first phase of development is the Needs Assessment, which consisted of the following three tasks:

- Information Access and Processing Requirements Analysis
- Database Identification and Analysis
- Prototype Development and Demonstration.

These tasks were performed simultaneously, and continuous feedback was exchanged between the task teams.

The primary goal of the Information Access and Processing Requirements Analysis task was to fully and accurately understand the information requirements of the major MUSC/EHAP components (academicians, clinicians, and physicians), state hospitals/clinics, and rural physicians. The requirements analysis was focused on the types of information required to assess and treat environmental/health hazards. Methods of information collection included personal interviews, phone interviews, questionnaires, and on-site research.

The purpose of the Database Identification and Analysis task was to identify and research a variety of environmental/health databases. Based on the information needs identified during the requirements analysis effort, a list of "candidate" databases was produced. Finally, databases were recommended for integration with the initial implementation of the ODAS.

The purpose of the Prototype Development and Demonstration task was to use prototyping techniques to build user interface screens and key system capabilities that would demonstrate the one-door access concept. Another objective of the prototype development task was to build an evaluation tool for the potential ODAS user community. In this way, system objectives and requirements could be clearly defined prior to initiating a full-scale software development effort.

1.3 Terminology

The term "database" can be interpreted in a variety of ways, depending on its context. It is often used in a general sense to describe any repository of data. In a more technical sense, it is used to describe an actual physical structure that stores data and relationships between data. The terms "information system" and "database" are often used interchangeably. However, an "information system" is actually an interface used to access a database, or set of databases.

During this study, a number of information sources were researched. Some of these sources were pure databases, residing independently on disk, tape, or CD-ROM. Other sources were information systems that provided access to one or more databases. For simplicity, the term "database" will be used in a general sense in this report. "Database" will be used to describe all of the varied sources of data that were researched.

2.0 Methodology

The potential ODAS user community includes a variety of organizations, both internal and external to MUSC. In order to identify the information access and processing requirements of these varied users, a structured approach was followed. This approach is highlighted in Figure 2-1, and discussed in the following sections.

2.1 Needs Assessment Interviews

The primary mechanism used to identify data access and information processing needs was the personal interview. The benefit of the personal interview is that it facilitates communication and reveals needs that may not be extracted on a written questionnaire. It also minimizes the risk of misinterpreting written questions and answers. Finally, the interview process ensures immediate feedback that can be helpful to other tasks, such as the prototype development and database survey tasks.

A key component of the interview process is the selection of interviewees. The goal in this effort was to identify academic, clinical, and research professionals in the areas of environmental/health risk assessment, both internal and external to MUSC. Within MUSC, a cross-section of departments providing input to EHAP was sought. External to MUSC, environmental professionals, state hospitals/clinics, rural physicians, and researchers at other universities were identified.

An EHAP Information Needs Assessment Questionnaire was developed to guide the interview process. This questionnaire, shown in Figure 2-2, was designed to collect information pertaining to the user's profile, current capabilities, and desired capabilities. The questionnaire provided a structured framework for the interview process, and it helped to keep the information exchange focused on the needs assessment goals. In the future, as new groups are added to the ODAS user community, the questionnaire can continue to be used as a needs collection tool.

2.2 Needs Assessment Follow-Up Questionnaire

Two primary objectives of the needs assessment effort are to identify new sources of data that will support the EHAP mission and to identify viable data sources for integration into the ODAS. Through research performed during the database survey effort, over 120 environmental and medical databases were identified. This list of databases was narrowed down through a selection process that resulted in the identification of databases that will best support the EHAP mission, as well as meet technical criteria.

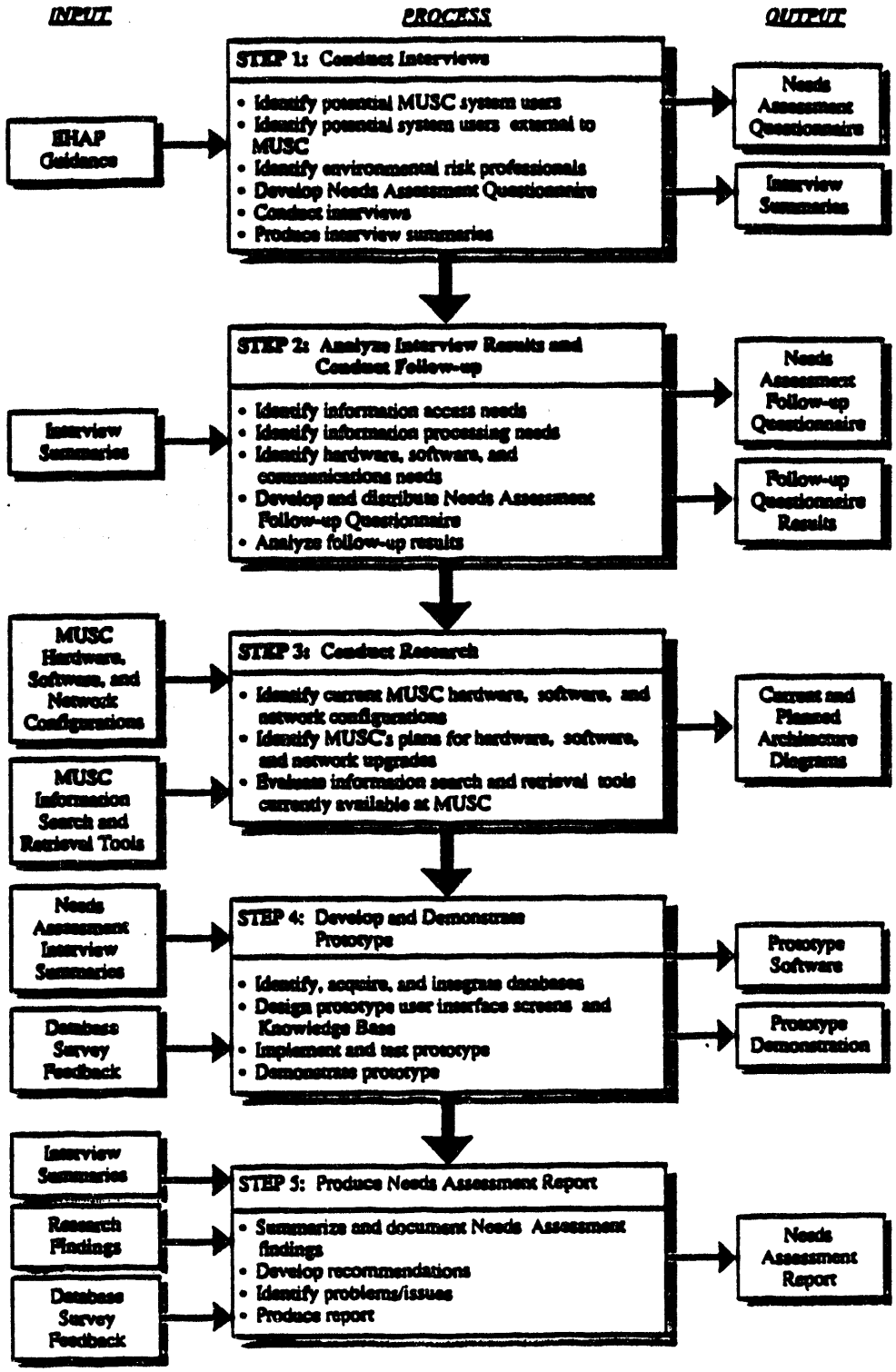


Figure 2-1. Needs Assessment Approach.

EHAP INFORMATION NEEDS ASSESSMENT QUESTIONNAIRE
MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
PHASE I : NEEDS ASSESSMENT

NOTE: IF MORE ROOM IS NECESSARY FOR REPLIES, PLEASE ATTACH SHEETS TO THE BACK OF THE QUESTIONNAIRE OR CONTINUE REPLIES ON THE BACK OF THE PAGE. PLEASE BE AS COMPLETE AND SPECIFIC AS POSSIBLE IN YOUR REPLIES.

USER PROFILE

1) NAME: _____

2) TITLE/OCCUPATION/DISCIPLINE: _____

3) PURPOSE(S) FOR ACCESSING DATA: _____

4) PHONE / INTERNET ADDRESS: _____

CURRENT CAPABILITIES

1) INFORMATION RESOURCES PRESENTLY BEING ACCESSED:

A) WHAT ARE THE INFORMATION RESOURCES CURRENTLY BEING ACCESSED? _____

B) WHAT ARE THE FORMATS OF THE INFORMATION MOST FREQUENTLY USED (e.g. Bibliographic, quantitative, full-text, abstract)? _____

C) WHAT ARE THE INFORMATION SUBJECT AREAS ACCESSED MOST FREQUENTLY (e.g. Risk Assessment, Toxicology)? _____

2) WHAT ARE THE CURRENT METHODS OF ACCESSING INFORMATION RESOURCES?

A. Hardware (e.g. DEC VAX, IBM PC, Macintosh: _____

B. Software (e.g. DOS, UNIX, VMS): _____

Figure 2-2. EHAP Information Needs Assessment Questionnaire.

C. Network Communications (e.g. LAN, WAN, INTERNET): _____

3) WHAT IS THE APPROXIMATE FREQUENCY OF ACCESS OF EACH INFORMATION RESOURCE BY THE USER (A=5 times or less, B=between 5 and 20, C=more than 20 times)? _____

4) HOW IS INFORMATION PROCESSED ONCE IT IS RETRIEVED FROM EACH INFORMATION RESOURCE (e.g. Exported to word Processor, spreadsheet, mathematical, or statistical applications)? _____

5) WHAT ARE THE CURRENT DATA REPORTING CAPABILITIES FOR EACH INFORMATION RESOURCE (e.g printed output, statistical output)? _____

6) WHAT ARE YOUR LIKES/DISLIKES WITH THE CURRENT CAPABILITIES(be specific)? _____

8) COMMENTS/RECOMMENDATIONS FOR IMPROVEMENTS TO CURRENT CAPABILITIES (be specific)? _____

Figure 2-2. EHAP Information Needs Assessment Questionnaire (continued).

DESIRED CAPABILITIES

1) INFORMATION RESOURCES NEEDED/DESIRED FOR ACCESS:

A) WHAT INFORMATION RESOURCES ARE OF INTEREST THAT ARE NOT CURRENTLY AVAILABLE? _____

B) WHAT FORMATS OF INFORMATION ARE DESIRED, BUT NOT CURRENTLY AVAILABLE (e.g. Bibliographic, Quantitative, graphical)? _____

C) WHAT INFORMATION SUBJECT AREAS ARE OF INTEREST THAT ARE NOT CURRENTLY AVAILABLE (e.g Environmental Risk Assessment, Toxicology)? _____

2) WHAT ADDITIONAL INFORMATION PROCESSING CAPABILITIES ARE DESIRED ONCE DATA IS RETRIEVED FROM EACH INFORMATION RESOURCE (e.g. Input to Geographic Information Systems (GIS), statistical applications)? _____

3) WHAT ARE THE DESIRED DATA REPORTING CAPABILITIES FOR EACH INFORMATION RESOURCE (e.g printed output, plots)? _____

4) LIST ADDITIONAL USERS/GROUPS THAT REQUIRE ACCESS: _____

5) ADDITIONAL COMMENTS OR SUGGESTIONS: _____

Figure 2-2. EHAP Information Needs Assessment Questionnaire (continued).

The selection process began with an analysis of the feedback collected during the interview process. Based on the interview results, information requirements were classified into general categories of data. For each category, databases containing information related to the category were identified. The list of databases includes those that are currently accessible at MUSC, as well as other sources of data.

The next step of the selection process involved contacting the potential system users for additional input. To accomplish this, a Needs Assessment Follow-Up Questionnaire was developed to collect the following information:

- Clarification of the suggested data categories and identification of additional data categories
- Information sources currently used at MUSC
- New information sources that will support EHAP work
- Prioritization of users' data access requirements.

The follow-up questionnaire is shown in Figure 2-3.

The questionnaire consists of two parts. The first part presents the data categories that were identified from the interviews. The second part contains a list of databases associated with each data category. Users were asked for information concerning their experience, familiarity, and/or interest associated with each database. The questionnaire was distributed to the original list of interviewees. Completed questionnaires were analyzed to select information sources that will best meet the collective needs of the ODAS user community.

2.3 Evaluation of Current Information Resources and Processing Capabilities

A key to understanding user needs is the evaluation of information sources and access tools that are currently available to the MUSC/EHAP staff. An analysis was performed to determine the following:

- Current MUSC hardware, software, and network configurations
- Plans for upgrading the current MUSC hardware, software, and network configurations
- Tools currently available to perform information search and retrieval.

EHAP INFORMATION SYSTEM NEEDS ASSESSMENT FOLLOW-UP QUESTIONNAIRE

PART I: CATEGORIZATION OF INFORMATION REQUIREMENTS

DATA CATEGORY	PRIORITY (H, M, L)	COMMENTS
Risk Assessment/Risk Analysis		
Toxicity Data/Toxic Substances		
Human Exposure Data		
Genetic Information/Genome Sequence Data		
Chemical Substances, Profiles/Analytical Chemistry		
Material Safety Data Sheets		
Hazardous Wastes/Waste Site Data/ Emergency Response Information		
Epidemiology		
Regulatory Data/Environmental Legislation		
ADDITIONAL DATA CATEGORIES REQUIRED? (INDICATE PRIORITIES)		

H = high M = medium L = low

Figure 2-3. EHAP Information System Needs Assessment Follow-Up Questionnaire

EHAP INFORMATION SYSTEM NEEDS ASSESSMENT FOLLOW-UP QUESTIONNAIRE
PART II: DATABASE/INFORMATION SYSTEM SELECTION

DATABASE/ INFORMATION SYSTEM NAME	TOPICS COVERED														DATA TYPE						MUSC ACCESS '		NEW DATA SOURCES	
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environment, General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology	Risk Assessment/ Management	Toxicology	Simulation Model	System of Databases	Abstract	Bibliographic	Fulltext	Quantitative	Do You Currently Access the Database at MUSC? (Yes/No)	If "Yes", How is it Accessed? (local, online, etc.)	Are You Familiar with the Database? If "Yes", Positive/Negative Comments?	Are You Interested in Accessing the Database? (Yes/No)
DATA CATEGORY: RISK ASSESSMENT/ RISK ANALYSIS																									
EXAMS II					X	X								X	X	X				X	X				
Exposure Models Library					X	X								X	X	X	X			X	X				
IRIS					X	X	X							X	X					X	X				
MEDLINE		X	X	X	X	X	X	X	X	X		X		X	X	X			X	X					
PATRIOT	X				X	X								X	X	X				X	X				
PCGEMS					X	X								X	X	X				X	X				
PIRANHA	X				X	X								X	X					X	X				
REPRORISK			X					X	X					X	X					X	X				
REPROTOX				X				X	X		X			X	X					X					
Risk Assistant					X									X	X	X	X			X	X				
Safety Sciences and Risk Assessment Database						X			X	X		X		X				X	X						
DATA CATEGORY: TOXICITY DATA/ TOXIC SUBSTANCES																									
CCRIS					X		X	X	X	X		X			X				X	X	X				
Clinical Toxicology of Commercial Products					X										X					X					
HAZDAT					X	X			X					X	X					X	X				
IRIS					X	X	X							X	X					X	X				
Pollution/Toxicology Database w/ EIS's					X	X								X	X			X	X						
POLTOX I						X			X				X		X			X	X						
TOMES Plus			X		X	X	X	X	X	X	X	X		X	X					X	X				
Toxicology Database					X				X				X	X	X										
TOXLINE			X		X	X	X	X	X		X	X	X	X	X			X	X						
TOXLIT				X	X	X	X		X				X	X	X			X	X						
TOXNET					X	X	X	X	X		X			X	X		X			X	X				

H = high M = medium L = low

Figure 2-3. EHAP Information System Needs Assessment Follow-Up Questionnaire (continued)

EHAP INFORMATION SYSTEM NEEDS ASSESSMENT FOLLOW-UP QUESTIONNAIRE

PART II: DATABASE/INFORMATION SYSTEM SELECTION

DATABASE/ INFORMATION SYSTEM NAME	TOPICS COVERED														DATA TYPE						MUSC ACCESS		NEW DATA SOURCES	
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environment, General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology	Risk Assessment	Toxicology	Simulation Model	System of Databases	Abstract	Bibliographic	Fulltext	Quantitative	Do You Currently Access the Database at MUSC? (Yes/No)	If "Yes", How is it Accessed? (local, online, etc.)	Are You Familiar with the Database? If "Yes", Positive/Negative Comments?	Are You Interested in Accessing the Database? (Yes/No)
TSCATS					X	X								X	X				X	X					
[redacted]																									
DATA CATEGORY: HUMAN EXPOSURE DATA																									
GIABS					X		X							X	X					X	X				
Hazardous Substances Data Bank			X		X	X			X	X		X	X	X	X					X	X				
HAZDAT					X	X			X					X	X					X	X				
RTECS					X		X	X	X					X	X					X	X				
[redacted]																									
DATA CATEGORY: GENETIC INFO./ GENOME SEQUENCE DATA																									
EMICBACK				X	X		X	X	X		X			X	X			X	X						
ETICBACK					X		X	X	X		X			X	X			X	X						
GENBANK								X	X									X	X	X	X				
GENE-TOX					X		X	X	X						X			X	X						
Genetics Database						X		X			X		X		X			X	X						
GENETOX			X				X	X	X											X	X				
The Nature of Genes			X	X			X	X	X											X					
[redacted]																									
DATA CATEGORY: CHEMICAL SUBSTANCES, PROFILES/ ANALYTICAL CHEMISTRY																									
Analytical Abstracts					X													X	X						
Biological and Agricultural Index	X	X		X	X	X		X	X		X							X	X						
CAB Abstracts				X	X	X												X							

H = high M = medium L = low

Figure 2-3. EHAP Information System Needs Assessment Follow-Up Questionnaire (continued)

EHAP INFORMATION SYSTEM NEEDS ASSESSMENT FOLLOW-UP QUESTIONNAIRE
PART B: DATABASE/INFORMATION SYSTEM SELECTION

DATABASE/ INFORMATION SYSTEM NAME	TOPICS COVERED															DATA TYPE						MUSC ACCESS		NEW DATA SOURCES	
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environment, General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology	Risk Assessment	Toxicology	Simulation Model	System of Databases	Abstract	Bibliographic	Full-text	Quantitative	Do You Currently Access the Database at MUSC? (Yes/No)	If "Yes", How is it Accessed? (local, online, etc.)	Are You Familiar with the Database? If "Yes", Positive/Negative Comments?	Are You Interested in Accessing the Database? (Yes/No)
CCIS			X		X	X	X	X	X	X	X	X		X	X		X		X	X	X				
CCRIS					X		X	X	X	X		X			X				X	X	X				
CHEM-BANK					X	X				X		X		X	X		X			X	X				
CHEMHAZIS					X				X	X		X			X			X		X					
Chemical Abstracts					X										X			X	X		X				
Chemical Engineering and Biotechnology Abstracts				X	X													X	X						
Chemical Info. System		X			X	X	X	X	X	X		X	X	X	X		X		X	X	X				
ChemID			X		X	X														X	X				
CHEMLINE					X															X	X				
CHEMLIST					X	X												X							
CHEMREACT					X																X				
CHEMSAFE					X					X		X								X	X				
Clinical Toxicology of Commercial Products					X										X					X					
EINECS plus-CD					X															X	X				
EMCIS					X	X						X								X	X				
Encyclopedia of Chemical Technology	X				X								X							X	X				
Hazardous Substances Data Bank			X		X	X			X	X		X	X	X	X					X	X				
IRIS					X	X	X							X	X					X	X				
IRPTC					X	X			X					X	X			X		X	X				
Merck Index Online					X				X				X		X					X	X				
POLTOX III: CAB	X				X	X									X			X	X						
RREL Treatability Database					X	X														X	X				
RTECS					X		X	X	X					X	X					X	X				
TOMES Plus			X		X	X	X	X	X	X	X	X		X	X					X	X				
Toxic Chemicals Release Inventory					X	X		X							X					X	X				
[illegible]																									

H = high M = medium L = low

Figure 2-3. EHAP Information System Needs Assessment Follow-Up Questionnaire (continued)

EHAP INFORMATION SYSTEM NEEDS ASSESSMENT FOLLOW-UP QUESTIONNAIRE

PART II: DATABASE/INFORMATION SYSTEM SELECTION

DATABASE/ INFORMATION SYSTEM NAME	TOPICS COVERED														DATA TYPE						MUSC ACCESS		NEW DATA SOURCES	
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environment, General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology	Risk Assessment	Toxicology	Simulation Model	System of Database	Abstract	Bibliographic	Full-text	Quantitative	Do You Currently Access the Database at MUSC? (Yes/No)	If "Yes", How is it Accessed? (local, online, etc.)	Are You Familiar with the Database? If "Yes", Positive/Negative Comments?	Are You Interested in Accessing the Database? (Yes/No)
DATA CATEGORY: MATERIAL SAFETY DATA SHEETS																									
BAKER					X					X		X			X					X	X				
MALLIN					X					X		X			X					X	X				
MSDS-CCOHS					X					X		X								X	X				
OHS-MSDS					X					X		X								X	X				
[redacted]																									
DATA CATEGORY: HAZ. WASTES/ WASTE SITE DATA/ EMERGENCY RESPONSE																									
Envir. Sciences and Pollution Mgt. Database		X		X	X	X			X					X	X			X	X						
ENVIROFATE					X	X														X	X				
Environmental Bibliography						X			X		X								X						
ERNS					X	X														X	X				
HAZARDLINE					X	X			X	X		X			X					X	X				
Hazardous Subsiances Data Bank			X		X	X			X	X		X	X	X	X					X	X				
Hazardous Waste Collection Database					X	X												X	X	X					
HAZDAT					X	X			X					X	X					X	X				
HAZINF					X					X										X	X				
IRIS					X	X	X							X	X					X	X				
OCLC Environmental Library						X													X						
OHMTADS					X	X				X		X								X	X				
Pollution Abstracts					X	X								X	X			X	X						
Pollution/Toxicology Database w/ EIS's					X	X								X	X			X	X	X					

H = high M = medium L = low

Figure 2-3. EHAP Information System Needs Assessment Follow-Up Questionnaire (continued)

EHAP INFORMATION SYSTEM NEEDS ASSESSMENT FOLLOW-UP QUESTIONNAIRE

PART II: DATABASE/INFORMATION SYSTEM SELECTION

DATABASE/ INFORMATION SYSTEM NAME	TOPICS COVERED															DATA TYPE						MUSC ACCESS		NEW DATA SOURCES	
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environment, General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology	Risk Assessment	Toxicology	Simulation Model	System of Database	Abstract	Bibliographic	Full-text	Quantitative	Do You Currently Access the Database at MUSC? (Yes/No)	If "Yes", How is it Accessed? (local, online, etc.)	Are You Familiar with the Database? If "Yes", Positive/Negative Comments?	Are You Interested in Accessing the Database? (Yes/No)
RREL Treatability Database					X	X														X	X				
TOMES Plus			X		X	X	X	X	X	X	X	X		X	X					X	X				
Toxic Chemicals Release Inventory					X	X		X							X					X	X				
TSCATS					X	X								X	X				X	X					
WasteInfo					X	X								X				X	X						
[redacted]																									
DATA CATEGORY: EPIDEMIOLOGY																									
AIDS and Cancer Research Database			X				X		X		X		X					X	X						
CANCER-CD			X				X	X	X									X	X						
CANCERLIT					X		X	X	X		X				X			X	X						
Current Awareness in Biological Science			X	X	X		X	X	X		X		X		X				X						
EMICBACK				X	X		X	X	X		X			X	X			X	X						
ETICBACK					X		X	X	X		X			X	X			X	X						
GENE-TOX					X		X	X	X						X				X	X					
GENETOX			X				X	X	X											X	X				
IARCancer Disc					X	X	X	X	X		X			X	X					X	X				
TERIS					X		X	X	X					X	X					X					
The Etiology of Cancer			X				X	X	X		X									X					
[redacted]																									
DATA CATEGORY: REGULATORY DATA/ ENVIRONMENTAL REGULATION																									
EARTHLAW						X														X					
RODSCAN						X														X					
WESTLAW						X														X					

H = high M = medium L = low

Figure 2-3. EHAP Information System Needs Assessment Follow-Up Questionnaire (continued)

Information was gathered through interviews with the MUSC Library staff and members of the Center for Computing and Information Technology (CCIT). In addition, hands-on evaluations of several information tools were conducted. The tools that were evaluated include Knowledge Finder (a search engine for Medline), the MUSC Library System (MUSCLS), the Cumulative Index to Nursing and Allied Health Literature (CINAHL), and the Toxic Release Inventory (TRI) CD-ROM. In addition, a CD Plus demonstration was attended and direct searches of National Library of Medicine (NLM) databases were performed with the assistance of the MUSC Library staff.

2.4 Prototype Development and Demonstration

Because the ODAS is targeted to a diverse user community, it is important to carefully define and understand the system requirements prior to launching a full-scale system development effort. For this reason, an ODAS Prototype is being developed. Prototyping techniques are effective in defining user requirements and evaluating technical feasibility issues. In addition, they result in software that can be demonstrated and evaluated.

The prototype development effort involves the following major tasks:

- Identification, procurement, and integration of databases
- Design and development of user interface screens
- Design and development of a "Knowledge Base"
- Design and development of software.

The prototype is being developed in a client-server environment, using the Sybase Relational Database Management System (RDBMS), the 'C' programming language, X-Windows, and Silicon Graphics hardware (see Figure 2-4). A user will access the prototype on a client machine that is connected to the MUSC network. The client machine executes the user interface software, which allows the user to formulate search criteria and review search results in a windowing environment. The actual database queries are performed on the database server.

The high-level prototype concept is shown in Figure 2-5. The server hosts two major data storage areas: the local database and the Knowledge Base. The Knowledge Base is the "intelligent" repository for the system. It stores the "rules" that guide system processes. In the prototype, the Knowledge Base contains information about the content and structure of external databases. The Local Database is used to store intermediate query and processing results. It also holds any data that has been downloaded from external databases.

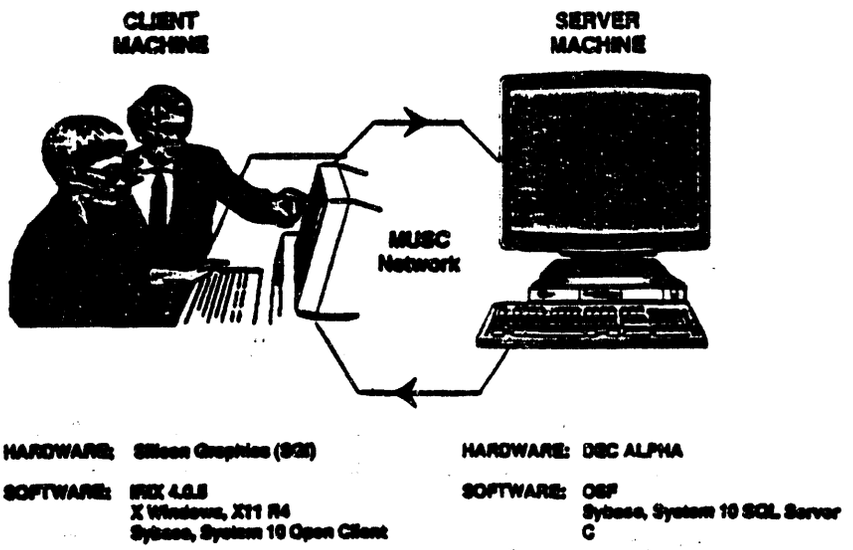


Figure 2-4. Prototype Architecture.

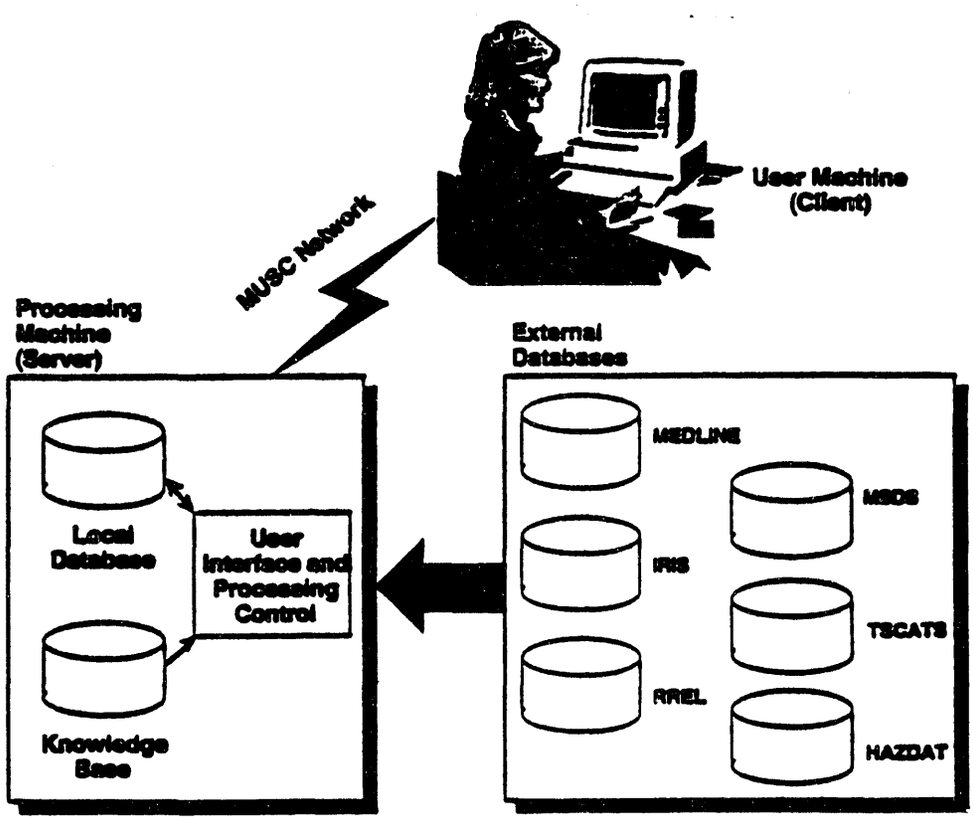


Figure 2-5. Prototype Concept.

The information currently available in the prototype has been integrated from the following databases:

- NLM's Medline Database
- Occupational Health Services (OHS) Material Safety Data Sheets (MSDS) Database
- Environmental Protection Agency's (EPA) Integrated Risk Information System (IRIS) Database
- EPA's Risk Reduction Engineering Laboratory (RREL) Treatability Database
- Toxic Substances Control Act Test Submissions (TSCATS) Online Database
- Agency for Toxic Substance and Disease Registry (ATSDR) HAZDAT Database.

These data sources were chosen for their availability and relevance to the EHAP work.

Prototype development facilitates communication between users and developers, providing an excellent vehicle for receiving valuable feedback. For this reason, the initial version of the prototype, Version 1.0, will be fielded to the user community for a hands-on evaluation. Based on the user comments received, system requirements will be refined and prototype enhancements will be prioritized and developed.

3.0 Needs Assessment

This section summarizes the results of the Needs Assessment activities. These activities included personal interviews, questionnaire distribution and tabulation, and technical research. The results include a description of the potential ODAS user profile, current information processing capabilities by user group, and the common and unique needs of the various user groups.

3.1 ODAS User Profile

A primary objective of the Needs Assessment effort was to define the ODAS user community. During the assessment, a number of potential user groups were identified. These groups include academicians, clinicians, and researchers at MUSC; representatives from other universities; rural physicians; state hospitals and clinics; and members of the commercial environmental risk community. Numerous interviews were conducted with members of these groups, as shown in Figure 3-1. This section describes the backgrounds of the potential user community and forms the basis for determining specific requirements for the ODAS. Figure 3-2, Potential Users of the One-Door Access System, depicts the potential user groups interacting with the ODAS. Summaries of the interviews conducted are included in Appendix A of this report.

3.1.1 MUSC/EHAP User Group

The MUSC/EHAP user group is potentially quite large and very diverse. To ensure that a thorough cross-section of the group was represented, individuals from each of the following MUSC departments were interviewed:

- Microbiology
- Family Medicine (Occupational and Environmental Medicine Office)
- Pharmacology and College of Pharmacy
- Pharmaceutical Sciences
- Biometry and Epidemiology
- Environmental Health Sciences
- College of Nursing
- Anatomical Pathology
- Mass Spectrometry.

MUSC/EHAP NEEDS ASSESSMENT INTERVIEW COVERAGE

NAME OF INTERVIEWEE	SPECIFIC DISCIPLINE	UNIVERSITY AFFILIATION	OCCUPATIONAL ORIENTATION		
			ACADEMIA	CLINICAL	RESEARCH
Dr. Stanley Schuman	Occupational/Environmental Medicine; Agromedicine	MUSC		H	M
Sam Caldwell	Occupational/Environmental Medicine; Agromedicine	MUSC		H	M
Mike Hughes	Poison Control/Agromedicine	University of Mississippi		M	M
Dr. Robert J. Kennedy	Environmental Health	MUSC	H		L
William P. Hollis	Environmental Health	MUSC	H		L
Dr. Pam Bolte	Nursing/Environmental Medicine	MUSC	H		L
Dr. Janardan Pandey	Microbiology	MUSC	L/M		H
Dr. Michael Schmidt	Microbiology	MUSC	L/M		H
Dr. Jean-Michel Goust	Microbiology	MUSC	L/M	L	H
Dr. David Jollow	Pharmacology	MUSC	M/H		M/H
Dr. David McMillan	Pharmacology	MUSC	M/H		M/H
Dr. JoElyn McMillan	Pharmacology	MUSC	M/H		M/H
Dr. Pat Maier	Pharmaceutical Sciences	MUSC	H	L	H
Dr. John Early	College of Pharmacy	MUSC	H		M/H
Dr. David Hoel	Biometry/Epidemiology	MUSC	M/H		H
Dr. Daniel Lackland	Biometry/Epidemiology	MUSC	H		M
Dr. Daniel Knapp	Mass Spectrometry	MUSC			H
Dr. John Cate	Anatomical Pathology	MUSC		H	
Dr. John Wheat	Occupational Medicine	University of Alabama	H	M/H	M/H
Dr. Stuart Nelson	Medical Internist	Medical College of Georgia	H	H	L

H - high emphasis
M - medium emphasis
L - low emphasis

Figure 3-1. MUSC/EHAP Needs Assessment Interview Coverage.

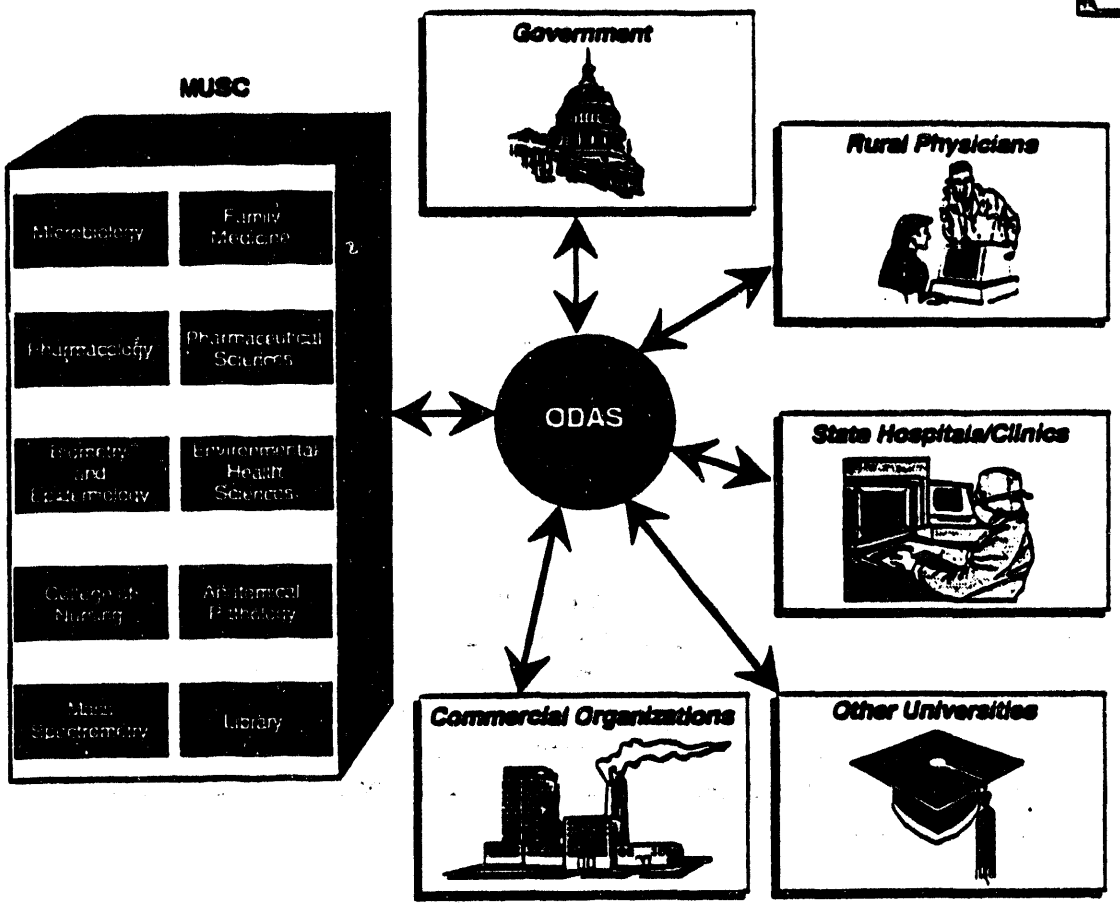


Figure 3-2. Potential Users of the One-Door Access System (ODAS).

The selection of interview candidates was based on the relevance of their field of study/expertise to EHAP. Most of the potential users interviewed have a basic understanding of computer-based information retrieval. However, their hands-on experience ranges from accessing information readily from personal computers to requesting information from the MUSC Library.

Several representatives were interviewed from the MUSC Microbiology Department. These included Dr. Janardan Pandey, Dr. Michael Schmidt, and Dr. Jean-Michel Goust. The interview with Dr. Pandey focused on genetic data processing. Specifically, the methods that are used to process information relevant to beryllium disease and silicosis. This interview revealed that computer driven statistical analyses can be performed to ascertain human genetic propensity to these illnesses.

Dr. Michael Schmidt is a microbiologist who spends much of his time responding to inquiries from the U.S. Department of Energy (DOE) regarding environmental matters. He is very familiar with services provided over the Internet for searching environmentally related information. Dr. Jean-

Michel Goust works closely with Dr. Schmidt, however his focus is primarily on genetics - much like Dr. Pandey.

In addition to the Microbiology Department, potential users from the Department of Family Medicine within the Occupational and Environmental Medicine Office were interviewed. These included Dr. Stanley Schuman and Sam Caldwell. Nearly fifty percent of the resources of this department are dedicated to working with state-wide agricultural medicine (agrimedicine). The Department provides a medical resource through the Cooperative Extension Service at Clemson University. In addition, the Department provides referral services for patients depending on their specific condition. The Office of Occupational and Environmental Medicine is currently developing environmental medicine curricula for the State-Wide Family Practice Residency System. This System consists of seven training sites in South Carolina, including one located at MUSC. The Office is an established resource to the other six sites for occupational environmental consultation and support.

The Pharmacology Department interviews were quite beneficial in determining the specific response processes and environmental risk assessment functions performed at MUSC. From the Pharmacology Department and the College of Pharmacy, interviews were conducted with Drs. David Jollow, David Mcmillian, JoEllyn McMillian, and Dr. John Early. Drs. McMillian and Jollow are primarily concerned with toxicological risk assessment and response. Dr. Early processes toxicological information using available bulletin board services and a system called HELIX, distributed by GLAXO Pharmaceutical.

Dr. Pat Meier is a Synthetic Organic Chemist in the Department of Pharmaceutical Sciences. He is also concerned with environmental risk assessment. Surveys performed indicate that pharmacists have become somewhat unwilling to render judgement regarding toxic human exposure. Pharmacists frequently receive questions related to insecticides, ultra-violet radiation, and the care and disposal of aged prescription drugs. They are often the first people contacted by people with health hazard questions. Dr. Early indicated in his interview that he frequently interacts with the Department of Family Medicine regarding toxicological issues.

Interviews conducted with Drs. David Hoel and Daniel Lackland from the Department of Biometry and Epidemiology were helpful in understanding the Department's concern with identifying human effects from hazardous substance exposure rather than with rats and other laboratory animals. The Department calculates quantified risk levels related to such exposure, however, there seems to be a great lack of available human data.

Interviews were also conducted with Dr. Robert J. Kennedy and William P. Hotle of the Department of Environmental Health Sciences. Their focus is primarily on public service education. The Department is currently developing an environmental risk assessment curriculum for MUSC. The curriculum will cover topics such as hazardous waste exposure, regulatory issues, risk

perception, assessment technology, legal issues, and ethnic/social sensitivities. In addition, the Department is interested in performing cost-benefit analyses for standards of hazardous waste removal.

Dr. Pam Betta from the College of Nursing is attempting to develop a nursing graduate degree curriculum in Occupational and Environmental Health Medicine. Much of the curriculum focus will be to train nurses to perform tasks in the Primary Care Physician role. Her primary interest is in locating employers in South Carolina that need occupational environmental nurses on their staff.

Interviews with Dr. Daniel Knapp of Mass Spectrometry Research and Dr. John Cate of the Anatomical Pathology Department of Children's Hospital were also conducted. Mass Spectrometry Research is oriented around chemical instrumentation and patent literature, however they do have specific information needs which will be discussed later. Anatomical Pathology focuses on laboratory activity with specific interests in genetic research.

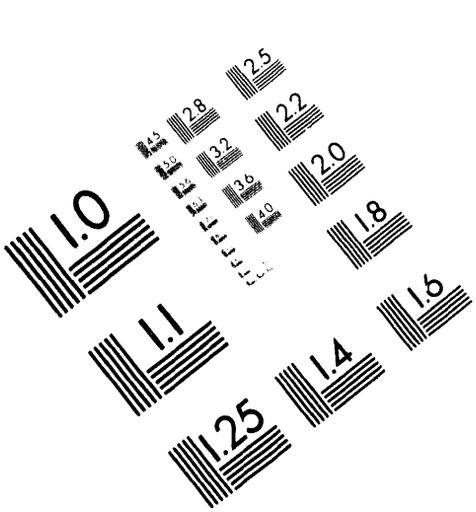
3.1.2 Rural Physicians

Rural medicine is an important area of interest to the MUSC/ EHAP. Physicians in rural areas stand to benefit greatly from the ODAS since they do not have immediate access to the latest research available, and medical libraries are not usually nearby. Many cases of human exposure result from the hazardous substances found in agricultural pesticides. Access to risk assessment and human exposure data can be somewhat limited in rural areas. Therefore, the treatment process is often unavoidably hindered by the lack of information available at a major university, such as MUSC.

Rural physicians concerned about a patient who has been exposed to a toxic substance typically contacts a specialist who has access to information and can provide detailed literature on toxic substances. The specialist searches the available data and provides the information to the rural physician. This process can be quite time consuming for both the rural physician and the specialist. Where treatment is considered, time is often a critical factor. Currently, there are efforts underway, such as the forming of agrimedicine teams, to support rural physicians in the treatment of their patients. In addition, the Federal Government has issued grants to universities, such as the University of Alabama, to perform more research in the agrimedicine area.

3.1.3 Other Universities

In addition to MUSC, many other universities have interest in environmental/health risk assessment. This potential user group can provide valuable input to the ODAS, and could greatly benefit from the data it provides. Interviews were conducted with Dr. John Wheat of the University of Alabama, Mike Hughes of the University of Mississippi, and Caron Chess, Director of Environmental Communications Research at Rutgers University to determine the types of information requirements facing other universities involved in environmental risk assessment.





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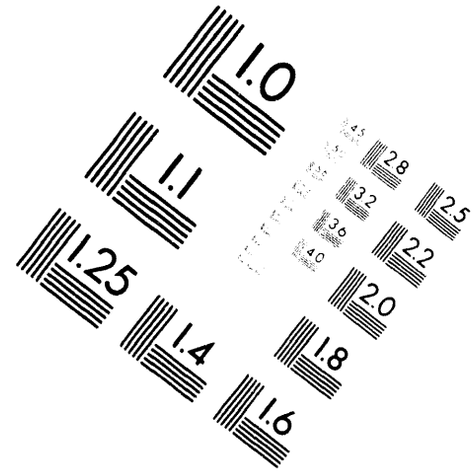

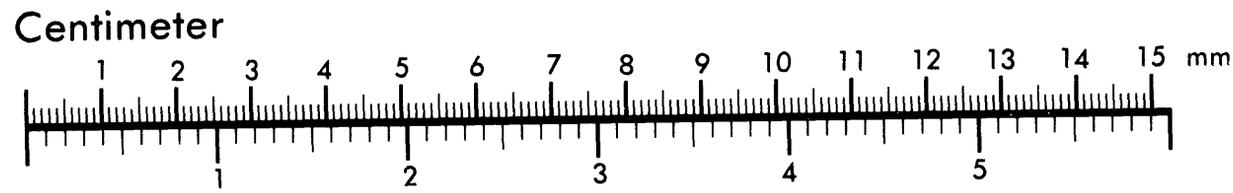

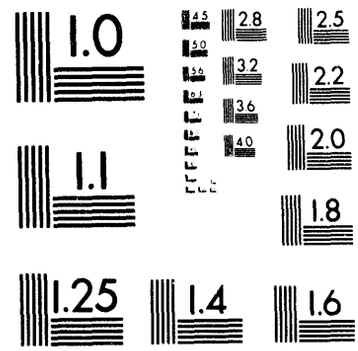

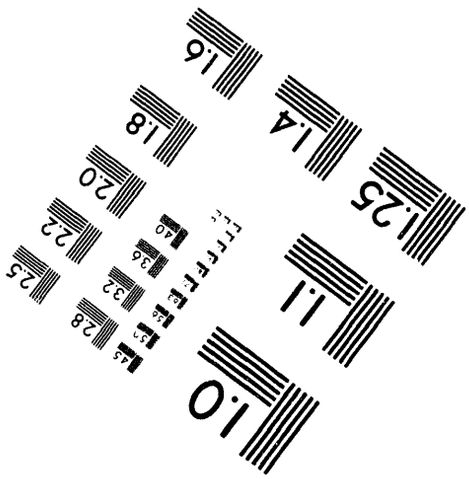

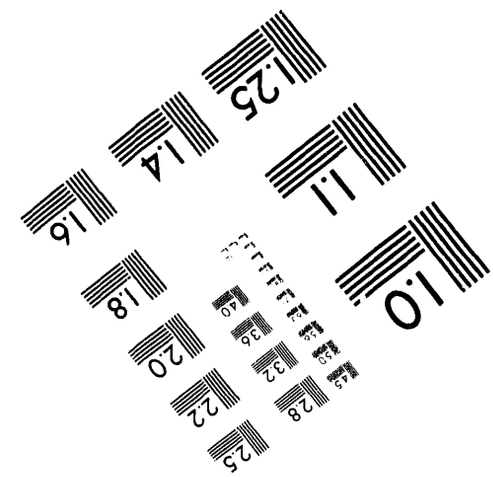

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3 of 8

Dr. Wheat manages the Occupational Medicine Unit and has a primary focus on rural medicine. He is currently in the process of establishing an Agrimedicine Department to provide exposure response in a similar manner to the one developed by Dr. Stanley Schuman and Sam Caldwell at the MUSC Department of Family Medicine. Mike Hughes works in both the Poison Control Center and the Agrimedicine Department at the University of Mississippi. Mr. Hughes frequently exchanges information with Dr. Schuman and Sam Caldwell at MUSC. Caron Chess frequently uses social science abstract information, information from the National Academy of Reports, and resources from the National Research Council.

In addition to the interviews described above, survey forms were distributed to numerous medical universities across the country. The purpose of the surveys was to determine the databases most frequently accessed when searching for environmental/health information. Reference the Database Survey Report for a sample of this survey and the associated results.

3.1.4 Commercial

Information sharing with the commercial community is crucial to the success of the EHAP mission and the ODAS. Environmental science research and risk assessment is commonly performed in commercial environments. Therefore, it is critical that data collected in the commercial sector be available through the ODAS.

The following representatives from the commercial environmental community were interviewed:

- Dr. Elizabeth Anderson, President and CEO, Sciences International, Inc.
- Dr. Charles Hostetler, Project Manager, Sciences International, Inc.
- Kevin Houson, Project Manager, Seattle Engineering Software, Inc.
- Dr. Joseph Rodericks, Co-founder, ENVIRON Corporation
- Dr. Peter Sandman, Independent Consultant. Former Director of Environmental Communications Research at Rutgers University.

The goal of these interviews was to determine the sources and types of data used by the commercial sector in addition to the methods in which the data is processed.

3.1.5 Government

Government organizations at the Federal, State, and Local levels represent a portion of the potential user community that stand to benefit greatly from the ODAS. Discussions conducted with officials from DOE and EPA have indicated that there is significant interest in acquiring integrated information resources that are not readily available. In addition, many government agencies such as DOE are participating in risk assessment activities that require access to environmental, medical, toxicological, and historical information to facilitate appropriate response to clean-up efforts and human exposure cases. There are a tremendous amount of data sources provided by government organizations as well. A good example is the EPA. Many government databases are directly accessible to the public.

3.2 Current Information Resources and Processing Capabilities

Identifying the current information resources and processing capabilities at MUSC/EHAP is an important step toward understanding the methods used for accessing and processing data. It is important to recognize that the following description represents the information resource topology of the University at the time of the publication of this report. Due to the evolving nature of the MUSC network, it is possible for some changes to have occurred since that time.

MUSC currently has many resources for processing electronic information. This includes access to the Internet, which can be used to obtain information from a variety of national and international sources. The MUSC Library also houses a myriad of electronic information resources. This includes many of the NLM databases such as Medline, Toxline, and Psychlit. In addition, the University has a backbone local area network (LAN) that enables attached users to gain access to many different software products and information resources, such as Knowledge Finder on the Novell Server. A full description of the current MUSC Network architecture and Library facilities is provided in the following sections.

3.2.1 MUSC Network Architecture

MUSC is in the process of establishing a distributed computing architecture. This new architecture is designed to replace the current computing capability which had been supported by a VAX 785 mini-computer. It is configured in a manner that should enable the manipulation of large data sets. Computer users should have access not only to the computer resources located at MUSC, but to computer resources located at other research institutions in South Carolina. The distributed computer system is designed to provide state of the art statistical, graphical, plotting, and computational capabilities including a complete array of major mathematical and statistical packages such as SAS, BMDP, SPSS, Minitab, IMSL, and Mathematica.

Currently, MUSC is connected to the Suranet Internet Service using a T1 line. They have two Cisco routers that are servicing the campus network and connecting to the T1. At this time the 50 or more subnets attached to these routers are following no standard configuration. However, the current plan is to migrate the academic computing subnets to one router, and the clinical and financial computing resources to the other. Plans have been made to put a "firewall" between the two routers to prevent intruders from accessing the financial and patient record systems. This could require the clinical and financial offices to each have two network connections for access to the Internet and academic computing resources.

3.2.2 Academic and Research Computing Resources

The MUSC academic and research computing architecture is composed of a combination of DEC station servers, SGI Challenge Servers, a DEC Alpha server, and a number of SGI Indigo high performance graphical workstations shown in Figure 3-3. The CCIT has configured each server to provide a specific functionality.

To support the academic computing needs there are six DEC station 5000 servers and one DEC 3000 AXP Model 500 server. A DEC station 5000 Model 25 is used as the domain name server for the network. There are three DEC station Model 25 servers that are configured as an Internet mail hub, a GOPHER server, and a Usenet News server respectively. Two DEC station 5000 Model 240 servers are configured for the MUSCLS and for Internet access. The DEC 3000 AXP Model 500 has been configured as an NFS server. All of these servers are located on subnet address 128.23.203 except for the MUSCLS server, which is located on subnet address 128.23.202.

To support the research computing needs, the CCIT has configured the two Silicon Graphics Challenge servers as NFS and application servers. These servers support EHAP systems development, bimolecular computing resources, statistical analysis, scientific visualization, and other research applications. The application server will be the center for major software applications to be used by researchers. The NFS server will provide "home directory" and software repository services to all workstations on the network. The DEC 3000 AXP Model 500 has been configured as the Sybase database server which can be accessed by workstations that have the Sybase client application software installed.

It was determined that there was a great need for additional graphics capabilities at MUSC. To support this need, there are seven SGI Indigo high performance graphics workstations that have been distributed to various University departments. These workstations contain client application software that enables access to Internet services such as GOPHER, electronic mail, and Usenet News. The MUSC networking capabilities are fully tested and operational. Interfaces with local colleges, state-wide networks, the Internet, and various network navigators, such as GOPHER, are complete.

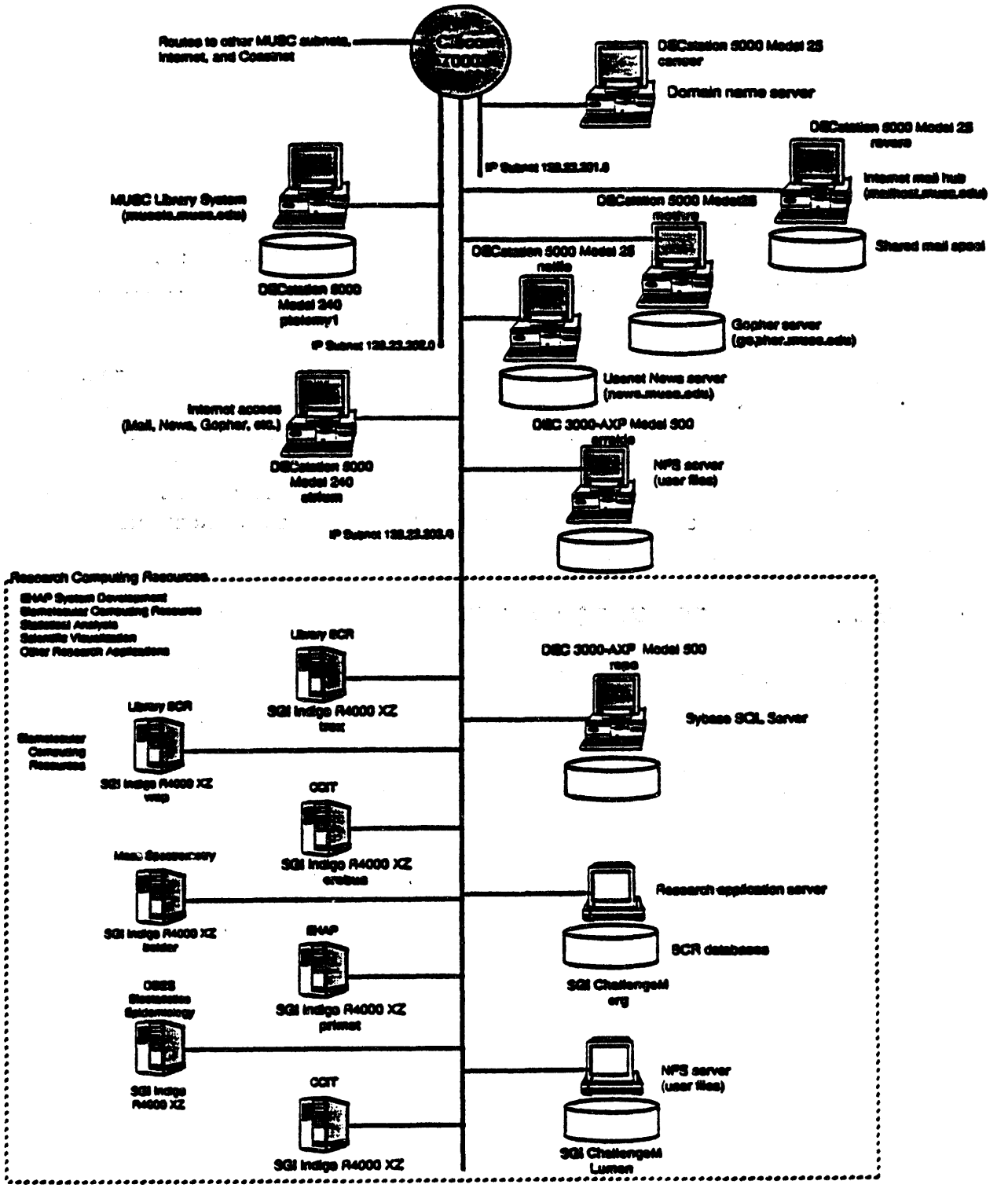


Figure 3-3. Academic and Research Computing Resources.

3.2.3 Environmental Hazards Assessment Program Computing Resources.

The EHAP computer resources are composed almost entirely of Macintosh computers with a Quadra 950 as the file server. There are two separate computer resource offices. They are the EHAP Main Office and the EHAP Finance Office. The EHAP Main Office is located at 156 Rutledge Avenue, and the EHAP Finance Office is located at 161 Rutledge Avenue. Fiber optic cable connects the Campus network router to both offices. All of the EHAP computers are connected using Ethernet concentrators. The concentrators are linked to the MUSC network on subnet 128.23.201.0, as shown in Figure 3-4.

All of the EHAP computers have access to Internet services such as GOPHER, electronic mail, and Usenet News over the MUSC network. One of the SGI Indigo machines is currently located at the EHAP Main Office on subnet address 128.23.201.0. It has been configured as part of Research Computing Resources and accesses the Challenge Servers. In addition, it will use the DEC 3000 AXP as its Sybase database server. Eventually, the EHAP SGI Indigo will be moved to subnet address 128.23.203. This is scheduled for some point in the near future to remain consistent with the goals of Research Computing Resources.

3.2.4 MUSC Library Computing Resources

The MUSC Library is connected to the MUSC network via subnet address 128.23.202.0. The Library currently provides a variety of computer resources to faculty, staff, and students as shown in Figure 3-5. In the Library there are two interconnected microcomputer laboratories. One of the laboratories is Macintosh based, and the other is IBM PC based. The Library provides a number of network services to users, such as connectivity with other universities, and access to both on-line and CD-ROM databases.

Connectivity with other universities is achieved using CoastNET. The CoastNET network links computers at The Citadel, the College of Charleston (University of Charleston), The Charleston County Library, MUSC, and Trident Technical College. Charleston Southern University is planned to be linked later in 1994.

CoastNET, through Trident Technical College, is connected to Technet. Technet is a VAX based network that links South Carolina's sixteen technical colleges, the State Board for Technical and Comprehensive Education, and computers at the University of South Carolina and Clemson. CoastNET is an available resource through one of the Macintosh workstations at the Library, a computer connected to the MUSC campus network, or from a home computer via telecommunications software and a modem.

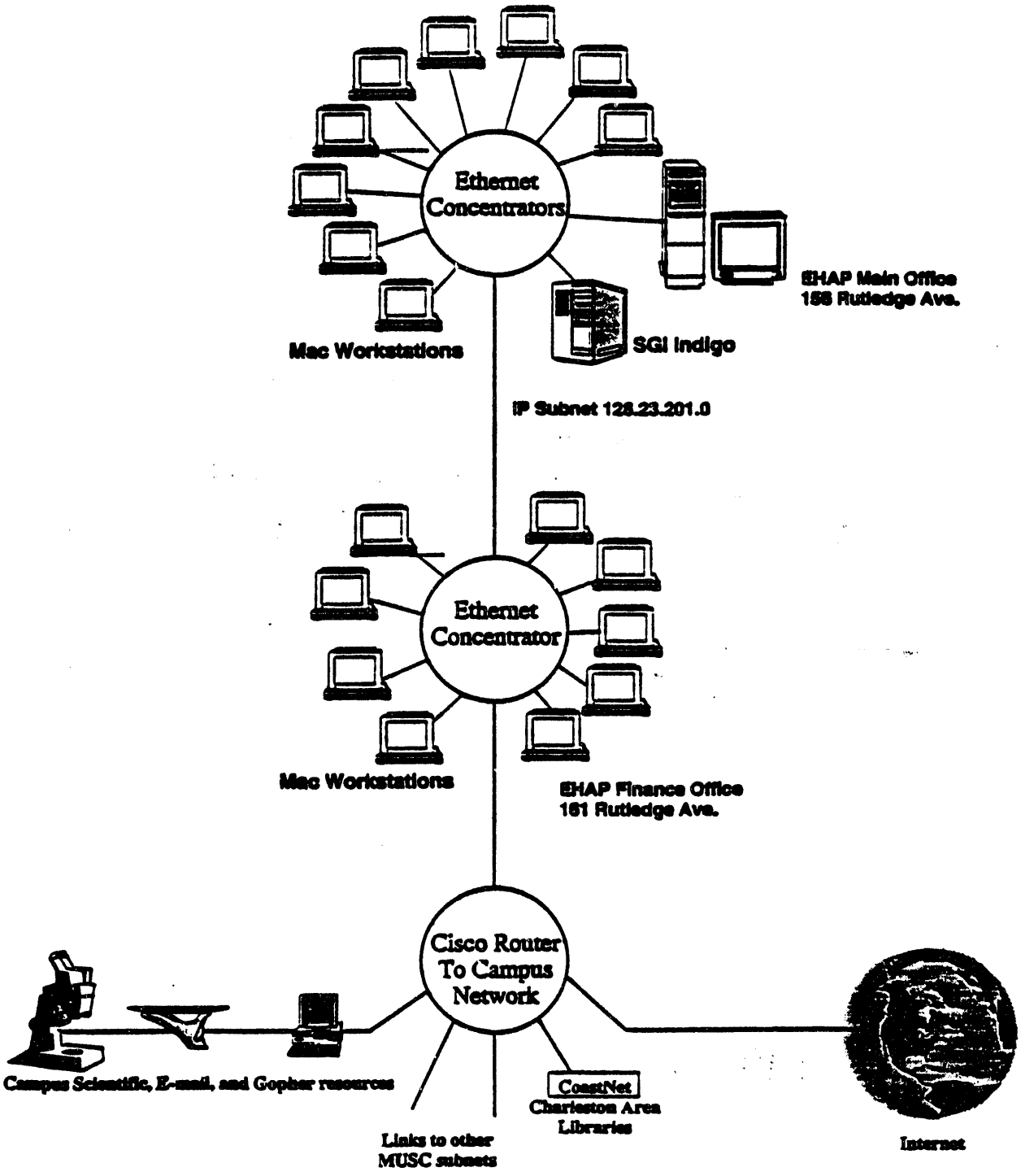


Figure 3-4. EHAP Computing Resources.

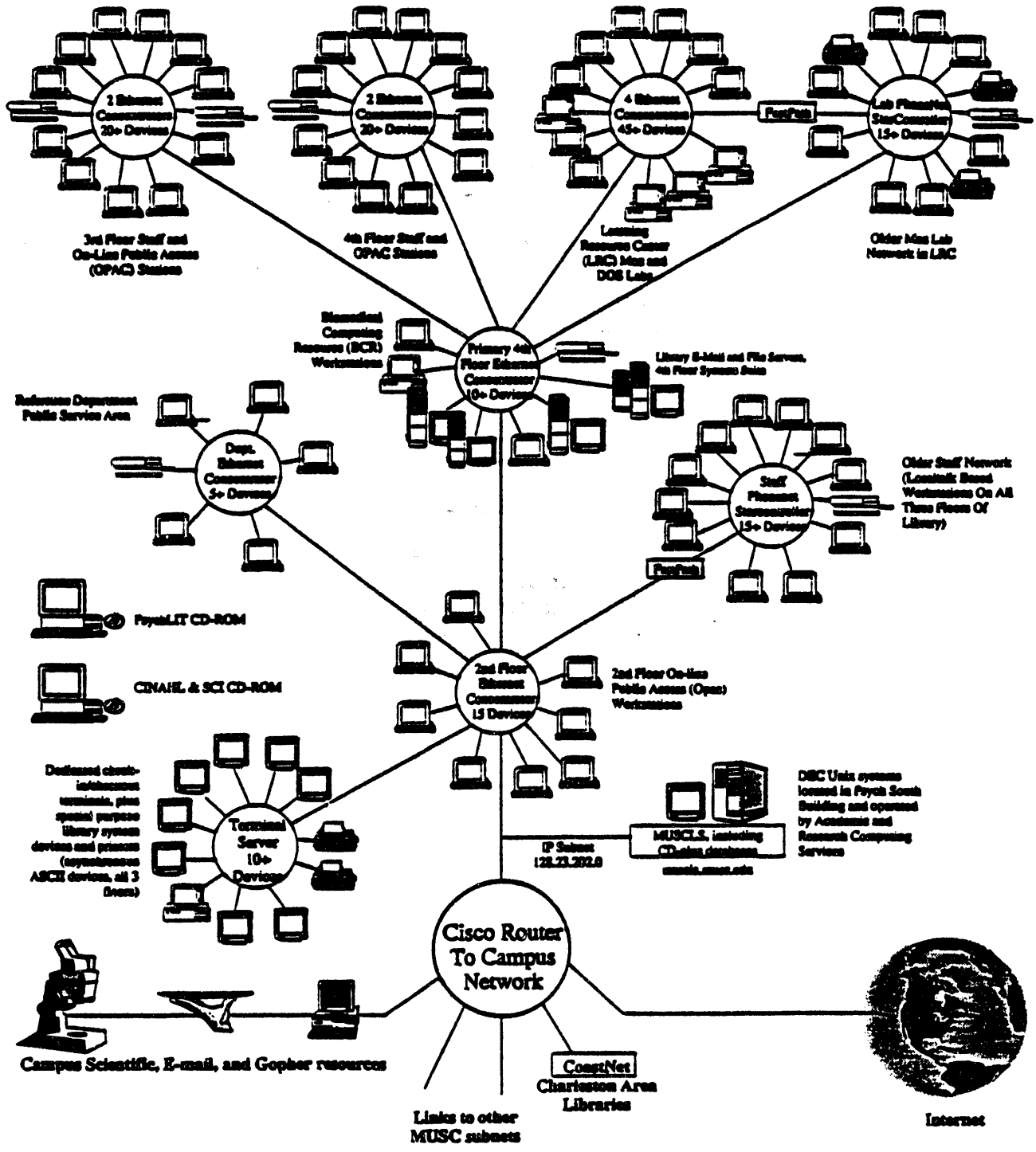


Figure 3-5. MUSC Library Computing Resources.

MUSCLS is a system that provides access to an on-line catalog of the MUSC Library. This includes books, audio-visuals, the journal collection, MiniMEDLINE, and access to local library collections and databases (CoastNET). Based on Georgetown University's Dahlgren Memorial Library's Library Information System, MUSCLS provides keyword searching and search capabilities by author, title, and subject. MUSCLS is part of the Academic and Research Computing Service.

The MUSC Library also provides access to CD-ROM and on-line databases. The Library reference staff can perform on-line searches of the NLM databases. These databases include the following: AIDSLINE, AIDSDRUGS, AIDSTRIALS, AVLINE, BIOETHICSLINE, BIOTECHSEEK, CANCERLIT, CATLINE, ChemID, CHEMLINE, DART, DENTALPROJ, DIRLINE, GENE-TOX, HEALTH, HISTLINE, HSDB, IRIS, MEDLINE, PDQ, POPLINE, RTECS, TOXLINE, TOXNET, TRI, and TRIFACTS.

The reference staff can also perform on-line searches on databases available from commercial vendors such as BRS, DIALOG and STN. There are hundreds of database sources available. Examples of databases relevant to MUSC/EHAP include the following: BIOSIS, CAS, EMBASE, ERIC, IPA, PATS, PSYCH, CINAHL, SCI, and SOFT.

The Library has a number of databases available for performing literature searches. These databases include the following: CINAHL, MiniMEDLINE, MEDLINE, MUSCLS, PsycLIT, SCI, and the CoastNET databases. The Bimolecular Computing Resource (BCR) collection of databases is also available at the Library. CINAHL and Science Citation Index both reside on a single-user workstation. PsycLIT resides on another single-user workstation.

The Library has selected the commercial vendor product CD Plus to provide navigation facilities to a number of databases. CD Plus will become available in June, 1994. The databases that will be provided by CD Plus include the following: MEDLINE, Current Contents, CancerLIT, CINAHL, Health Administration, and PSYCHINFO.

3.2.5 User Resources and Capabilities

Information access and processing capabilities vary greatly among the potential users interviewed. This section provides a detailed description of these capabilities. In addition, it provides insight to Section 3.3, which identifies specific user information resource and processing needs. It is important to note that some interviewees were unaware of available information processing resources. Others were aware of the available resources, but were unsure how to access them.

3.2.5.1 MUSC/EHAP User Community

The MUSC/EHAP user community represents a large portion of the ODAS user base. In this section, the user resources and capabilities are presented for each MUSC Department. It is important

to note that research indicates, among personal computer users at MUSC, a relatively even distribution among those who use Macintosh and IBM PC computers.

The Microbiology Department is primarily Macintosh based. Dr. Pandey is currently using his Macintosh computer to collect and store statistical genetic data. However, very little if any computer data processing is performed by this computer. Data is collected and stored in Macintosh format and transferred to the National Institutes of Health (NIH) in Washington D.C. for processing and analysis. The turn around on receipt of the data analysis results is often lengthy, sometimes upwards of months for large data sets. Dr. Schmidt accesses environmental related information over the Internet using the Mosaic system on his Macintosh in response to DOE requests for information.

Both the MUSC Department of Family Medicine and the Department of Pharmacology process information acquired from the NLM Medline and Toxline databases. These data sources provide valuable information regarding chemical substances and their toxicity. However, the user interfaces to these data repositories developed by NLM are known to be somewhat cumbersome and user-unfriendly. It is for this reason that products such as Knowledge Finder (Macintosh) and Grateful Med (IBM PC) were developed. These products offer flexible search techniques and a user-friendly interface in the personal computing environment.

Several different methods of electronic information access are available at the University. For example, Medline may be accessed by using Knowledge Finder on a Macintosh computer or by using dial-up fee based access available in the MUSC Library. This essentially means that MUSC is paying twice for the same service. It is important to recognize that some users, such as Dr. John Cate in the Anatomical Pathology Department at Children's Hospital, are content with submitting requests to the MUSC Library for Medline and Toxline data. In many cases this information is accessed infrequently, and on-line access provides little benefit.

In many situations, such as with the Department of Pharmacology, information that is currently available electronically is not being used. Manual searching of hard copy documentation frequently occurs. Such perusing through large volumes of literature can be quite arduous and time consuming. It is also important to note that electronic access is not a panacea to this problem. For example, while interviewing Drs. Jollow and McMillian, the discussion of the convenient electronic access to the ATSDR data was overshadowed by the need to impose judgement onto that databased on human knowledge. With electronic access, there still remains the tedious process of eliminating overlapping data as it is retrieved.

The Department of Family Medicine has been using a commercial off-the-shelf (COTS) software package called Reference Manager to store and retrieve bibliographic references to medical articles residing in the office. The collection of these resources has been extremely beneficial to the Department, and has enabled Dr. Schuman and Sam Caldwell to be more responsive to exposure and treatment inquiries. In addition to Reference Manager, Medline, and Toxline, the Department is able

to access on-line Material Safety Data Sheet (MSDS) information from the campus VAX computer. All total, the Department currently uses five IBM PC based machines for information access and processing.

The Department of Biometry and Epidemiology currently has limited electronic data access to human exposure data. The Department is aware through EPA publications that there are many EPA systems providing exposure data that are accessible. However, the primary thrust of the Department is to acquire as much human exposure data as possible. Many of the EPA and commercial data sources available provide tests results for laboratory animals. Dr. Lackland currently has access to the MUSC LAN, but not to Medline through Knowledge Finder since his only available computer is an IBM PC.

The primary method of accessing information used by the Department of Environmental Health Sciences is through a GOPHER facility over the Internet. Dr. Kennedy and Mr. Hotle use the Federal Register to acquire current regulatory information. In addition, they have become familiar with the Education Resources Inventory Catalog (ERIC) system.

Dr. Pam Betta from the College of Nursing currently operates in an IBM PC environment. Therefore, she does not have direct access to Medline using Knowledge Finder. Her primary source of information retrieval is the CINAHL system, which is available only through the MUSC Library by appointment.

Dr. Cate from Anatomical Pathology at Children's Hospital currently has no access to the MUSC LAN. The Department collectively has about 80 IBM PC and 20 Macintosh Computers. In addition, the Department is connected to a VAX which provides access to a CERNER system. The CERNER system provides patient data strictly to the Department. It was stressed that Medline inquiries made within the Department, however frequent they may be, are not cumbersome. However, the MUSC Library is the only available resource to this Department for Medline data. Individuals from the Department must physically walk to the Library to retrieve Medline data. In addition, there is no electronic mail facility currently available to the nearly 40 people residing in this Department.

In the Mass Spectrometry Department one of the most commonly used resources is Chem Abstracts. However, direct access to this information is not currently available to the Department. Chem Abstract retrievals are performed off-hours by a MUSC Library Staff person. Mass Spectrometry is an occasional user of Medline information using Knowledge Finder on a Macintosh computer. However, very little Medline data is of value since the non-biological references to Medline are limited.

At one time, the Mass Spectrometry Department had an IBM PC in service, but this is no longer the case. The PC was used to search through patent literature using software provided by the U.S. Patent Office. Patent information is crucial to this Department since the development of new

chemical instrumentation techniques involves avoiding existing patent infringements. When the IBM PC was removed from service, the ability to search patent information ended.

In addition to Chem Abstracts, Mass Spectrometry also uses sequence databases available on the University VAX for accessing and processing protein data. The anticipation of the Department is to move to a Silicon Graphics platform to perform bimolecular processing/modeling using Tripo-Sibble software. Silicon Graphics is a powerful high-end workstation platform that is well suited for graphics processing, including three dimensional image manipulation.

3.2.5.2 Other Universities

A primary source of information for the University of Mississippi Poison Control Center is the Computerized Clinical Information System. This system was developed by a company called MICROMEDIX in Denver, Colorado. In addition, they are in the process of providing on-line access to the Farm Chemical Handbook.

At the University of Alabama Occupational Medicine Unit, access to Medline via Grateful Med is most common. Since the Unit is a satellite branch to the main campus, direct access to Internet is not available. Sophisticated chemical and toxic substance searches are performed by a research librarian at the main campus library, where access to Internet is available.

3.2.5.3 Commercial and Government

From the commercial and government perspectives, information resources commonly used include the EPA databases, such as the Integrated Risk Information System (IRIS) and information from the ATSDR. An electronic risk assessment product called SiteAnalyzer is available from a company called Sciences International Incorporated. SiteAnalyzer provides a tool suite for performing analyses on distributions of chemicals in environmental media such as soil, ground water, and air. It is designed to provide automatic risk calculation through the application of EPA standards.

3.3 Information Resource and Processing Needs

There are several common types of information that potential users have identified as pertinent to their field. The information needs identified during the interview process can be categorized as follows:

- Genetic Information/Genome Sequence Data
- Toxicity Data/Toxic Substances

- Chemical Substances, Profiles/Analytical Chemistry
- Epidemiology
- Human Exposure Data
- Risk Assessment/Risk Analysis
- Regulatory Data/Environmental Legislation
- Material Safety Data Sheets
- Hazardous Wastes/Waste Site Data/Emergency Response Information.

The Database Survey Report provides a list of the databases containing relevant information for each category.

3.3.1 Genetic Information/Genome Sequence Data

Genetic information is becoming increasingly prominent in risk assessment. In fact, the processing of genetic information/genome sequence data has led to studies directed at predetermination of human genetic propensity to certain ailments such as beryllium disease and silicosis - a major step in risk assessment. Access to Genetic data repositories is currently somewhat limited at MUSC. For example, Dr. Pandey must send his genetic data to NIH for processing since there are limited genetic processing resources available at the University. Although GENBANK is available and used regularly by the University, there are many other available sources that are not accessed, as shown in the Database Survey Report. The ODAS should facilitate such access.

3.3.2 Toxicity Data/Toxic Substances

In addition to genetic information, there is a general need for toxicological data. This applies particularly to synthetic chemicals/compounds. An interesting fact regarding man-made chemicals is that of the over one-half million varieties that exist, information is only available for roughly one percent! Toxline (available through NLM) is an excellent resource for searching chemical references. However, toxicologists would benefit greatly from additional resources, especially those which contain up-to-date information about newly synthesized chemicals.

Nearly all of the interviewees expressed an interest in accessing toxicological data. In particular, toxicity data is of high priority to the Department of Family Medicine and the Department of

Pharmacology. There is a general need for information regarding toxicity levels in drinking water, agricultural products, and in high quantities of everyday products. Little is known about the risk associated with these types of exposures. The ODAS should strive to accommodate this need by providing the appropriate level and volume of exposure data.

3.3.3 Chemical Substances, Profiles/Analytical Chemistry

There is a great variance on quantitative and regulatory restriction of toxic chemicals. This variance depends on occupational, accidental, or chronic exposure. There is a primary need for a system, such as the ODAS, to filter and remove information which overlaps this information. This is not simply to eliminate redundancies, but to prevent "information avalanche" as well. Chemical substance/analytical chemistry data found in sources such as the EPA Risk Reduction Environmental Laboratory (RREL) would be valuable information to nearly all ODAS users. Such data includes information pertaining to material safety, chemistry, and toxicity. Access to chemical substances, profiles/analytical chemistry was of high priority to the departments of Family Medicine, Mass Spectrometry Research, and Pharmacology. The Department of Environmental Health Sciences also showed interest in this type of information.

3.3.4 Epidemiology and Human Exposure Data

Epidemiology plays a major role in the risk assessment process. The Needs Assessment study revealed that there is a significant lack of available human data. This type of data is of high priority to the Department of Family Medicine. In addition, it is very useful to the Departments of Environmental Health Sciences and Mass Spectrometry Research. It is often difficult and sometimes impossible to translate exposure results found in laboratory animals to expected results in humans. The ODAS should facilitate this need by providing access to information sources based on human data, such as the NLM Hazardous Substance Data Bank.

3.3.5 Risk Assessment/Risk Analysis

In addition to epidemiological information, quantified risk assessment/risk analysis data is extremely important in risk assessment. The need for such data stems from the requirement in the risk assessment process to combine statistical information to formulate legitimate risk expectations. In order for the ODAS to effectively provide insight to quantified data, it should provide the capability to export such information into COTS applications for additional processing and analysis. For example, many statistical software packages provide the capability to produce detailed charts and graphs based on statistical data analysis. This capability would be quite useful to MUSC, other universities, government, and industry for identifying key environmental health risk areas and trends.

3.3.6 Regulatory Data/Environmental Legislation

There is a general need for regulatory/environmental legislation information throughout the potential user community. Regulatory and legislative information provide insight to government monitoring and control over hazardous substances. Interest in accessing regulatory/environmental legislation information was observed in several interviews. The Department of Environmental Health Sciences indicated that access to current Congressional environmental policies and issues hearings in addition to legal court settlement information would be vital to their public service education initiative.

3.3.7 Material Safety Data Sheets

MSDSs provide critical information regarding product safety, handling, and exposure recommendations along with other important information useful in risk assessment. This information would be quite beneficial to the ODAS. In particular, MSDS information is of high-priority to the Department of Family Medicine and the Department of Pharmaceutical Sciences. For example, in the case of an accidental oil spill, the ODAS could be used to integrate MSDS summaries of hazards, fire, and explosion data with toxicity information from other data sources. This would help toxicologists to provide swift and accurate response to on-site HAZMAT officials. The need for MSDS data in risk assessment is underscored by the lack of available data on synthetic chemicals. This includes short and long-term human exposure effects such as carcinogenicity.

3.3.8 Hazardous Wastes/Waste Site Data/Emergency Response Information

A major objective of the MUSC/EHAP mission is to establish an environmental program to ensure a healthy society in a healthy biological environment. Many cases of human exposure to hazardous substances are reported each year as a result of hazardous waste site clean-up efforts. Tremendous amounts of data are being collected both at waste sites and medical facilities to help address this problem. In many cases, residual effects are reported from individuals who previously worked at hazardous waste sites. There is an eminent need for information resource capabilities, such as those provided by the ODAS, to enable academicians, clinicians, and researchers to further understand and more effectively treat cases of human exposures. DOE has invested a great deal of time and funding in hazardous waste site clean-up since the advent of nuclear arsenal and atomic energy development. Therefore, there exists voluminous amounts of data pertaining to environmental contamination. The ODAS should provide access to environmental contamination and other hazardous waste site data. This type of data is a high priority need of the departments of Environmental Health Sciences and Biometry and Epidemiology.

3.3.9 Summary of Common ODAS Information Resource and Processing Needs

Within the MUSC user community there exists a broad spectrum of opinion and suggestions for the ODAS. In general, the concept was well received by all of those interviewed. Throughout the research and interviewing process, many types of information resources were identified as viable candidates for integration with the system. These resources are described in the Database Survey Report.

The common high-level requirements for the ODAS identified during the needs assessment effort can be summarized as follows:

- A single point of reference for information access
- A system that requires very little, if any, training to operate
- A system that is informative when no search results are obtained. For example, the ODAS should provide a reference facility to inform the user of a place to look for information if the data does not exist in the system
- A system that can operate on an IBM PC or Macintosh platform
- A system that narrows the scope of user inquiries to prevent an overwhelming volume of results.

In addition, needs for specific types of data were shared across potential user groups. As described in Section 2.2, a Needs Assessment Follow-up Questionnaire was distributed to gain an understanding of user group priorities for accessing specific types of data. This questionnaire is shown in Figure 2-3. Figure 3-6 summarizes the results collected from the follow-up questionnaire.

In conclusion, one of the major objectives of the MUSC/EHAP mission is to develop a holistic, national basis for risk assessment, risk management, and risk communication. In recognition of this objective, perhaps the most important need identified that should be fulfilled by the ODAS is the establishment of a common medium for information exchange among all individuals concerned with the direct impact of environmental hazards on human health.

DATA CATEGORY	HIGH PRIORITY	MEDIUM PRIORITY	LOW PRIORITY
Risk Assessment/Risk Analysis	Enviro. Health Sciences Biometry & Epidemiology	Family Medicine Pharmacology	Mass Spectrometry Research Pharm. Sciences
Toxicity Data/Toxic Substances	Family Medicine Pharmacology	Enviro. Health Sciences Mass Spectrometry Research Biometry & Epidemiology Pharm. Sciences	
Human Exposure Data	Family Medicine Biometry & Epidemiology Pharmacology	Enviro.Health Sciences Mass Spectrometry Research	Pharm. Sciences
Genetic Information/Genome Sequence Data	Mass Spectrometry Research		Family Medicine Enviro. Health Sciences Biometry & Epidemiology Pharmacology Pharm. Sciences
Chemical Substances, Profiles/Analytical Chemistry	Family Medicine Mass Spectrometry Research Pharmacology	Enviro. Health Sciences	Biometry & Epidemiology
Material Safety Data Sheets	Family Medicine Pharm. Sciences	Enviro. Health Sciences	Mass Spectrometry Research Biometry & Epidemiology Pharmacology
Hazardous Waste/Waste Site Data/Emergency Response Information	Enviro. Health Sciences Biometry & Epidemiology	Family Medicine Pharmacology Pharm. Sciences	Mass Spectrometry Research
Epidemiology	Family Medicine Biometry & Epidemiology	Enviro. Health Sciences Pharmacology Pharm. Sciences	Mass Spectrometry Research
Regulatory Data/Environmental Legislation	Enviro. Health Sciences Pharm Sciences	Pharmacology	Family Medicine Mass Spectrometry Research Biometry & Epidemiology
Population Demographics	Biometry & Epidemiology		
Protein Sequence Data	Mass Spectrometry Research		
Crystal Structure Data	Mass Spectrometry Research		
Engineering and Physics Literature	Mass Spectrometry Research		
Patent Literature	Mass Spectrometry Research		

Figure 3-6. Summary of Information Requirements by MUSC Department.

4.0 Conclusions

At the start of this task, the direction in which the ODAS development should take was undefined. The needs assessment and prototype development efforts have proven extremely valuable for identifying user needs, defining a basic system concept, and revealing technical issues. This section presents some possible directions, recommendations and issues that should be considered and discussed prior to initiation of a full-scale system development effort.

4.1 Recommendations

The amount of available environmental/health information is growing quickly. Unfortunately, the development of tools to facilitate access to this information has not kept pace with the growing volume of data. Many development teams are tackling the problem of providing "intelligent" access to data, while minimizing the risk of "information avalanche." A universal problem being encountered by many software vendors centers around understanding the vast amounts of data that are available and defining relationships between the data fields within disparate databases. The needs assessment effort has enabled the ODAS development team to review the information access problem in depth. This review has resulted in a number of recommendations for consideration, prior to finalizing the ODAS concept, objectives, and requirements.

4.1.1 Prototype Evaluation and Enhancement

The initial version of the ODAS Prototype, Version 1.0, has been instrumental in investigating feasibility issues and exploring design alternatives. In addition, allowing users to view actual screens and experiment with system functions enables them to more clearly define their system and data requirements. Therefore, prior to launching a full-scale system design, it is important to continue enhancement of the prototype to a level that will more clearly define the overall system objectives.

To receive user feedback, the initial version of the prototype should be fielded to the user community for a hands-on evaluation period. During this needs assessment effort, a number of potential system users were interviewed to determine their information access and processing needs. Sessions should be scheduled with these potential users to explain the ODAS concept, demonstrate the prototype, conduct a hands-on evaluation, and record any comments. This feedback can then be used to identify additional requirements.

A number of areas in which the prototype can be enhanced have already been identified, including the following:

- Integration of portions of the NLM Unified Medical Language System (UMLS) tools
- Integration of the NLM Medical Subject Headings (MESH) tool
- Interaction with an external database
- Development of an information index, which will provide a list of sources containing information related to a search query; this will be useful for identifying relevant information sources that are not available from the ODAS
- Expansion of the ODAS Help facility to include definitions of codes and abbreviations used by certain databases
- Enhancement of the "View Results" capability to allow users to manipulate data retrieved
- Expansion of the data resources accessed by the prototype
- Research of advanced text searching methods, such as "fuzzy" logic
- Implementation of the capability to interactively update the Knowledge Base
- Research of the technical issues involved with implementing the ODAS in a multi-user environment.

As feedback is received during the prototype evaluation period, additional ideas for enhancements will be identified. It is recommended that the enhancements listed above, as well as any additional suggestions, be prioritized for implementation.

4.1.2 Incorporation of Unified Medical Language System Tools

NLM is developing a suite of experimental products collectively known as the UMLS. The UMLS project is an ongoing NLM research and development effort designed to facilitate the retrieval and integration of information from multiple machine-readable biomedical information sources. Versions of the UMLS products have been distributed to over 300 institutions for experimental use.[1]

The UMLS approach is to build "Knowledge Sources" that can be integrated into a variety of applications. Currently, the following three Knowledge Sources are being developed:

[1] *National Library of Medicine. Unified Medical Language System Knowledge Sources; 4th Experimental Edition, April 1993; National Institutes of Health, National Library of Medicine; pg. 6.*

- Metathesaurus — "Contains information about biomedical concepts, their representation in different vocabularies and thesauri, and their use and co-occurrence in selected data bases. It represents a variety of relationships among terms and can support mapping from the user's terms to appropriate controlled vocabularies."

- Semantic Network — "Contains information about the types or categories (e.g., 'Disease or Syndrome,' 'Virus') of terms in the Metathesaurus and the permissible relation ships among these types (e.g., 'Virus' causes 'Disease or Syndrome')."

- Information Sources Map — "Contains both human readable and machine "processable" information about the scope, location, vocabulary, syntax rules, and access conditions of biomedical databases of all kinds."[2]

A more detailed description of the UMLS products is provided in Appendix B.

The UMLS products are not end-user applications. The Knowledge Sources are intended to be integrated with intelligent interface programs for specific applications. Because the UMLS products are being developed by NLM and fielded to many health institutions, they are becoming a type of standard across the health industry. Therefore, it is imperative that they be considered for integration with the ODAS.

During the next phase of the prototype development effort, the UMLS products should be evaluated to determine how they can be integrated with the prototype. Experimental agreements have already been signed and submitted to NLM so that copies of the UMLS software can be obtained. The experimental software includes copies of the Metathesaurus, Semantic Network, and the Information Sources Map on CD-ROM.

In addition, members of the UMLS development team should be contacted to discuss the UMLS products, UMLS development plans, and potential uses of the Knowledge Sources in the ODAS Prototype. Currently, the UMLS development team includes a core team at NLM, as well as several contractors. The current UMLS contractors are: Lexical Technology, Inc., Massachusetts General Hospital, Brigham and Women's Hospital, the University of Pittsburgh and its subcontractor the University of Utah, Yale School of Medicine, and Columbia University.[3] Dr. Stewart Nelson of the Medical College of Georgia was interviewed to discuss his involvement with the UMLS development effort and to review his medical applications, which integrate portions of the UMLS products.

[2] *National Library of Medicine Fact Sheet, "Unified Medical Language System (UMLS)", July 1993, National Institutes of Health, National Library of Medicine.*

[3] *National Library of Medicine, Unified Medical Language System Knowledge Sources; 4th Experimental Edition, April 1993; National Institutes of Health, National Library of Medicine: pg. 6.*

4.1.3 ODAS Configuration Alternatives

The potential ODAS user community includes academicians, clinicians, and researchers located both on and off the MUSC campus. When considering possible system configurations, geographical distribution must be taken into account. In addition, the hardware and software available at each user site will influence the system configuration. For these reasons, several options for providing user access to the system must be considered.

The distributed database client strategy, shown in Figure 4-1, illustrates one feasible architecture for the ODAS. This architecture is based on a single database server with multiple database clients. Each client resides on a separate and distinct computing platform along with the GUI client and server software. These machines must be workstations capable of supporting GUI based displays. The External Database Processor is a separate and distinct machine which manages data exchange with databases external to the ODAS. The advantages of this architecture include its optimum user

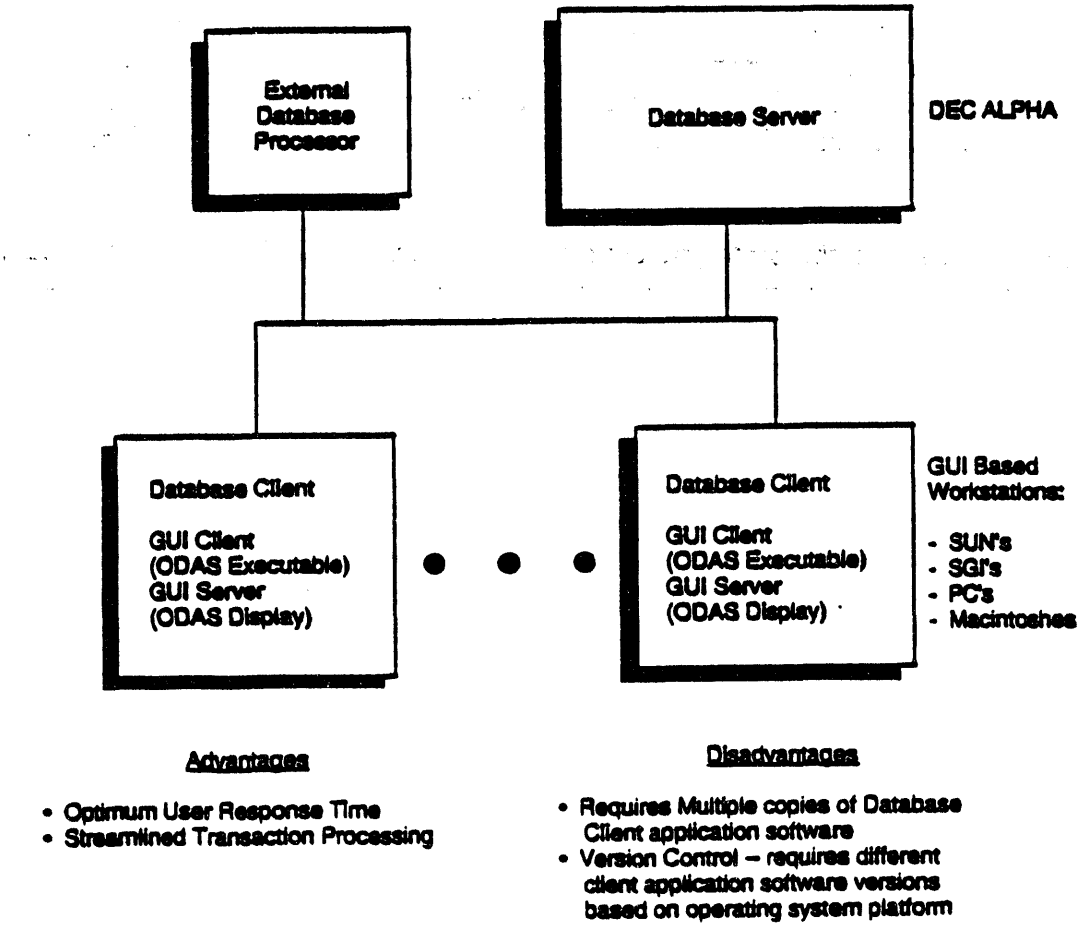


Figure 4-1. Alternative 1: Distributed Database Client Strategy.

response time and streamlined transaction processing. Disadvantages include the expense for multiple machines and license fees and the need for multiple versions of the ODAS client applications (one for each client hardware platform).

The non-distributed database client strategy, shown in Figure 4-2, illustrates a slightly different architecture for the ODAS. This architecture is based on a single database server and client. The client executes multiple ODAS applications, each of which have their own displays. In this architecture, the client machine must be powerful and large enough to support the ODAS user community. The advantages of this architecture include the reduced number of database clients and the ability for the ODAS user to utilize their current PC and Macintosh machines with few configuration modifications. Disadvantages include sub-optimal user response time and the expense of a powerful database client machine.

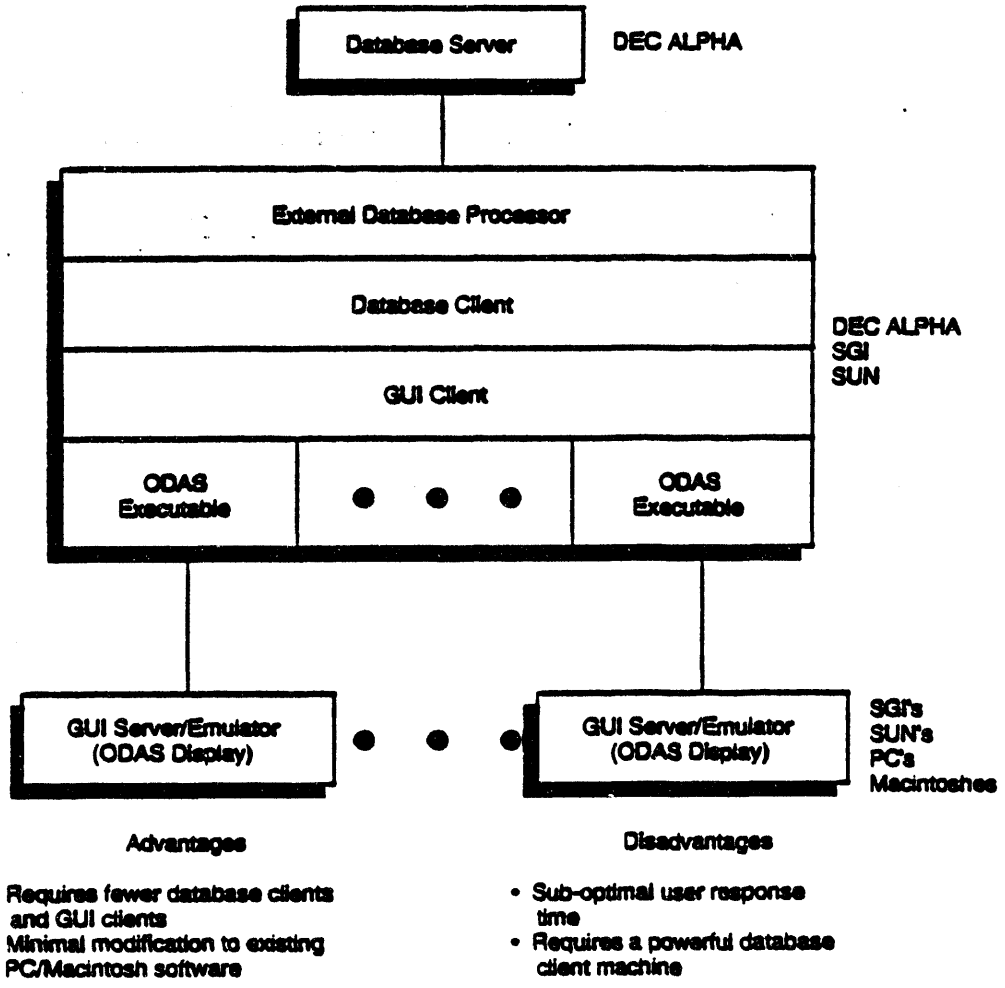


Figure 4-2. Alternative 2: Non-Distributed Database Client Strategy.

It is important to note that these alternatives represent a high-level conceptual view of the system architecture at this point in time. During the system design phase, several factors must be considered, including the database size, the potential user community size, and the number of transactions processed. During the design, a detailed set of hardware, software, and communications architectures will be developed and priced. A cost/benefit analysis will be performed to select the optimal solution.

4.1.4 ODAS Information Sources

A key component to the success of the ODAS is the informational value of the databases it will access. The process of identifying useful information sources for integration into the system requires analysis of the requirements identified during the Information Access and Processing Requirements Analysis effort, as well as the Database Identification and Analysis effort. The process used to narrow down the large list of available databases is described in detail in the Database Survey Report. Based on the information gathered during both of these efforts, several conclusions have been reached.

There are numerous software vendors that have developed and marketed search engines for accessing one or more databases. For example, MUSC has several methods of accessing Medline. It may be accessed via the Knowledge Finder software on a Macintosh platform and through MUSCLS, which accesses a mini version of Medline received from Georgetown University in MUMPS format. Soon, Medline will also be available through the CD Plus product, which has recently been purchased by MUSC.

Although access to popular databases such as Medline and Toxline represents a high priority need, it is important that time and money not be spent "re-inventing" search engines that are already available. Many vendors have worked for years to develop and enhance their search products, and MUSC has made financial commitments to several of these products. At the same time, it is important that the user community has convenient access to available search and retrieval products, which often execute on limited platforms.

Several recommendations have been formulated to address this issue. A long term solution is to provide direct access to NLM databases, such as Medline, via the UMLS. NLM databases will be obtained on CD-ROM and accessed directly. In this solution, the UMLS Knowledge Sources will be used to help "narrow" the scope of user queries.

It is important to note that the UMLS products are still under development. Therefore, a short-term solution will be required to access the required NLM databases. One potential solution is to provide an interface to external search products, such as CD Plus, through the ODAS windowing environment. In this way, a user can actually invoke the commercial software to perform searches on Medline from within the ODAS application.

As described above, there are numerous vendors that supply search capabilities for the NLM databases. MUSC has invested in a number of these products, including CD Plus and Knowledge Finder. There are many databases that are not as easily accessible, including IRIS, RREL, and the ATSDR databases. Access to these databases may require a remote dial-up session. Therefore, when prioritizing databases for integration into the ODAS, the "ease of access" currently available for required databases must be evaluated.

Databases developed locally at MUSC to store and retrieve research results should also be considered for integration into the ODAS. Several of the needs assessment interviewees expressed an interest in accessing data compiled by MUSC researchers. For example, Mike Hughes of the University of Mississippi was interested in accessing the Agrimedicine information that Dr. Schuman and Sam Caldwell have compiled and stored in a local database at MUSC.

The integration of databases developed locally at MUSC into the ODAS could promote information sharing with other universities, government, and industry. This information sharing would be supportive of important initiatives, such as the Crossroads of Humanity Series, which brings together individuals from all walks of life to address important environmental health issues. The ability to share information will also help to establish and strengthen relationships between universities doing related research.

The development of the prototype has permitted the ODAS development team to research and experiment with several design options. The team has concluded that it will be more efficient to load certain databases locally rather than accessing them externally. Databases that should be loaded into a local database include those that are not available on-line, and those that are fairly static (i.e., yearly updates). This will help to optimize the software required to perform complicated searches. It should be noted that conversion routines may be required to translate databases from their native format to the local database format.

4.1.5 ODAS Working Group

The access to environmental/health data resources is crucial to supporting the EHAP mission. However, as shown in this report, specific data requirements are broad and diverse. Therefore, it would be beneficial to establish an ODAS Working Group to serve as a forum for discussing system issues and priorities. The ODAS Working Group should perform the following functions:

- Serve as a liaison between the user community and the development team
- Prioritize user requirements for implementation
- Discuss and resolve technical and cost issues

- Serve as the ODAS Configuration Control Board (CCB) once system baselines have been established. In this role, the group should document system problems, evaluate and approve recommendations for system enhancements, evaluate and approve suggestions for new data sources, and prioritize all software and data changes.

The ODAS Working Group should include representatives from the EHAP Office, the user community, the CCIT, the MUSC Library, and the ODAS development team.

4.1.6 Data and Information System Needs External to the ODAS

During the needs assessment process, requirements for systems and database support outside of the ODAS were identified. In addition, some interviewees expressed concern about the ODAS concept. The suggestions and concerns that were collected are described in the following paragraphs.

Dr. Hoel of the Department of Biometry and Epidemiology suggested that future data analysis and system development should be concentrated in the following four areas:

- Selection of a field of expertise for MUSC, collection of data in this area, and establishment of MUSC as the national focal point for that information; development of a system that can be accessed both internally and externally to MUSC to retrieve related information

- Development of an information reference tool that will supply database names, database descriptions, and point-of-contact information on specific categories of data

- Support of MUSC's involvement with DOE studies of health issues at the Savannah River Plant and collection of health studies, analyses, and other data related to the Savannah River Plant

- Implementation of the capability to access primary databases, such as Medline, throughout the campus as well as from home.

The first three suggestions above could feasibly be incorporated into the ODAS, as discussed below. The fourth suggestion involves the accessibility of applications via the MUSC network.

If a MUSC field of expertise is chosen, the ODAS could serve as the search tool required to locate and retrieve data within this field. In addition, if Savannah River Plant data is important, data related to the plant can be assigned a high priority status for integration with the initial implementation of the ODAS. These two suggestions do not affect the ODAS design, but rather define the content of the databases to be included in the ODAS.

An information reference tool could be implemented as part of the ODAS help facility. For example, if a user enters a search query that returns few or no results, the user can access the information reference tool within help. The tool could list databases relevant to the query. If the databases listed are not available through the ODAS, the user would at least have point-of-contact information that will help them locate the required data.

Dr. Early, of the College of Pharmacy, stressed a need for remote access to their department's drug related databases. This would be extremely helpful in providing instant feedback to questions fielded at health fairs. This need can be addressed outside of the ODAS design by implementing a network solution to provide remote access to the Pharmacology Department's databases. If the drug databases are selected for integration with the ODAS, the Pharmacology Department could access the ODAS remotely and select their drug databases for searching.

Several of the interviewees expressed a need for "contact databases." For example, Dr. Early requires a system that will provide contact information for obtaining data on medicines and chemicals. This type of system would be especially beneficial if it could provide a mechanism to access E-mail and bulletin board systems to electronically send a request once the required contact information is located. Dr. Hoel's suggestion for an information reference tool would also be accommodated in this type of "contact database."

Dr. Schmidt of the Microbiology Department expressed concern that the ODAS concept is already being developed in industry and government. He believes the EHAP information system effort should be targeted toward a different problem. Dr. Schmidt currently uses GOPHER facilities at MUSC to analyze the activities of his colleagues and competitors. He also accesses the funding information related to these activities. Dr. Schmidt recommends that a front-end search tool be developed for searching through Internet GOPHERS and web servers for keywords.

In order to address all of the requirements collected during the needs assessment, the requests described above should be evaluated and considered. As discussed, some of these requirements could be incorporated into the ODAS design, while others may require development of a separate system or database.

Finally, many of the needs identified during the interviews centered around hardware and communications needs. For example, access to the MUSC network and hardware availability were common issues. These needs should be addressed by an on-site technical support team.

4.2 Issues

Prior to performing a comprehensive system development effort, there are several technical and cost issues to consider. It is recommended that these issues, described in the following paragraphs,

be discussed in a technical exchange forum attended by representatives from the EHAP Office, the CCIT, the MUSC Library, the user community, and the ODAS development team.

4.2.1 Diversity of the User Community

A key MUSC/EHAP objective is to establish an international computer network of approved data and informational support to develop a national basis for risk assessment, risk management, and risk communication. For this reason, the ODAS user community could potentially be very large. There are many connectivity issues associated with providing access to such a large user community. In addition, such a diverse set of users results in a wide range of information access and processing requirements. Therefore, it is imperative that a plan be developed for integrating the requirements of the various user groups and establishing connectivity to the system. This plan should include a prioritization of requirements and a schedule for system installation and training at the various user sites.

4.2.2 Hardware and Software Costs

There are several cost issues to be considered prior to beginning the system development effort. The first cost issue is related to the actual configuration of the system, described in Section 4.1.3. For example, the distributed database client strategy would require a Sybase client site license at MUSC. The non-distributed database client strategy would require X-Window Emulation software to be purchased for each end-user machine. To accurately represent the costs associated with the configuration alternatives, the following steps should be taken during the system design phase:

- Work with the CCIT to study current licenses, available hardware, and available soft ware at MUSC
- Investigate MUSC projects and plans for future projects (such as enhancements to the MUSC personnel system) that may require similar licenses and configurations
- Perform a survey to assess hardware availability at the potential user sites.

Once these steps have been completed, the hardware and software costs associated with each configuration strategy should be developed. A cost/benefit analysis should then be performed to determine the optimal strategy for MUSC/EHAP.

4.2.3 Information Access Costs

A second cost issue that must be addressed is the cost of accessing data. Although many databases may be obtained at no charge, or for a nominal fee, other databases are quite expensive. MUSC has

already made financial commitments to numerous information sources and access tools. For example, a significant investment has recently been made to purchase CD Plus, which provides access to a number of databases, including Medline, MiniMedline, Current Contents, and CINAHL. Due to vendor proprietary issues, it is difficult to bypass the vendor's processing mechanism, and directly access these databases.

In certain cases, however, vendors have provided mechanisms to facilitate queries directly to their data. An example of such a vendor is SilverPlatter Information, Inc. Direct access to Analytical Abstracts and other SilverPlatter database structures can be gained through their proprietary query software called Data Exchange Protocol (DXP). The ODAS can formulate and send sophisticated queries in DXP format and store the query results locally as a portion of an integrated end-user result. There are many benefits that can be achieved by utilizing data access methods such as these. Some of the major benefits include the following:

- Reduced overhead responsibility for the ODAS Knowledge Base since access to multiple data sources can be accommodated through common query formats (either proprietary or non-proprietary)
- Direct interoperability with remote data sources without prior knowledge of remote data structures
- Reduced amount of data stored locally within the ODAS local database.

Additional benefits gained from integrating data that can be manipulated independently from vendor systems are a reduction in ODAS development costs and complexity, and an increase in flexibility for acquiring data.

Many data sources, such as BAKER, are available through a dial-up service at a certain rate per hour, with an additional subscription fee required. It is not recommended that these data sources be considered for integration due to the complexity of the cost tracking and system design issues. Research has suggested that with the amount of data sources available on CD-ROM alone, data available through dial-up services is likely to be available on CD-ROM as well.

4.2.4 Text Searching Requirements

A key component of the ODAS Prototype is the capability to locate keywords in database fields. During the prototype development effort, it was discovered that several candidate databases have fields containing large volumes of textual information. Text searching is a feature that is crucial to the ODAS, since the software must locate keywords in these large text fields.

The use of Structured Query Language (SQL) is greatly inhibited when manipulating information found in large fields. To be specific, the location of multiple occurrences of a word or phrase in such fields is computationally infeasible. Therefore, a method of searching large text fields must be developed.

As additional front-end searching requirements and preferences are identified, efficient text field manipulation becomes increasingly important. For example, users are often unsure of word spellings when they initiate a search. The advent of "fuzzy" logic searching has addressed this problem by enabling the user to enter the word or phrase to the best of their ability. The "fuzzy" logic search will then locate the closest matching word or phrase.

"Fuzzy" logic tools, in addition to many other text searching tools, are available in many COTS document retrieval software packages. It is recommended that COTS software that provides an application programming interface (API) to text searching software be investigated and incorporated into the ODAS. APIs enable the user to develop custom software to provide features such as "fuzzy" logic without having to duplicate functions already available in commercial software.

4.2.5 Evolution of Requirements

The requirements represented in this report were collected through interviews, questionnaires, research, and informal discussions. As a result, the requirements are varied and cover a wide range of areas. The next phase of the ODAS development effort will involve a hands-on evaluation period, in which potential users can experiment with the ODAS Prototype. Hopefully, this evaluation period will provide users with the opportunity to review their requirements and provide the ODAS development team with focused comments, suggestions, and potential problems. As a result, the needs assessment process is evolutionary and should continue throughout the next iteration of the ODAS Prototype.

Appendix A

NEEDS ASSESSMENT INTERVIEW SUMMARIES

SUMMARY OF THE MUSC/EHAP NEEDS ASSESSMENT INTERVIEWS
January 26 - June 1, 1994
Conducted By:
COLEMAN RESEARCH CORPORATION
Information Systems Division

INTERVIEW 1: 1/26/94

Members Present:

Dr. Janardan Pandey - MUSC Microbiology Department
Jeff Ready - CRC
Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to gain an understanding from the genetic microbiological perspective on the resources used and desired for information processing.

Interview Summary:

Dr. Pandey is a genetic microbiologist. He is currently performing research for EHAP determining genetic predisposition toward negative responses. Dr. Pandey uses a Macintosh computer for processing genetic information locally at MUSC. He does not, however, have access to Macintosh based statistical genetic software that is of great importance to his research. He collects most of his data from lab samples. In order to have his data statistically analyzed, he must send it to places such as NIH in Washington, D.C. In fact there is a very limited amount of access to genetic information (other than Gene Bank) within MUSC. Dr. Pandey feels that access to genetic information and genetic statistical analysis software could be very useful for students at the University. In addition, this information is critical in determining factors such as human genetic propensity to an illness.

A primary focus of Dr. Pandey's research is beryllium disease genetics and silicosis (a form of lung disease). Some of the basic genetic analysis functions are performed at MUSC. Dr. Pandey

would like a Macintosh-based tool for performing genetic linkage, pedigree, and segregation analysis. He is aware of such packages that are currently available on IBM machines, however, Dr. Pandey is not familiar with processing information on IBM based machines and does not have immediate access to one in his office.

INTERVIEW 2: 1/26/94

Members Present:

Dr. Stanley Schuman - MUSC Medical Doctor Research
Sam Caldwell - Assistant to Dr. Schuman
Jeff Ready - CRC
Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to gain an understanding from the medical family practice research perspective on resources used and desired for information processing.

Interview Summary:

Drs. Schuman and Caldwell work under the Department of Family Medicine within the Occupational and Environmental Medicine Office. The Office evolved from a preventive medicine background into occupation-oriented medicine activities. Half of their time is spent working with state-wide agricultural medicine. They provide a medical resource through the Cooperative Extension Service at Clemson University. They are electronically tied into Clemson and the 46 South Carolina counties through E-Mail using the Clemson Hufban System. Agricultural medicine activities performed by the Office include public service education and research. Public service activities focus on information and consultation. They provide referral services for patients depending on their specific condition. General consultation services are provided to both physicians and patients. Between 300 and 400 of these consultations are performed by this office each year. The facilities used include the MUSC Library which provides access to Medline and Toxline, and local records management using a software program named Reference Manager (a bibliographic based commercial off-the-shelf (COTS) software package). Included in Reference Manager are bibliographic references to articles collected within the Office over the years. Reference Manager is an IBM PC Microsoft Windows based application.

The Office is preparing to order Grateful Med. Grateful Med is a COTS software product designed for use by physicians. It is a graphical user interface (GUI) front-end information system

that provides access to a subset of the National Library of Medicine databases currently available. The Office also uses library resources such as Medline to access pertinent information. Mini-Medline is available on the computer located within the Office. Since the Office is IBM PC based, applications that are Macintosh based, such as Knowledge Finder, are inaccessible directly. However, it was noted in the interview that Knowledge Finder will shortly be available through the Novell Server in MS Windows which is directly accessible from the Office. The Office is also currently able to access the MSDS system through connectivity to the VAX using a 80286 based machine. The Office would like to be able to access the MSDS system through more than just one PC. The number of simultaneous consultations that are able to take place is currently at a minimum due to the time required to access information at MUSC. The Office currently has four 80486 based machines at their disposal.

On behalf of EHAP, the Office is developing Environmental Medicine Curricula for the Statewide Family Practice Residency System consisting of seven training sites in South Carolina, one of which is at MUSC. A committee was formed featuring one faculty member representing each one of these sites. The committee is developing curriculum modules for interactive computer programming, slide lectures, and different instructional methods. The Office has established themselves as a resource to the six other sites for providing consultation on occupational environmental questions in the same support role as was performed for agricultural medicine.

The other six sites are not trusting of the MUSC Office, and are not supportive of their efforts. They feel that their support roles are very time consuming and far too resistive of closure.

INTERVIEW 3: 1/26/94

Members Present:

Dr. Michael Schmidt - MUSC Microbiology Department
Jeff Ready - CRC
Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to gain an understanding about current information access methods used and desired by the MUSC Microbiology Department for performing environmental risk assessment functions.

Interview Summary:

Dr. Schmidt is a microbiologist and responds to issues such as environmental questions from the Department of Energy. From his perspective, information access would be best facilitated by providing a front-end search tool that would be capable of searching through Internet GOPHERs and web servers for key words. He currently uses GOPHER facilities at MUSC to analyze what his colleagues and competitors are publishing and being funded to do. Dr. Schmidt is quite familiar with electronically accessing information in his area of research. He demonstrated the capabilities of the GOPHER and Mosaic system developed by the National Science Foundation (NSF).

INTERVIEW 4: 1/26/94

Members Present:

Dr. Jean-Michel Goust - MUSC Microbiology Department
Jeff Ready - CRC
Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to gain further understanding about current information access methods used and desired by the MUSC Microbiology Department for performing environmental risk assessment functions.

Interview Summary:

Dr. Goust operates with Genetic physical map, genetic sequences, and genetic comparisons (e.g. Amino Acids, Nucleotides). In the future he will be participating with risk assessment efforts related to beryllium and other heavy metals. Our visit with Dr. Goust was brief. Dr. Goust expressed that he relies primarily on Dr. Mike Schmidt for accessing electronic information resources. He indicated an interest in combining information via GOPHER with the University of Minnesota.

INTERVIEW 5: 1/27/94

Members Present:

Dr. David Jollow - MUSC Pharmacology Department
Dr. David Macmillian - MUSC Pharmacology Department

Dr. JoEllyn Macmillian - MUSC Pharmacology Department
Jeff Ready - CRC
Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to gain further understanding about current information access methods used and desired by the MUSC Pharmacology Department for performing environmental risk assessment functions pertaining specifically to Toxicology.

Interview Summary:

This group of individuals is primarily concerned with responding to toxicological risk assessment. Currently, they have no ethernet network connections to their office computers. They were not aware that the Macintosh residing in Dr. Jallow's office is connected to the network. Currently, they are connected to Localtalk, but the Localtalk is attached to a fast path router that connects them ultimately to the network.

The current information access requirements from this group are to be able to search through information residing in Medline and Toxline. At one time they had a connection to these databases through Grateful Med which resided on a PC. However, this PC was placed out of service after an office move. They would like to be provided with a list of other information resources and their contents. Specifically, those resources related to chemical descriptions, toxicology, and risk assessment. Electronic access to ATSDR was discussed, but the group stated that their specific responsiveness requires human judgement based on knowledge. The numbers and regulations on toxic chemicals vary depending on the type of human exposure (e.g. occupational, chronic, or accidental). Overlapping information should be removed when data is accessed and retrieved electronically. Currently, there are over a half million man-made chemicals known. Of those half million chemicals, information is available for only about one percent.

INTERVIEW 6: 1/28/94

Members Present:

Dr. Daniel Lackland - MUSC Department of Biometry and Epidemiology
Jeff Ready - CRC
Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to gain an understanding about current information access methods used and desired by the MUSC Department of Biometry and Epidemiology for performing environmental risk assessment functions pertaining specifically to Biometry and Epidemiology.

Interview Summary:

Electronic data access capabilities for Dr. Lackland are currently somewhat limited. He shared with us a book developed by EPA called "Inventory of Exposure Related Data Systems Sponsored by Federal Agencies" - EPA/600/R-92/078. The book explains how to gain access to a vast amount of human exposure related database systems. The Department is more concerned with specific human effects than with effects on rats and other laboratory animals. He mentioned that Dr. Stong of CRC my be aware of mechanisms to access real human data. Dr. Lackland performs quantified human risk levels related to exposure. The Department would like to have direct access to human exposure-related data if possible. Dr. Lackland stated that the Department needs to be more responsive from both the aspect of access speed and data accuracy. Dr. Lackland has used Toxnet in the past and is familiar with Haznet.

Dr. Lackland has not been connected to the MUSC network since the EHAP project was first funded. He uses an IBM PC and could access the network, but would not yet be able to gain access to Macintosh-based systems such as Knowledge Finder. His immediate need is to have electronic access to the MUSC library.

INTERVIEW 7: 3/7/94

Members Present:

Dr. Pam Betta - MUSC College of Nursing
Jeff Ready - CRC

Interview Purpose:

The purpose of this interview was to gain an understanding from the nursing perspective on the resources used and desired for information processing.

Interview Summary:

Dr. Betta is attempting to develop a nursing graduate degree curriculum in Occupational and Environmental Health Medicine. Several focus groups have been established to research the environmental health nursing role including required courses, job titles, and salaries.

There is a focus on the need to educate and train nurses to perform the Primary Care Physician role. Currently, only 14 schools have nursing graduate programs. Dr. Betta is attempting to locate employers in South Carolina who are willing to hire occupational environmental nurses. She is compiling a mailing list for dispersement of survey forms. Her plan is to construct a database of employers who are interested in hiring nurse practitioners.

Dr. Betta uses CINAHL to perform her searches. Unfortunately, the CINAHL system is stand alone in the library, and she must make appointments to use it. In addition, Dr. Betta would like to access Knowledge Finder, but she is currently PC based, and Knowledge Finder is a Macintosh based product. She would like access to ERIC, Sociallit, Psychlit, and Business journals, including Time and Newsweek. She is also interested in articles on Occupational and Environmental medicine.

INTERVIEW 8: 3/9/94

Members Present:

Dr. Robert J. Kennedy - MUSC EHAP Department of Environmental Health Sciences
William P. Hotle - MUSC Department of Environmental Health Sciences
Jeff Ready - CRC
Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to gain an understanding from the environmental health sciences perspective on resources used and desired for information processing.

Interview Summary:

Dr. Kennedy and Mr. Hotle work in the MUSC Department of Environmental Health Sciences. Their primary focus is on public service education with regard to State and Federal regulations. They have been using the Federal Register to access current regulatory information. They would like to have online access to US Code and Code of Federal Regulation data. The access methods to a major

portion of the data they use is through Gopher over the Internet at MUSC. They also expressed interest in a product called Rodscan which lists all recorded regulatory decisions. Rodscan is available on CD-ROM.

The Department is developing environmental risk assessment courses for the University. Some of the data sources they would like to use in the lecture material include the following:

- Remediation technology
- Control technology
- Economics and cost, feasibility, and implementation
- Measurement techniques of hazardous waste
- Analytical methods
- Health effects, toxicity values (IRIS)
- Government regulations (ARR - Available and Applicable Requirements)
- Sources of pollution.

A primary focus is on hazardous waste. Online access to NTIS would be very helpful. Legal issues, such as court cases and settlement data are also of interest to the Department. Dr. Kennedy and Mr. Hotle explained how the U.S. court system in itself is a means of environmental risk management. Legal issues and torts will be discussed in the course curricula being developed by the Department.

Access to current Congressional hearings on environmental policies and issues would also be very helpful to the Department. They also showed great interest in accessing EPA data, such as EPA Online. In general, the Department is completely Macintosh oriented. During the interview, they presented a concept of a decision support model that has the following components:

- Technology
- Economics
- Health Risk

- Risk Assessment
- Social Aspects
- Acceptability
- Risk Perception
- Public Commentary.

Dr. Kennedy and Mr. Hotle are also interested in cultural and ethnic sensitivities. They expressed interest in establishing a bulletin board capability to review incoming public commentary. CRC pointed out that this capability is currently being reviewed as a future Gopher capability at MUSC. Dr. Kennedy and Mr. Hotle are familiar with the Education Resources Inventory Catalog (ERIC) system and the methodology of "scoping" information searches.

From the economic standpoint, the Department is interested in performing cost-benefit analyses when standards are created for clean-up of hazardous waste. The topic of policy was discussed in terms of balancing cost-benefits for hazardous waste clean-up. There was interest in the evaluation of international standards and comparisons to U.S. standards.

The Department recognizes that this constitutes an enormous amount of data. However, they are interested in acquiring access to as much data as possible to achieve a broader perspective on hazardous risk assessment. This is viewed as crucial to the development of a successful curriculum.

INTERVIEW 9: 3/9/94

Members Present:

Dr. Daniel Knapp - Director of Mass Spectrometry Research
Jeff Ready - CRC
Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to gain an understanding about information access methods used and desired by mass spectrometry researchers for performing environmental risk assessment functions.

Interview Summary:

Dr. Knapp requires better access to Chem Abstracts. Currently, Chem Abstracts are searched off-hours by Terry Lynn of the MUSC Library. Since she usually only works one day per week, timing the information retrieval with her scheduled work day is difficult and often causes delays of up to one week. Chem Abstracts now has a front-end called STN Express (Science and Technology Network) that allows users to formulate searches off-line, so that training is not required to use it. STN Express uses a menu driven search strategy. STN Express is used to access several on-line chemical databases.

Dr. Knapp says his department also uses Knowledge Finder to access Medline data. However, his department is more oriented around chemical instrumentation. Medline does not provide strong non-biological references that relate to instrumentation or chemical analysis. Dr. Knapp would also like to know which databases might provide information on physics and electrical engineering. Patent searching capabilities in the Department are currently sub-optimal. They had patent files on microfilm and used a PC package provided by the U.S. Patent Office to search through the files. When their PC was taken out of service, they no longer had that ability. They currently access all of their patent literature through Chem Abstracts. Patent literature is used for obtaining chemical compound and instrumentation information. The group also uses sequence databases accessible through the University VAX for processing protein data. Dr. Knapp feels that a campus-wide need is universal access to amino and nucleic acid databases, which are part of the National Center for Biotechnology Research databases. The group also anticipates using the Tripo-Sibble software on a Silicon Graphics computer for graphical bimolecular processing and modeling.

INTERVIEW 10: 3/10/94

Members Present:

Dr. John Cate - MUSC Children's Hospital, Anatomical Pathology
Jeff Ready - CRC
Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to gain further understanding about information access methods used and desired by the MUSC Children's Hospital, Anatomical Pathology Department for performing environmental risk assessment functions.

Interview Summary:

Dr. Cate stated that there is no LAN connectivity in laboratory medicine. There are roughly 100 personal computers (80 IBM PCs and 20 Macintosh PCs) that currently reside within the Department. Their ultimate goal is to connect these PCs on a LAN. In addition, they will continue to need access to the CERNER System which runs on a VAX. The only information available over the CERNER System is patient data which resides in the laboratory host computer within Dr. Cate's department. He would like to access patient data, OACIS (Open Architecture Clinical Information System) data, library card catalog information, records information, and Medline/Toxline data. However, he stressed that the current Medline/Toxline searching is convenient and not cumbersome. Mostly, he uses Medline for locating books and journals available in the MUSC Library. He simply walks over to the library and fills out a request form to initiate the search. He performs this task frequently. He stated that he would be quite willing to learn how to use new search software, such as an ODAS, if it did not require a lot of his time to learn.

There are some people in his department who have special needs for accessing genome sequence data and gene data banks. Currently, there is a LAN called STATLAN in the Hospital. The developer of the STATLAN software, a physician named Dr. Don Symborg, also developed OACIS. OACIS data is very important, since it structures information better than CERNER and provides additional data not provided by CERNER. Dr. Cate feels that medical community access to this data would be quite beneficial. Both STATLAN and OACIS are owned by Bell Atlantic, who is currently trying to sell both of these products.

Dr. Cate does not have access to E-Mail. He would like to be connected to the campus network. Currently, there are 30-40 faculty people that work within the Department. Dr. Cate is unsure how many of these individuals currently have access to the campus network. The Department will soon be attending a demonstration of the Pathworks LAN product. Dr. Cate recommended that we speak to a gentleman named Lawrence Moser. Mr. Moser handles business affairs at Children's Hospital, and is quite knowledgeable about the PC and network acquisition process. Currently, the Department is greatly underpowered in terms of their computing capabilities. They are using a VAX 6510 with a VAX 7610 on order. The performance of their VAX is very poor, since they are operating at 100% of CPU capacity all of the time. The 6510 will be clustered with the 7610 once the 7610 is online.

INTERVIEW 11: 5/12/94

Members Present (Phone Interview):

Dr. Elizabeth Anderson - President and CEO of Sciences International Inc.
J. Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to solicit input from the commercial environmental risk assessment sector concerning the data and processing methods required to support this field of research.

Interview Summary:

Dr. Anderson has several years experience with the EPA. She founded the EPA Risk Assessment Office during the mid 1970s. In addition, she directed all of the EPA on-site Superfund efforts and Superfund site risk assessments. Dr. Anderson stated that she has been heavily involved with establishing public guidelines for Risk Assessment over the past several years. However, her direct interaction with information resources that may be of pertinent interest to universities such as MUSC is somewhat limited. She recommended that we speak with Charles Hostetler, (509) 735-0758, with whom she interacts with on matters concerning information resources.

INTERVIEW 12: 5/12/94

Members Present (Phone Interview):

Dr. Charles Hostetler - Project Manager, Sciences International,Inc.
J. Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to solicit input from the commercial environmental risk assessment sector concerning the data and processing methods required to support this field of research.

Interview Summary:

Dr. Hostetler has over ten of years experience with the EPA, DOE, and the Nuclear Regulatory Commission (NRC). A major portion of his expertise is in the analysis of site contaminant distribution patterns. This includes hazards identification, dose-response modeling, exposure assessment, and risk characterization. He has conducted numerous EPA Superfund site risk assessments, including assessments at the Hanford site. These assessments involved the consideration of metals, mixed waste, and nuclear waste.

Dr. Hostetler has been involved with the design and implementation of the Sciences International SiteAnalyzer software to assist in conducting risk assessments. The SiteAnalyzer software development project operates from a Geographical Information System (GIS) platform for the analysis of spatial and temporal distributions of chemical constituents in environmental media. Perhaps the most important feature of SiteAnalyzer is the automatic calculation of exposure and associated risk using standard EPA scenarios. The software enables rapid assessment to be completed quickly for sites with large data sets.

INTERVIEW 13: 5/17/94

Members Present (Phone Interview):

Kevin Houson - Project Manager, Seattle Engineering Software, Inc.
J. Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to solicit input from the commercial environmental risk assessment sector concerning the data and processing methods required to support this field of research.

Interview Summary:

Mr. Houson is working directly with Dr. Hostetler with the design and implementation of the Sciences International SiteAnalyzer software. His responsibility is for the integration of the GIS product with SiteAnalyzer.

INTERVIEW 14: 5/18/94

Members Present (Phone Interview):

Dr. Joseph Rodericks - Co-founder of ENVIRON Corporation of Arlington, VA.
J. Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to solicit input from the commercial environmental risk assessment sector concerning the data and processing methods required to support this field of research.

Interview Summary:

Dr. Rodericks is a former Chief Science Advisor to the Food and Drug Administration (FDA) Commissioner. He has published over 70 scientific publications on food safety and risk assessment. His expertise in assessing the risks to human health from exposure to toxic substances is internationally recognized.

Dr. Rodericks stated that the information resources he uses include the ATSDR and IRIS. He recommended that these data sources at a minimum should be made available to MUSC if they already are not. He is not aware of any centralized repository for DOE site specific exposure data. In his opinion, this would be quite useful to MUSC, but difficult to pull together since data for each site is quite disparate. He recommended researching information sources available through the National Science Foundation (NSF) and possibly exposure related surveys conducted by NASA.

INTERVIEW 15: 5/17/94

Members Present (Phone Interview):

Caron Chess - Director of Environmental Communications Research, Rutgers University.
J. Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to solicit input from another university involved in environmental research and risk assessment concerning the data and processing methods required to support this field of research.

Interview Summary:

Ms. Chess stated that her primary focus was on risk communication. She stated that her direct involvement with electronic information resources was limited, but she had some specific suggestions for MUSC. She thought that access to social science abstracts may be useful to the University. In addition, she recommended access to the National Academy of Reports and data resources used by the National Research Council.

INTERVIEW 16: 5/17/94

Members Present (Phone Interview):

Dr. Peter Sandman - Independent Consultant. Former Director of Environmental Communications Research, Rutgers University.

J. Mark Debnam - CRC

Interview Purpose:

The purpose of this interview was to solicit input from another university involved in environmental research and risk assessment concerning the data and processing methods required to support this field of research.

Interview Summary:

Dr. Sandman is also a specialist in risk communication. He stated that his role is response oriented rather than assessment oriented. He had no suggestions to offer the University for information resource access.

INTERVIEW 17: 4/15/94

Members Present (Phone Interview):

Mike Hughes - Managing Director, University of Mississippi Poison Control Center
Jeff Ready - CRC

Interview Purpose:

The purpose of this interview was to gain an understanding from another university providing toxic exposure services concerning the data and processing methods required to provide these services.

Interview Summary:

The Poison Control Center and the Agrimedicine Department currently use the Agricultural Library Forum (ALF) which contains citations and breakdown summaries on a variety of topics related to agricultural issues. Mr. Hughes believes it is distributed by NLM. He also uses a system called Computer Clinical Information Systems, which is distributed by Micromedics in Denver, Colorado. In addition, he relies heavily on the Farm Chemical Handbook published by Meister

Publishing in Willoughby, Ohio. A year ago he was attempting to put this handbook online. The University of Mississippi was supposed to become a beta test site, but this has not yet occurred. Mr Hughes feels that once online, the handbook will be helpful to their research.

Mr. Hughes stated that he shares information with the Department of Family Medicine at MUSC, and he thought it would be much easier if information could be exchanged electronically using the Internet. In addition, he would be very interested in being able to access the agrimedicine information that Sam Caldwell and Dr. Schuman keep locally in Reference Manager at MUSC.

INTERVIEW 18: 5/2/94

Members Present:

Dr. Pat Meier - Associate Professor of Medicinal Chemistry, MUSC Department of Pharmaceutical Sciences
Jeff Ready - CRC

Interview Purpose:

The purpose of this interview was to gain an understanding from the MUSC Pharmaceutical Sciences perspective on resources used and desired for information processing.

Interview Summary:

The types of information that Dr. Meier primarily needs is data associated with the local area (within 200 miles). Specifically, information about what is there (sources of toxic substances), what was there (old dumping site or farm where pesticides are used), and historical records of the area.

The Department requires training in risk assessment. The Department staff must know the common, everyday materials that may be hazardous in large quantities. They must also be aware of the toxic chemicals that have little or no associated risk in certain amounts. In addition, the Department requires information regarding the severity of contamination to determine risk. This may be more of an educational issue than a data availability issue.

The Department completed a survey of Pharmacists and their basic determination was that pharmacists are often unwilling to risk making determinations. Dr. Meier's feeling is that pharmacists should be the primary or secondary source of information on health hazard questions. Most likely, the first person someone would call when they spill pet dipping solution on themselves would be a pharmacist, in order to determine how dangerous this type of exposure is. A number of

the questions that a pharmacist receives are related to insecticides, sun exposure, disposal of drugs, disposal of flea dips, and the possible effects of taking prescription drugs that have expired.

The Department would benefit greatly from a list of persons to reach for hazardous exposure treatment. This list would include environmental protection agencies, the FDA, and environmental groups. All pharmacists use computers, and all these computers are linked together. This linkage is likely through terminals connected to a mainframe.

Databases that contain information on severity and risk, including information on brand, constituents, and risk/severity relationships, would be very useful to the Department.

In addition, Dr. Meier mentioned a drug database built in the Netherlands that would also be useful. The point of contact for this database is:

Dr. John H. N. Meerman
Division of Toxicology
Center for Bio-Pharmaceutical Sciences
University of Leiden
PO. Box 9503
2300 RA Leiden Netherlands

Dr. Meier mentioned the C & E News Trade Journal, which has a section on letters to the editor where people discuss hazards and toxicology. Also, he would like to have on-line access to the following sources:

- Journal of Organic Chemistry
- Journal of American Chemical Society (possibly already available through Chemical Abstract Services STN)
- Chemical Research and Toxicology.

Dr. Meier indicated that he had seen the Chemist's Home Database provided by Chemical Abstract Services STN which is available in an IBM PC and Macintosh version. He stated that the information is useful, but that he did not like the user interface. He indicated that a one-door access system with an information searching mechanism and information limiter would be highly beneficial. He feels that the information highway is a place to get run over if you don't have help finding what you are looking for.

INTERVIEW 19: 5/16/94

Members Present (Phone Interview):

Dr. John Wheat - Associate Professor, University of Alabama Department of Behavioral and Community Medicine
Jeff Ready - CRC

Interview Purpose:

The purpose of this interview was to gain an understanding from other medical universities what resources and information processing capabilities would be useful.

Interview Summary:

Dr. Wheat works in the Occupational Medicine Unit (a satellite branch at Tuscaloosa, Alabama) where there is approximately 40 medical students and a medical family practice. He manages an occupational medicine unit and is heavily involved with rural medicine. He directs the rural medicine clerkship and is involved in medicine in industry and small towns. Approximately five to six times a year he receives phone calls about people who have come in contact with, or request literature about, some form of chemical substance. He uses the research librarian at the main campus library to perform searches for such information.

Dr. Wheat is in the process of establishing an Agrimedicine Department similar to the one at MUSC. He is focusing on three different industries: poultry, logging, and hazardous waste dump sites in Alabama. It would be beneficial to have access to information regarding the various dump sites in Alabama.

Most of the people that Dr. Wheat works with use Grateful Med. He would like to have Internet access, but realizes this might be difficult since he is in a university satellite office. He is fairly confident the main campus has Internet access. He primarily uses the main campus librarian for information, since this person is able to retrieve data quickly.

The Department is just beginning work on their agrimedicine grant. Dr. Wheat stated that his group is currently conducting a Needs Assessment. He will have a much clearer perspective on the different types of information required, once the assessment is complete.

The Department has developed a group of agrimedicine teams composed of people from different counties in a variety of different professions including pharmacists, doctors, and farmers to determine specific problems and needs. Once they have compiled a list, they will refine and prioritize it. The Department will also provide research assistance to help the local teams.

The teams will then have the opportunity to review their lists and re-prioritize their needs. The teams will then attempt to develop a list of resources needed by the specific local sites, and a list of resources that will be held centrally for all to access. This process should take about six months. Dr. Wheat thinks he could benefit from anything the teams can provide since they have made great strides in agrimedicine. He would like to keep in contact so his needs may be addressed in the future.

Dr. Wheat provided the following list of resources (journals) that are used by agrimedicine researchers:

- Journal of Agrimedicine *
- Journal of Rural Health *
- Journal of Occupational Medicine
- American Journal of Industrial Medicine *
- Occupational Medicine: State of the Art Reviews
- Marshfield Clinic Bulletin
- American Review of Respiratory Disorders
- Journal of Emergency Medical Services
- Journal of Emergency Medicine
- American Journal of Emergency Medicine
- Rural Health Nursing
- American Journal of Community Psychology
- American Journal of Public Health
- Journal of Environmental Health
- American Industry Hygiene Association Journal
- Environmental Health Perspectives
- Journal of Occupational Accidents
- Journal of Safety Research
- Agricultural Engineering
- Farm Journal
- Extension Review
- Successful Farming
- Agriculture Impact
- Rural California Report
- Family Medicine Journal
- Journal of Family Practice
- Academy of Family Practice.

* indicates important source

INTERVIEW 20: 5/23/94

Members Present:

Dr. John Early - Dean, MUSC College of Pharmacy
Jeff Ready - CRC

Interview Purpose:

The purpose of this interview was to gain an understanding from the MUSC College of Pharmacy on the resources used and desired for information processing.

Interview Summary:

The basic needs of the College of Pharmacy are similar to most of the departments interviewed at MUSC. These needs include access to Medline and Toxline. The College currently uses IBM PCs and is attached to the MUSC network. They access some bulletin board type services related to pharmacology. One in particular is called HELIX which is provided by GLAXO Pharmaceutical. Dr. Early is interested in toxicological information. He currently uses Material Safety Data Sheet (MSDS) information in hard copy format.

Dr. Early would like information that provides contact sheets for calling companies to obtain additional information on medicines and chemicals. It would also be beneficial if these contacts were available on-line. The College would like a system that provides access to drug related databases remotely when they are at health fairs. People frequently bring medications to health fairs, and the College would like to provide quick responses, instead of waiting to return to the University to perform the research.

The College communicates frequently with the Department of Family Medicine, but the Department of Family Medicine is not on the MUSC network. They currently use fax machines for these communications. Dr. Early indicated that it would be beneficial if they could communicate over the network.

INTERVIEW 21: 6/1/94

Members Present:

Dr. David Hoel - Chairman, MUSC Department of Biometry and Epidemiology
Jeff Ready - CRC

Interview Purpose:

The purpose of this interview was to gain an understanding about current information access methods used and desired by the MUSC Department of Biometry and Epidemiology for performing environmental risk assessment functions pertaining specifically to Biometry and Epidemiology.

Interview Summary:

Dr. Hoel indicated that he is aware of a number of companies that are putting 'like' databases together into information systems that will provide centralized access to them. He is concerned about the quality and accuracy of non-commercial database access. Dr. Hoel offered the following four recommendations:

- MUSC/EHAP should spend its time being an expert in one area, making the University the central focal point for the country on that area. He stated that information should be collected and placed into a format that can easily be accessed from outsiders.

- An information "reference" should be built for available information. This "reference" should contain a description of databases, contact lists, and phone numbers. He stated that when he wants to obtain information on all animal studies, he knows to access Hanford, since they are currently working on compiling that information.

- It is his belief that MUSC will be heavily involved in DOE studies of health issues at the Savannah River Plant and should begin gathering information available in that area. This includes health studies and analysis information. If possible, MUSC should also collect information related to the Navy yard.

- Access to the main commercial databases (i.e. MEDLINE) is important. Cross-campus and home access would also be beneficial. He understands that this is more of a Library function, and it could be included as a portion of the ODAS.

Appendix B

NATIONAL LIBRARY OF MEDICINE UNIFIED MEDICAL LANGUAGE SYSTEM

NLM is developing a suite of experimental products collectively known as the UMLS. The UMLS project is an ongoing NLM research and development effort designed to facilitate the retrieval and integration of information from multiple machine-readable biomedical information sources. The UMLS approach is to build "Knowledge Sources" that can be integrated into a variety of applications. Currently, the following three Knowledge Sources are being developed:

- Metathesaurus —
  Contains information about biomedical concepts, their representation in different vocabularies and thesauri, and their use and co-occurrence in selected databases. It represents a variety of relationships among terms and can support mapping from the user's terms to appropriate controlled vocabularies.

- Semantic Network —
  Contains information about the types or categories (e.g., Disease or Syndrome, Virus) of terms in the Metathesaurus and the permissible relationships among these types (e.g., Virus causes Disease or Syndrome).

- Information Sources Map -
  Contains both human readable and machine processable information about the scope, location, vocabulary, syntax rules, and access conditions of biomedical databases of all kinds.

The UMLS products are not end-user applications. The Knowledge Sources are intended to be integrated with intelligent interface programs for specific applications. Because the UMLS products are being developed by NLM and fielded to many health institutions, they are becoming a type of standard across the health industry. Therefore, it is imperative that they be considered for integration into the ODAS.

Technical Descriptions

MUSC/EHAP has recently obtained the 1994 Experimental edition of the UMLS Knowledge Sources. The Knowledge sources arrived on four CD-ROM disks, which contain an ASCII version, two browser applications of Meta-1.4, the current version of the UMLS Metathesaurus, and files that summarize the significant differences between this version and the 1993 version. In addition, the disks contain two different physical formats of the Semantic Network, a browser application that uses

one of these formats, a single format of the Information Sources Map, two different physical formats for the latest UMLS Knowledge Source, SPECIALIST Lexicon, and a set of lexical programs for use with the UMLS Knowledge Sources.

Any machine equipped to read ISO 9660 CD-ROM disks will be able to access the UMLS software. All ASCII relational and unit record files on these disks have been terminated by a carriage return/line feed character. This is an MS-DOS standard, and matches both the UNIX and Macintosh standard line terminators. The ASCII file containing Meta-1.4 data elements is more than 450 megabytes in length. The Semantic Network files total approximately 600 kilobytes, the Information Sources Map files total about 800 kilobytes, and the SPECIALIST Lexicon files total about 25 megabytes in length.

Disk four of the set contains the Coach Metathesaurus Browser. This program requires a PC AT-compatible microcomputer running MS-DOS version 4.0 or higher. The Macintosh HFS Browser disk contains the interactive Metathesaurus Hypercard Browser MetaCard, developed by Lexical Technologies. MetaCard runs under Hypercard 2.x and System 6.x or higher. The most direct method of accessing Meta-1.4 information in the ASCII file is to read the CD-ROM files into a database management system. The user may select data elements and create a desired data representation.

General Descriptions

The current Version 1.4 of the Metathesaurus is a database of concepts that appear in one or more different controlled vocabularies and classifications used in the field of biomedicine. The Metathesaurus preserves the meanings, hierarchical connections, and other relationships between terms present in its source vocabularies. In addition, it provides basic information on each of its concepts and establishes new relationships between concepts and terms from different source vocabularies.

The Metathesaurus is organized by concept and meaning. Its purpose is to link alternative names and views together to identify useful relationships among different concepts. Each name in the Metathesaurus has a unique string identifier, and is linked to lexical variants by means of a common term identifier. Each term identifier is linked to a concept identifier. Different terms with the same meaning are linked to the same concept identifier.

Coach Metathesaurus Browser

The Coach Metathesaurus Browser (Coach) is designed to facilitate Grateful Med users with retrieving information from MEDLINE. Coach takes one or two-word queries as input, and returns a list of related concepts from the Metathesaurus as output. The output is ranked using a best-match algorithm based on seven elements of the Metathesaurus record and inverse term frequency.

Coach displays concept definitions, synonyms, lexical variants, related terms, child and sibling terms, semantic types, previous indexing usage, and many other types of information. Coach also displays two views of the Metathesaurus co-occurrence data, which are pairs of concepts that occur together in literature. It also displays tree structures for concepts originating from hierarchically organized sources. This kind of information helps users select additional terms or replacement terms for incorporation with Grateful Med and other on-line search facilities.

Semantic Network

The purpose of the Semantic Network is to provide a consistent categorization of all concepts represented in the UMLS Metathesaurus, and to provide a set of useful relations between these concepts. Major groupings have been established in the Semantic Network for organisms, anatomical structures, biologic function, chemical events, physical objects, and concepts/ideas. Each of the concepts in the Metathesaurus has been assigned one or more semantic types. The 1994 release of the Semantic Network contains 133 semantic types.

The Semantic Network serves as an authority for the semantic types assigned to concepts in the Metathesaurus, and to databases in the Information Sources Map (ISM). However, the relations provided in the Semantic Network do not represent all possible relations between semantic types. Rather, these relations provide a basis for development of a larger set of relations useful for retrieving information from a variety of computerized biomedical databases.

Information Sources Map

The ISM, which is currently under development, describes information sources available in electronic format that provide insight to query response. The prototype ISM file contains data on the major publicly available NLM databases. In addition, it covers database and expert system programs outside of the NLM relating to human genetics, medical diagnosis, environmental health, and toxicology. The ISM is intended to allow automatic connection to information sources and facilitate successful information retrieval sessions.

SPECIALIST Lexicon

SPECIALIST Lexicon provides lexical information needed for the SPECIALIST Natural Language Processing System. It is intended to be a general English lexicon that includes biomedical terms. SPECIALIST Lexicon includes commonly used English words as well as a biomedical vocabulary. The lexicon entry for each word or term records the syntactic, morphological, and graphemic information needed by the SPECIALIST NLP System. SPECIALIST Lexicon consists of a set of lexical entries with one entry for each spelling or set of spelling variants in a particular part of speech.

Conclusion

A great deal of time, effort, and money has been invested in the development of the UMLS technology. The system has been developed and delivered in a common ASCII format that can easily be imported into a relational database management system. Many of the concepts that have been suggested for the ODAS are currently being developed and implemented by the UMLS development team. In order to avoid "reinventing the wheel", incorporating the UMLS system as part of the ODAS should be considered a high priority.

Appendix C

ACRONYM DEFINITIONS

AIDSDRUGS	Acquired Immune Deficiency Syndrome Drugs
AIDSLINE	Acquired Immune Deficiency Syndrome On Line
AIDSTRIALS	Acquired Immune Deficiency Syndrome Trials
ALF	Agricultural Library Forum
API	Application Programming Interface
ATSDR	Agency for Toxic Substance and Disease Registry
AVLINE	Audiovisuals On Line
BCR	Biomolecular Computing Resource
BIOETHICSLINE	Bioethics On Line
BIOSIS	Biological Abstracts
BIOTECHSEEK	Biotechnology Seek
BRS	Bibliographic Retrieval Services
CANCERLIT	Cancer Literature
CAS	Chemical Abstracts System
CATLINE	Catalogue On line
CCB	Configuration Control Board
CCIT	Center for Computing and Information Technology
ChemID	Chemical Identification

CHEMLINE	Chemical On Line
CINAHL	Cumulative Index to Nursing and Allied Health Literature
COTS	Commercial Off-The-Shelf
DART	Developmental and Reproductive Toxicology
DENTALPROJ	Dental Projects
DIRLINE	Directory of Information Resources On Line
DOE	Department of Energy
DXP	Data Exchange Protocol
EHAP	Environmental Hazards Assessment Program
EMBASE	Excerpta Medica Database
EPA	Environmental Protection Agency
ERIC	Education Resources Inventory Catalog
FDA	Food and Drug Administration
GIS	Graphical Information System
GUI	Graphical User Interface
GENE-TOX	Genetic Toxicology
HEALTH	Health Planning and Administration
HISTLINE	History of Medicine On Line
HSDB	Hazardous Substances Data Bank
IPA	International Pharmaceutical Abstracts

IRIS	Integrated Risk Information System
LAN	Local Area Network
MEDLINE	Medical Literature On Line
MESH	Medical Subject Headings
MSDS	Material Safety Data Sheets
MUSC	Medical University of South Carolina
MUSCLS	Medical University of South Carolina Library System
NIH	National Institutes of Health
NLM	National Library of Medicine
NRC	Nuclear Regulatory Commission
NSF	National Science Foundation
ODAS	One-Door Access System
OHS	Occupational Health Services
PATS	Patents
PDQ	Physician Data Query
POPLINE	Population Information On Line
RTECS	Registry of Toxic Effects of Chemical Substances
RDBMS	Relational Database Management System
RREL	Risk Reduction Engineering Laboratory
SCI	Science Citation Index
PSYCH	Psychology

PsycLIT	Psychological Literature
SQL	Standard Query Language
STN	Scientific and Technical Network
TOXLINE	Toxicology On Line
TOXNET	Toxicology Net
TRI	Toxic Chemical Release Inventory
TRIFACTS	Toxic Chemical Release Inventory FACT Sheets
TSCATS	Toxic Substances Control Act Test Submissions
UMLS	Unified Medical Language System

Environmental Hazards Assessment Program

One-Door Access System



Database Survey Report

Attachment I: Completed Database Survey Forms

FINAL

For The:

Medical University of South Carolina

June 30, 1994

Submitted by:

Coleman Research Corporation
Information Systems Division
6551 Loisdale Ct., Suite 800
Springfield, Virginia 22150
(703) 719-9200

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: AIDS AND CANCER RESEARCH DATABASE

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of the literature on a particular subject, guide to ordering full-text documents

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/FAX 301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in specific fields

METHODS OF ACCESSING THE DATA: Magnetic tape local load, remote access via host vendors

ACCESS FEES, IF APPLICABLE: Local load-fixed annual fee/unlimited access; remote-consult host vendor

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX, or micro-computer

SECONDARY STORAGE: Magnetic tape

MEMORY REQUIRED TO STORE THE DATABASE (mbs): five yrs-222.7; ten yrs.-245.1, annually-40.3

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: AGRICOLA

TYPES OF DATA STORED: Bibliographic information

DESCRIPTION OF USES: Research in agricultural science

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: National Agricultural Library

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia/researchers, professionals in agricultural science, etc.

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, Macintosh PC; CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 4 CD-ROM discs

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: AGRIS

TYPES OF DATA STORED: Bibliographic

DESCRIPTION OF USES: Research in agricultural science and technology

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: Food and Agriculture Organization of the United Nations

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia/researchers, prfessionals in agricultural science and technology

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, Macintosh PC; CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 5 CD-ROM discs

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: AGRISEARCH

TYPES OF DATA STORED: Full-text

DESCRIPTION OF USES: Research and development in agriculture and food science

DATA UPDATE FREQUENCY: Annually

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: USDA, Canadian Agricultural Research Council, Comm. of European Communities

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia, researchers, scientists, anyone concerned with research and development in agriculture and food science

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, Macintosh PC; CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1 CD-ROM disc

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: ANALYTICAL ABSTRACTS

TYPES OF DATA STORED: Bibliographic information

DESCRIPTION OF USES: Research in analytical chemistry

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: Royal Society of Chemistry

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia/researchers of analytical chemistry

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM-PC, Macintosh PC; CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1 CD-ROM disc

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: BAKER - J.T. Baker Company Material Safety Data Sheets

TYPES OF DATA STORED: Full-text, quantitative information found on Material Safety Data Sheets

DESCRIPTION OF USES: Compliance with OSHA requirements, industrial hygiene, chemical/medical research

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI International, Inc.)

DATABASE SPONSOR: Chemical Information Systems

TECHNICAL POINT-OF-CONTACT: Customer Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737/FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Professionals concerned with OSHA compliance and industrial hygiene, researchers and academia

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus hourly online and display fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: PC at local level after downloading or screen capturing

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: BIOSIS PREVIEWS - BIOLOGICAL ABSTRACTS

TYPES OF DATA STORED: Bibliographic data with abstracts, major and minor descriptors, keywords

DESCRIPTION OF USES: Research covering the literature of the life sciences including original research and review in the biological and biomedical areas

DATA UPDATE FREQUENCY: Weekly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: BRS Online Service

DATABASE SPONSOR: BIOSIS

TECHNICAL POINT-OF-CONTACT: Online Support Department

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-298-4277/FAX 703-893-0490

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers in the medical, biology, and life sciences professions; academia

METHODS OF ACCESSING THE DATA: Online through Internet; direct access through local telephone network

ACCESS FEES, IF APPLICABLE: Online hourly fees, online and offline prints, telecommunications fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: Gateway database system

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: BIOTECHNOLOGY ABSTRACTS

TYPES OF DATA STORED: Bibliographic information

DESCRIPTION OF USES: Research in biotechnology

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: Derwent Publications, Ltd.

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia/researchers in biotechnology

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, Macintosh PC; CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1 CD-ROM disc

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: BIOTECHNOLOGY AND BIOENGINEERING DATABASE

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of the literature available on a particular subject, guide to ordering full-text documents

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/FAX 301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in a specific field

METHODS OF ACCESSING THE DATA: Magnetic tape local load, remote access via host vendors

ACCESS FEES, IF APPLICABLE: Local load-fixed annual fee/unlimited access; remote-consult host vendor

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX or microcomputer

SECONDARY STORAGE: Magnetic tape storage

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 5 yrs-444.6; 10 yrs-799.8; annually-83.0

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: BIOTECHSEEK

TYPES OF DATA STORED: Bibliographic citations

DESCRIPTION OF USES: Research and current awareness in biotechnology

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: National Library of Medicine

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia and professionals in biotechnology-related disciplines

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via terminals at the NLM, local access via magnetic tape

ACCESS FEES, IF APPLICABLE: Online fees; flat annual fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CAB ABSTRACTS

TYPES OF DATA STORED: Bibliographic references covering agriculture and related sciences, including biotechnology, forestery, and veterinary medicine

DESCRIPTION OF USES: Researching information on agriculture and related sciences

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Abstracts Service

DATABASE SPONSOR: CAB International

TECHNICAL POINT-OF-CONTACT: Jim Sexton; Mngr. of Operations Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-848-6533/FAX 614-447-3713

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia and professionals seeking information on agriculture and related sciences

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Online hourly fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: STN International, Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CABCD

TYPES OF DATA STORED: Bibliographic information

DESCRIPTION OF USES: International research in agriculture, forestry, and related disciplines

DATA UPDATE FREQUENCY: Annually

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: CAB International

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: International academia/researchers in agricultural science, forestry, and related disciplines

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, Macintosh PC; CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 4 CD-ROM discs

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CANCER-CD

TYPES OF DATA STORED: Bibliographic information

DESCRIPTION OF USES: Research on cancer and cancer-related disciplines

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: Elsevier Science Publishers, National Library of Medicine

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia/researchers, anyone interested in cancer-related disciplines

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, Macintosh PC, CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 3 CD-ROM discs

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CANCERLIT

TYPES OF DATA STORED: Bibliographic citations

DESCRIPTION OF USES: Research on major cancer topics

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: National Cancer Institute

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, clinicians, etc. concerned with cancer and related subjects

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via magnetic tape or terminals located at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online fees; flat annual fees for leased magnetic tape

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CATLINE

TYPES OF DATA STORED: Bibliographic citations

DESCRIPTION OF USES: Research in the biomedical sciences; guide to ordering full-text documents

DATA UPDATE FREQUENCY: Weekly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: National Library of Medicine

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, professionals in the biomedical sciences

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via magnetic tape and terminals located at the National Library of medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat annual fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CCML - COMPREHENSIVE CORE MEDICAL LIBRARY

TYPES OF DATA STORED: Fulltext

DESCRIPTION OF USES: A source of fulltext information from major medical journals and textbooks

DATA UPDATE FREQUENCY: Twice weekly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: BRS Online Service

DATABASE SPONSOR: BRS Online Service

TECHNICAL POINT-OF-CONTACT: Online Support Department

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-289-4277/FAX 703-893-0490

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Professionals, researchers and academia in the medical field

METHODS OF ACCESSING THE DATA: Online through Internet; direct access via local telephone network

ACCESS FEES, IF APPLICABLE: Online hourly fees, online and offline prints, telecommunications fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE:

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE: Gateway database system

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CCRIS - CHEMICAL CARCINOGENESIS RESEARCH INFORMATION SYSTEM

TYPES OF DATA STORED: Full-text, quantitative data on assay results and test conditions for 1451 chemicals, including carcinogenicity, mutagenicity and teratogenicity

DESCRIPTION OF USES: Medical/chemical research, occupational safety and health, industrial hygiene

DATA UPDATE FREQUENCY: Irregular (subject to availability of new data)

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI International, Inc.)

DATABASE SPONSOR: National Cancer Institute/National Institutes of Health

TECHNICAL POINT-OF-CONTACT: Customer Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737 /FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, professionals, individuals seeking data on chemical substances

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus hourly online and display fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: PC at local level after downloading or screen capturing

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CHEM-BANK (includes IRIS, RTECS, HSDB, OHMTADS, and CHRIS)

TYPES OF DATA STORED: Full-text, quantitative potentially hazardous chemical information

DESCRIPTION OF USES: Research in analytical chemistry, hazardous substances, toxicology, and related disciplines

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: EPA, NIOSH, NLM, US Coast Guard

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia/researchers in analytical chemistry, anyone requiring data on potentially hazardous chemical substances

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, Macintosh PC, CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 3 CD-ROM discs

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CHEMHAZIS - CHEMICAL HAZARDS INFORMATION SYSTEM

TYPES OF DATA STORED: Abstract data on potentially toxic chemicals

DESCRIPTION OF USES: Used for occupational safety and health-type work; also applies to industrial hygiene

DATA UPDATE FREQUENCY: Irregular

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI International, Inc.)

DATABASE SPONSOR: Chemical Information Systems

TECHNICAL POINT-OF-CONTACT: Customer support staff

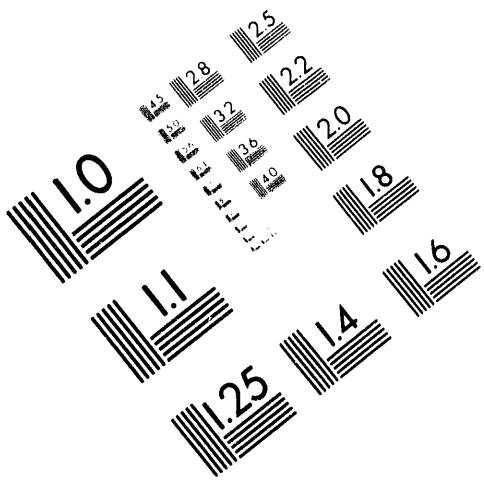
TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737/FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Professionals requiring data on potentially toxic substances as it applies to occupational safety and health

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus hourly online and display fees





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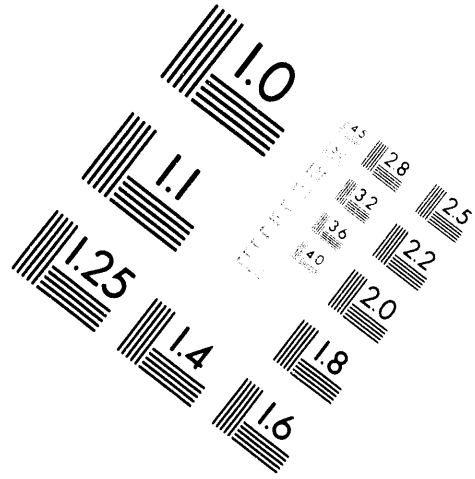

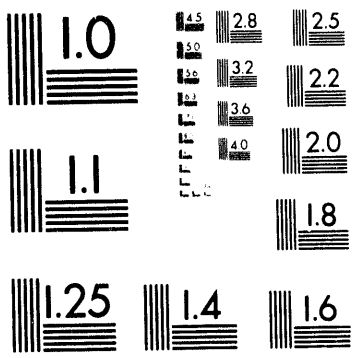

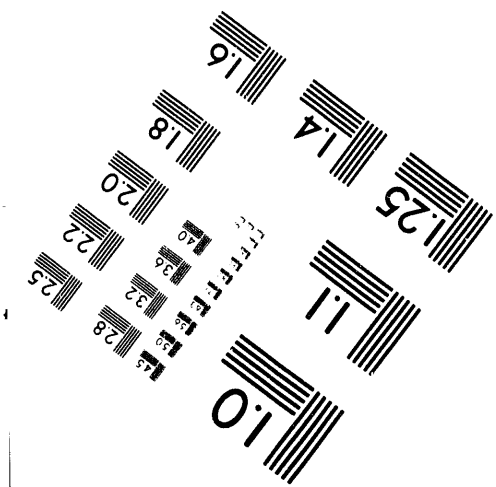

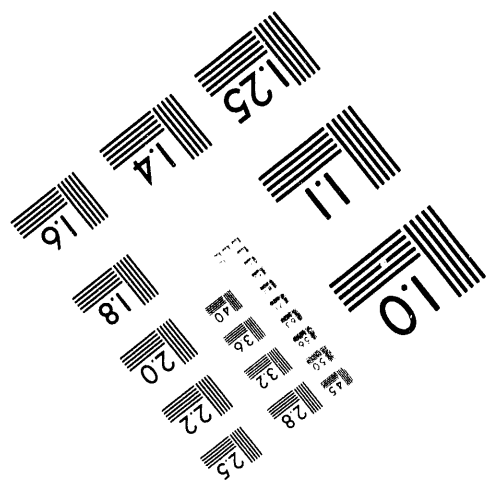

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4 of 8

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: PC at local level after downloading or screen capturing

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: Chemical Abstracts

TYPES OF DATA STORED: Bibliographic references and citations covering biochemistry, chemistry, and chemical engineering

DESCRIPTION OF USES: Researching documentation on biochemistry, chemistry, and chemical engineering

DATA UPDATE FREQUENCY: Biweekly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Abstracts Service

DATABASE SPONSOR: CAB International

TECHNICAL POINT-OF-CONTACT: Jim Sexton; Mngr. of Operations Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-848-6533/FAX 614-447-3713

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia and professionals seeking information on biochemistry, chemistry, and chemical engineering

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Online hourly fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: STN International, Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CHEMICAL ENGINEERING AND BIOTECHNOLOGY ABSTRACTS

TYPES OF DATA STORED: Bibliographic information on chemical engineering and biotechnology

DESCRIPTION OF USES: Researching documentation on chemical engineering and biotechnology

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Abstracts Service

DATABASE SPONSOR: Royal Society of Chemistry

TECHNICAL POINT-OF-CONTACT: Jim Sexton; Mngr. of Operations Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-848-6533/FAX 614-447-3713

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, professionals seeking information on chemical engineering and biotechnology

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Online hourly fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: STN International, Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CHEMICAL SAFETY NEWS BASE

TYPES OF DATA STORED: Contains bibliographic information related to fire and explosions, storage and transport, toxic substances, studies on laboratory animals, waste removal, and other subjects related to chemical health and safety

DESCRIPTION OF USES: Researching chemical health and safety

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Abstracts Service

DATABASE SPONSOR: Royal Society of Chemistry

TECHNICAL POINT-OF-CONTACT: Jim Sexton; Mngr. of Operations Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-848-6533/FAX 614-447-3713

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academians, and professionals seeking information related to chemical health and safety

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Online hourly rates

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: STN International, Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: ChemID

TYPES OF DATA STORED: Full-text, quantitative data on chemical compounds

DESCRIPTION OF USES: Chemical dictionary for over 180,000 compounds of regulatory and biomedical interest

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: National Library of Medicine

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, and professionals in analytical chemistry

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via magnetic tape or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat annual fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CHEMLINE

TYPES OF DATA STORED: Full-text, quantitative data on chemical compounds

DESCRIPTION OF USES: Dictionary for chemical compounds

DATA UPDATE FREQUENCY: Bimonthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: National Library of Medicine

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia and professionals in analytical chemistry

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via magnetic tape or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat annual fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CHEMLIST

TYPES OF DATA STORED: Full-text information on chemical substances listed in the EPA's Toxic Substances Control Act Inventory, subject to regulation under SARA Title III, taken from the EINECS database, or from a variety of other sources

DESCRIPTION OF USES: Researching information on chemical substances

DATA UPDATE FREQUENCY: Weekly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Abstracts Service

DATABASE SPONSOR: Chemical Abstracts Service

TECHNICAL POINT-OF-CONTACT: Jim Sexton; Mngr. of Operations Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-848-6533/FAX 614-447-3713

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academians, professionals seeking information on chemical substances

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Online hourly fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: STN International, Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CHEMREACT

TYPES OF DATA STORED: Contains chemical structures and reaction information for organic substances

DESCRIPTION OF USES: Researching chemical structures and reactions for organic chemicals

DATA UPDATE FREQUENCY: Annually

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Abstracts Service

DATABASE SPONSOR: InfoChem

TECHNICAL POINT-OF-CONTACT: Jim Sexton; Mngr. of Operations Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-848-6533/FAX 614-447-3713

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Chemical engineers, researchers, academians, and professionals seeking information on chemical structures and reactions for organic chemicals

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Online hourly rates

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: STN International, Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CHEMSAFE

TYPES OF DATA STORED: Contains full-text and bibliographic information on evaluated safety characteristics of flammable substances

DESCRIPTION OF USES: Researching technical rules, laws, collections of safety parameters, and accident prevention regulations pertaining to flammable substances

DATA UPDATE FREQUENCY: Twice per year

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Abstracts Service

DATABASE SPONSOR: Chemical Abstracts Service

TECHNICAL POINT-OF-CONTACT: Jim Sexton; Mngr. of Operations Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-848-6533/FAX 614-447-3713

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Chemical engineers, researchers, and professionals concerned with the safety characteristics of flammable substances

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Online hourly rates

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: STN International, Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CHID - COMBINED HEALTH INFORMATION DATABASE

TYPES OF DATA STORED: Bibliographic with abstracts, some fulltext

DESCRIPTION OF USES: Provides a wide variety of medical information to health professionals, as well as the general public, on various health issues and topics

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE VENDOR: BRS Online Service

DATABASE PRODUCER: Various Federal agencies

TECHNICAL POINT-OF-CONTACT: Online Support Department

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-289-4277/FAX 703-893-0490

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Health professionals, researchers, and academia, general public

METHODS OF ACCESSING THE DATA: Online via Internet; direct access via local telephone network

ACCESS FEES, IF APPLICABLE: Online hourly fees, online and offline prints, telecommunications fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: Gateway database system

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CHRIS - CHEMICAL HAZARD RESPONSE INFORMATION SYSTEM

TYPES OF DATA STORED: Full-text, quantitative information on approximately 1220 chemicals

DESCRIPTION OF USES: Medical/chemical research, occupational safety and health, industrial hygiene

DATA UPDATE FREQUENCY: Irregular (subject to availability of new data)

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI International, Inc.)

DATABASE SPONSOR: US Coast Guard

TECHNICAL POINT-OF-CONTACT: Customer Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737/FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, professionals, individuals seeking data on chemical substances

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus hourly online and display fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: Gateway database system

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CONFERENCE PAPER DATABASE

TYPES OF DATA STORED: Citations, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of the literature on a particular subject, guide to ordering full-text documents

DATA UPDATE FREQUENCY:

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/(FAX)301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in a specific field

METHODS OF ACCESSING THE DATA: Magnetic tape local load; remote access via host vendors; online from DIALOG Information Services and STN International

ACCESS FEES, IF APPLICABLE: Local load-fixed annual fee/unlimited access, remote-consult host vendors

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: PC at local level after downloading or screen capturing

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX, or microcomputer

SECONDARY STORAGE: Magnetic tape

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 5 yrs-217.5; 10 yrs-402.9; annually-43.2

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CRISP - COMPUTERIZED RETRIEVAL OF INFORMATION ON SCIENTIFIC RESEARCH PROJECTS

TYPES OF DATA STORED: Bibliographic information with some abstracts

DESCRIPTION OF USES: Researching information on various research projects sponsored by the US Public Health Service; covers grants, contracts, intramural projects and cooperative agreements

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE VENDOR: BRS Online Service

DATABASE PRODUCER: National Institutes of Health

TECHNICAL POINT-OF-CONTACT: Online Support Department

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-289-4277/FAX 703-893-0490

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Research scientists, organizations and individuals seeking funding for research

METHODS OF ACCESSING THE DATA: Online via Internet; direct access via local telephone network

ACCESS FEES, IF APPLICABLE: Online hourly fees, online and offline prints, telecommunications fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: Gateway database system

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CTCP - CLINICAL TOXICOLOGY OF COMMERCIAL PRODUCTS

TYPES OF DATA STORED: Full-text information on manufacturers, uses, and composition of approximately 23,000 commercial products

DESCRIPTION OF USES: Medical/chemical research, occupational safety and health research, industrial hygiene applications

DATA UPDATE FREQUENCY: None

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI International, Inc.)

DATABASE SPONSOR: Chemical Information Systems

TECHNICAL POINT-OF-CONTACT: Customer Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737/FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, professionals, individuals seeking information on chemical substances and commercial products

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus hourly online and display fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible

SECONDARY STORAGE: PC at local level after downloading or screen capturing

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CURRENT AWARENESS IN BIOLOGICAL SCIENCES

TYPES OF DATA STORED: Bibliographic

DESCRIPTION OF USES: Researching information on the biological sciences

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: BRS Online Service

DATABASE SPONSOR: BRS Online Service

TECHNICAL POINT-OF-CONTACT: Online Support Department

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-289-4277/FAX 703-893-0490

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Biologists, life scientists

METHODS OF ACCESSING THE DATA: Online via Internet; direct access via local telephone network

ACCESS FEES, IF APPLICABLE: Online hourly fees, online and offline prints, telecommunications fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: Gateway database system

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CURRENT CONTENTS

TYPES OF DATA STORED: Bibliographic information from all items in scholarly journals including title, author, keywords, keywords plus, abstract, author reprint address, publisher's address

DESCRIPTION OF USES: Current awareness, retrospective searching, competitive awareness; researchers can also use author information to build a database of network contacts; profiles can be saved and run on new weekly updates

DATA UPDATE FREQUENCY: Weekly releases for all formats

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Institute for Scientific Information

DATABASE SPONSOR: Institute for Scientific Information

TECHNICAL POINT-OF-CONTACT: Technical Help Desk

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-336-4474/FAX 215-386-6362

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Scientists, researchers, graduate students, librarians, information specialists, information brokers in academic, corporate and government sectors world-wide

METHODS OF ACCESSING THE DATA: Hard copy, IBM PC, Macintosh PC, NEC 9800, CD-ROM, magnetic tape, online through DIALOG and Data-Star; also networking available

ACCESS FEES, IF APPLICABLE: Varies/format; online varies/vendor; annual subscription for off-line formats

IV. DATABASE PLATFORM

DBMS TYPE: CD-ROM uses Quid Software

HARDWARE REQUIREMENTS: Varies by format and platform; all platforms available

SECONDARY STORAGE: Varies by format and platform

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Varies by format and edition

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: None; network contracts are negotiable

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: CURRENT CONTENTS SEARCH

TYPES OF DATA STORED: Bibliographic information from all items in scholarly journals including title, author, keywords, keywords plus, abstract, author reprint address, publisher's address

DESCRIPTION OF USES: Current awareness, retrospective searching, competitive awareness; researchers can also use author information to build a database of network contacts; profiles can be saved and run on new weekly updates

DATA UPDATE FREQUENCY: Weekly releases for all formats

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Institute for Scientific Information

DATABASE SPONSOR: Institute for Scientific Information

TECHNICAL POINT-OF-CONTACT: Technical Help Desk

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METHODS OF ACCESSING THE DATA: Hard copy, IBM PC, Macintosh PC, NEC 9800, CD-ROM, magnetic tape, online through DIALOG and Data-Star; also networking available

ACCESS FEES, IF APPLICABLE: Varies/format; online varies/vendor; annual subsctription for off-line formats

IV. DATABASE PLATFORM

DBMS TYPE: CD-ROM uses Quid Software

HARDWARE REQUIREMENTS: Varies by format and platform; all platforms available

SECONDARY STORAGE: Varies by format and platform

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Varies by format and edition

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: None; network contacts are negotiable

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: DBIR - DIRECTORY OF BIOTECHNOLOGY INFORMATION RESOURCES

TYPES OF DATA STORED: Full-text descriptions, points-of-contact, organization profiles, etc.

DESCRIPTION OF USES: Used as a referral tool for biotechnology information resources

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: National Library of Medicine

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, professionals; anyone searching for information on biotechnology

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via magnetic tape or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat annual fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: DERWENT BIOTECHNOLOGY ABSTRACTS

TYPES OF DATA STORED: Bibliographic information covering all aspects of biotechnology, from genetic manipulation through biochemical engineering and fermentation to downstream processing

DESCRIPTION OF USES: Researching world-wide literature on biotechnology

DATA UPDATE FREQUENCY: Biweekly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Abstracts Service

DATABASE SPONSOR: Derwent Publications, Ltd.

TECHNICAL POINT-OF-CONTACT: Jim Sexton; Mngr. of Operations Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-848-6533/FAX 614-447-3713

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academians, and professionals seeking bibliographic information on biotechnology

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Online hourly rates

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: STN International, Internet

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible

SECONDARY STORAGE: Magnetic tape

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: DRUG INFORMATION FULLTEXT

TYPES OF DATA STORED: Full-text drug monographs on every single-drug entity available in the U.S. and the compatibility/stability of those drugs

DESCRIPTION OF USES: Pharmacological and chemical research

DATA UPDATE FREQUENCY: Yearly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI International, Inc.)

DATABASE SPONSOR: American Society of Hospital Pharmacists

TECHNICAL POINT-OF-CONTACT: Customer Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737/FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, professionals, practitioners, individuals concerned with compatibility/stability of commercial/investigational drugs

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus hourly online and display fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: PC at local level after downloading or screen capturing

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: DRUG INFORMATION FULL-TEXT/ITERNATIONAL PHARMACEUTICAL ABSTRACTS

TYPES OF DATA STORED: Bibliographic and full-text

DESCRIPTION OF USES: Pharmaceutical research

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: American Society of Hospital Pharmacists

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia/researchers in pharmacology

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, Macintosh PC, CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 2 CD-ROM discs

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: DRUGUPDATES

TYPES OF DATA STORED: Full-text information covering all stages of pharmaceutical development, from laboratory or patent report to clinical trials to market introduction

DESCRIPTION OF USES: Researching the history of development of pharmaceuticals as well as current news events concerning the drug

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Abstracts Service

DATABASE SPONSOR: IMS World Publications

TECHNICAL POINT-OF-CONTACT: Jim Sexton; Mngr. of Operations Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-848-6533/FAX 614-447-3713

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academians, and professionals concerned with the developmental history and current news events of pharmaceuticals

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Online hourly rates

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: STN International, Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: EINECS PLUS-CD

TYPES OF DATA STORED: Full-text and quantitative information on chemical substances

DESCRIPTION OF USES: Research in analytical chemistry

DATA UPDATE FREQUENCY: Irregular

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: European Community's Office for Official Publications

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia/researchers in analytical chemistry

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: One-time subscription fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, Macintosh PC; CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1 CD-ROM disc

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: EMBASE

TYPES OF DATA STORED: Contains bibliographic references covering worldwide literature in the biomedical and pharmaceutical fields

DESCRIPTION OF USES: Researching information on biomedicine and pharmacology, including biological science, biochemistry, environmental science applications

DATA UPDATE FREQUENCY: Weekly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Abstracts Service

DATABASE SPONSOR: Elsevier Science Publishers

TECHNICAL POINT-OF-CONTACT: Jim Sexton; Mngr. of Operations Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-848-6533/FAX 614-447-3713

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, and professionals seeking bibliographic information on biomedicine and pharmacology

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Online hourly rates

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: STN International, Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: EMICBACK - ENVIRONMENTAL MUTAGEN INFORMATION CENTER BACKFILE

TYPES OF DATA STORED: Bibliographic citations, references to chemical, biological, and physical agents that have been tested for genotoxic activity

DESCRIPTION OF USES: Researching international information on chemical, biological, and physical agents that have been tested for genotoxic activity

DATA UPDATE FREQUENCY: Irregular

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: DOE (ORNL), EPA, NIEHS

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, professionals searching for information on environmental mutagens

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via magnetic tape or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat annual fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IMB PC or compatible, modem

SECONDARY STORAGE: PC at local level after downloading or screen capture

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: ENVIROLINE

TYPES OF DATA STORED: Bibliographic indexing and abstracts

DESCRIPTION OF USES: Researching periodicals, government documents, industry reports, proceedings of meetings, newspaper articles, films, and monographs pertaining to environmental issues

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: R. R. Bowker Electronic Publishers

DATABASE SPONSOR: R. R. Bowker Electronic Publishers

TECHNICAL POINT-OF-CONTACT: Jim Nicolson; Mngr.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-323-3288/FAX 908-665-3528

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, professionals, and academia in federal, private and academic sectors concerned with environmental issues

METHODS OF ACCESSING THE DATA: IBM PC or compatible, modem

ACCESS FEES, IF APPLICABLE: Annual subscription fee, online per-minute fees and offline print fees

IV. DATABASE PLATFORM

DBMS TYPE: Proprietary

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Access through Internet for similar fees

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: ENVIRONMENTAL BIBLIOGRAPHY

TYPES OF DATA STORED: Bibliographic indexing covering fields of human ecology, atmospheric studies, energy, land resources, water resources, and nutrition and health

DESCRIPTION OF USES: Environmental research

DATA UPDATE FREQUENCY: Bimonthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: DIALOG Information Services, Inc.

DATABASE SPONSOR: DIALOG Information Services, Inc.

TECHNICAL POINT-OF-CONTACT: User Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-334-2564/FAX 415-858-4043

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, librarians, chemists, land use planners, government officials, corporate executives, private industry

METHODS OF ACCESSING THE DATA: IBM PC or compatible, modem

ACCESS FEES, IF APPLICABLE: Annual subscription fee, online per-minute fee and offline print fee

IV. DATABASE PLATFORM

DBMS TYPE: Proprietary software

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Access through Internet for similar fees

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: ENVIRONMENTAL SCIENCES AND POLLUTION MANAGEMENT DATABASE

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of literature available on a particular subject, guide to ordering full-text documents

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/(FAX)301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in specific fields

METHODS OF ACCESSING THE DATA: Magnetic tape local load; remote access via host vendors

ACCESS FEES, IF APPLICABLE: Local load-fixed annual fee/unlimited access; remote-consult host vendors

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX or microcomputer

SECONDARY STORAGE: Magnetic tape

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 5 yrs-572.3; 10 yrs-981.1; annually-101.0

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: ERNS - EMERGENCY RESPONSE NOTIFICATION SYSTEM

TYPES OF DATA STORED: Full-text and quantitative information on hazardous substance releases in U.S. territories

DESCRIPTION OF USES: Researching environmental assessments, remediation projects, emergency preparedness, etc.

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI International, Inc.)

DATABASE SPONSOR: Environmental Protection Agency

TECHNICAL POINT-OF-CONTACT: Customer Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737/FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Environmental professionals and researchers

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus hourly online and display fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: PC at local level after downloading or screen capture

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: ETICBACK - ENVIRONMENTAL TERATOLOGY INFORMATION CENTER BACKFILE

TYPES OF DATA STORED: Bibliographic citations with references to agents which may cause birth defects

DESCRIPTION OF USES: Researching information on teratology, developmental and reproductive toxicology

DATA UPDATE FREQUENCY: Irregular

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: ATSDR, EPA, NIEHS

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia and professionals searching for information on teratology and developmental and reproductive toxicology

METHODS OF ACCESSING THE DATA: Online via PC and modem, remote access via magnetic tapes or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: The Etiology of Cancer

TYPES OF DATA STORED: Full-text, multi-media

DESCRIPTION OF USES: Multi-media tutorial adressing the environmental and genetic causes of cancer

DATA UPDATE FREQUENCY: One-time

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: SilverPlatter Information, Inc.

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia, researchers, physicians; anyone concerned with the environmental and genetic causes of cancer

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: One-time fee

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: Macintosh PC with multi-media capability

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1 CD-ROM disc

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: EXAMS II - EXPOSURE ANALYSIS MODELLING SYSTEM

TYPES OF DATA STORED: Quantitative and full-text

DESCRIPTION OF USES: Persistence and mobility of organic chemicals in aquatic ecosystems

DATA UPDATE FREQUENCY: Semi-annual

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Environmental Protection Agency

DATABASE SPONSOR: Environmental Protection Agency

TECHNICAL POINT-OF-CONTACT: Lawrence Burns

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 706-546-3511/FAX 706-546-3252

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Primarily government and industrial/consultant technical staff

METHODS OF ACCESSING THE DATA: PC CD-ROM, EPA WAN

ACCESS FEES, IF APPLICABLE: N/A

IV. DATABASE PLATFORM

DBMS TYPE: N/A

HARDWARE REQUIREMENTS: IBM PC

SECONDARY STORAGE: CD-ROM, hard drive

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 20 mb and CD-ROM

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: N/A

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: *EXPANDED* LIFE SCIENCES COLLECTION *PLUS* MARINE BIOLOGY AND BIOENGINEERING DATABASE

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of available literature on a particular subject, guide to ordering full-text documents

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/FAX 301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in specific fields

METHODS OF ACCESSING THE DATA: Magnetic tape local load; remote access via host vendors

ACCESS FEES, IF APPLICABLE: Local load-fixed annual fee/unlimited access; remote-consult host vendor

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX, or microcomputer

SECONDARY STORAGE: Magnetic tape

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 5 yrs-1,481.3; 10 yrs-2,495.1; annually-209.1

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: GENBANK

TYPES OF DATA STORED: Contains nucleic acid sequence data and related descriptive and bibliographic information

DESCRIPTION OF USES: Researching nucleic acid sequence data

DATA UPDATE FREQUENCY:

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Abstracts Service

DATABASE SPONSOR: National Center for Biotechnology Information

TECHNICAL POINT-OF-CONTACT: Jim Sexton; Mngr. of Operations Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-848-6533/FAX 614-447-3713

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academians, and professionals seeking information on nucleic acid sequences and related descriptive and bibliographic information

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Online hourly rates

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: STN International, Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: GENETICS DATABASE

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of available literature on a particular subject, guide to ordering full-text documents

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/(FAX)301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in specific fields

METHODS OF ACCESSING THE DATA: Magnetic tape local load, remote access via host vendors

ACCESS FEES, IF APPLICABLE: local load-fixed annual fee/unlimited access; remote-consult host vendor

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX, or microcomputer

SECONDARY STORAGE: Magnetic tape

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 5 yrs-328.8; 10 yrs-488.8; annually-68.9

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: GENETOX

TYPES OF DATA STORED: Full-text and quantitative mutagenicity data on over 4300 chemicals tested against various biological systems

DESCRIPTION OF USES: Genetic and biomedical research

DATA UPDATE FREQUENCY: Irregular (subject to availability of new data)

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI International, Inc.)

DATABASE SPONSOR: Chemical Information Systems

TECHNICAL POINT-OF-CONTACT: Customer Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737/FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia and professionals in genetic and biomedical research

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus hourly online and display fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: PC at local level after downloading or screen capturing

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: GENE-TOX

TYPES OF DATA STORED: Full-text, bibliographic

DESCRIPTION OF USES: Research on chemicals tested for mutatgenicity

DATA UPDATE FREQUENCY: Irregular

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: EPA

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, professionals searching for information on genetic toxicology and chemicals tested for mutagenicity

METHODS OF ACCESSING THE DATA: Online via PC and modem, remote access via magnetic tape or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat fees for leased magnetic tape

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: GIABS - GASTROINTESTINAL ABSORPTION DATABASE

TYPES OF DATA STORED: Full-text and quantitative data on the absorption, distribution, metabolism, or excretion of approximately 3,100 chemicals and their effects on humans and laboratory animals

DESCRIPTION OF USES: Researching data on exposure to chemical substances through ingestion

DATA UPDATE FREQUENCY: Irregular (subject to availability of new data)

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI International, Inc.)

DATABASE SPONSOR: Chemical Information Systems

TECHNICAL POINT-OF-CONTACT: Customer Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737/FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia and professionals researching data on exposure to chemical substances through ingestion

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus hourly online and display fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: PC at local level after downloading or screen capturing

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: HAZARDOUS WASTE SUPERFUND COLLECTION DATABASE

TYPES OF DATA STORED: Bibliographic references and abstracts for documents in the EPA Hazardous Waste Superfund Collection; which contains books, legislation, regulations, reports from Federal agencies, etc. related to hazardous waste

DESCRIPTION OF USES: Researching information on hazardous waste and the Federal Superfund Program; also assists EPA staff by making key documents and services easily accessible through the EPA Library Network

DATA UPDATE FREQUENCY: Unknown

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: EPA

DATABASE SPONSOR: EPA

TECHNICAL POINT-OF-CONTACT: Felice Sacks

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 202-382-5934

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: EPA staff, hazardous waste professionals, researchers, academia; accessible by general public

METHODS OF ACCESSING THE DATA: IBM PC or compatible, modem (online)

ACCESS FEES, IF APPLICABLE: None

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): N/A

INFORMATION SYSTEM TYPE: Gateway database system

NETWORKS PROVIDING ACCESS TO THE DATABASE: EPA's LAN/WAN

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: HAZDAT - HAZARDOUS SUBSTANCE RELEASE/HEALTH EFFECTS DATABASE

TYPES OF DATA STORED: Quantitative data (with few text files) related to hazardous waste sites, as collected from documents released by ATSDR

DESCRIPTION OF USES: Provides site-specific and media/contaminant-specific data; as well as health studies and toxicology information

DATA UPDATE FREQUENCY: Daily

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Agency for Toxic Substances and Disease Registry (ATSDR)

DATABASE SPONSOR: ATSDR

TECHNICAL POINT-OF-CONTACT: Sandra A. Susten, Ph.D.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 404-639-0700/FAX 404-639-0744

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Public health officials (federal, state, and local), researchers, academia

METHODS OF ACCESSING THE DATA: LAN/WAN to the mainframe computer, Centers for Disease Control and Prevention (CDC), Atlanta, GA

ACCESS FEES, IF APPLICABLE: None

IV. DATABASE PLATFORM

DBMS TYPE: ADABASE

HARDWARE REQUIREMENTS: IBM PC on LAN/WAN

SECONDARY STORAGE: NA

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 100 megabytes

INFORMATION SYSTEM TYPE: Autonomous Database System

NETWORKS PROVIDING ACCESS TO THE DATABASE: LAN/WAN

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: InterNet HazDat - HAZARDOUS SUBSTANCE RELEASE/HEALTH EFFECTS DATABASE

TYPES OF DATA STORED: Quantitative data related to hazardous waste sites, as collected from documents released by ATSDR; includes summary text from some documents

DESCRIPTION OF USES: Provides site-specific and media/contaminant-specific data, as well as toxicological information

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Agency for Toxic Substances and Disease Registry (ATSDR)

DATABASE SPONSOR: ATSDR

TECHNICAL POINT-OF-CONTACT: Sandra A. Susten

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 404-639-0700/FAX 404-639-0744

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Health officials, researchers, academia, industry

METHODS OF ACCESSING THE DATA: Via InterNet

ACCESS FEES, IF APPLICABLE: None

IV. DATABASE PLATFORM

DBMS TYPE: Sybase

HARDWARE REQUIREMENTS: UNIX workstation, IBM PC or Macintosh; modem or direct connect to InterNet

SECONDARY STORAGE: NA

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 100 megabytes

INFORMATION SYSTEM TYPE: Autonomous Database System

NETWORKS PROVIDING ACCESS TO THE DATABASE: InterNet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: HAZINF - HAZARDOUS CHEMICALS INFORMATION AND DISPOSAL

TYPES OF DATA STORED: Full-text and quantitative information on disposal/classification of 220 substances or classes of substances

DESCRIPTION OF USES: Industrial hygiene, transportation of hazardous substances, chemical research

DATA UPDATE FREQUENCY: None

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI, International, Inc.)

DATABASE SPONSOR: Chemical Information Systems

TECHNICAL POINT-OF-CONTACT: Customer Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737/FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers and professionals in industrial hygiene, transportation, and handling of hazardous materials

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus hourly online and display fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: PC at local level after downloading or screen capturing

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: HEALSAFE

TYPES OF DATA STORED: Bibliographic information covering literature relating to public health, safety, and industrial hygiene

DESCRIPTION OF USES: Researchnig worldwide bibliographic information on public health, safety, and industrial hygiene

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Abstracts Service

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Jim Sexton; Mngr. of Operations Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-848-6533/FAX 614-447-3713

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academians, and professionals seeking bibliographic information on public health, safety, and industrial hygiene

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Online hourly rates

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: STN International, Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: HSDB - HAZARDOUS SUBSTANCES DATA BANK

TYPES OF DATA STORED: Full-text, quantitative information on hazardous chemicals and their toxic effects, environmental fate, and safety and handling procedures

DESCRIPTION OF USES: Researching toxicity and biomedical effects of hazardous chemicals; also for emergency handling procedures, environmental fate, human exposure, and regulatory requirements

DATA UPDATE FREQUENCY: Continuous

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: NLM, ATSDR

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia and professionals searching for information on hazardous chemicals

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via magnetic tape or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat annual fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: IARCancer Disc

TYPES OF DATA STORED: Full-text

DESCRIPTION OF USES: Researching links between exposure to environmental chemicals and the development of human cancer and genetic effects

DATA UPDATE FREQUENCY: Irregular

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: International Agency for Cancer Research

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia, researchers, regulatory agencies, anyone interested in understanding the links between exposure to chemicals and the development of cancer and genetic defects in humans

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: One-time fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS

HARDWARE REQUIREMENTS: IBM PC, CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1 CD-ROM disc

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: INTERNATIONAL PHARMACEUTICAL ABSTRACTS

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Research in pharmacology and drug therapy-related disciplines

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: American Society of Hospital Pharmacists

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia, researchers in pharmacology and drug therapy-related disciplines

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, Macintosh PC, CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1 CD-ROM disc

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: IRIS - INTEGRATED RISK INFORMATION SYSTEM

TYPES OF DATA STORED: Quantitative and fulltext information on health risk and regulatory information on specific chemicals

DESCRIPTION OF USES: Researching data on oral and inhalation reference doses for chemicals, calculating health risks associated with them, and reviewing regulatory information applying to them

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Environmental Protection Agency

DATABASE SPONSOR: Environmental Protection Agency

TECHNICAL POINT-OF-CONTACT: Ruby Boyd

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 202-260-8387/FAX 202-260-4655

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Toxicologists, environmental professionals, anyone researching data on potentially toxic substances

METHODS OF ACCESSING THE DATA: Available online from NLM and CIS; local mount from NTIS

ACCESS FEES, IF APPLICABLE: Online hourly fees or one-time flat fee, depending on the vendor

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem for remote access

SECONDARY STORAGE: Floppy disk and hard drive for local mount

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

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5 of 8

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: IRPTC - INTERNATIONAL REGISTER OF POTENTIALLY TOXIC CHEMICALS

TYPES OF DATA STORED: Fulltext and quantitative information on chemical substances

DESCRIPTION OF USES: International databank of chemical profiles aimed at helping the world community make better use of global resources and give developing countries the information base to manage chemicals effectively

DATA UPDATE FREQUENCY: Annually

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Environmental Protection Agency

DATABASE SPONSOR: Environmental Protection Agency

TECHNICAL POINT-OF-CONTACT: Emma McNamara

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 202-260-1522/FAX 202-260-3923

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: U.S. EPA, United Nations Environment Programme members

METHODS OF ACCESSING THE DATA: EPA mainframe

ACCESS FEES, IF APPLICABLE: Not Applicable; not available for public access

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: Unknown

SECONDARY STORAGE: Not Applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: None

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: MALLIN - Mallinckrodt, Inc. Material Safety Data Sheets

TYPES OF DATA STORED: Full-text, quantitative information found on Material Safety Data Sheets

DESCRIPTION OF USES: Compliance with OSHA requirements, industrial hygiene, chemical/medical research

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI International, Inc.)

DATABASE SPONSOR: Chemical Information Systems

TECHNICAL POINT-OF-CONTACT: Customer Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737/FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Professionals concerned with OSHA compliance and industrial hygiene, researchers and academia requiring data on chemical substances

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus hourly online and display fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: PC at local level after downloading or screen capturing

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: LIFE SCIENCES COLLECTION (Online/CD-ROM)

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of available literature on a particular subject, guide to ordering full-text documents

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/(FAX)301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in specific fields

METHODS OF ACCESSING THE DATA: Online - DIALOG Information Services, STN International; CD-ROM databases

ACCESS FEES, IF APPLICABLE: Local load-fixed annual fee/unlimited access; remote access-consult host vendor; CD-ROM-annual subscription fee

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX, or microcomputer

SECONDARY STORAGE: CD-ROM Reader

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1982+/4 discs; 1986+/3 discs; 1990+/2 discs

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: MEDLARS - MEDICAL LITERATURE ANALYSIS AND RETRIEVAL SYSTEM

TYPES OF DATA STORED: Not applicable

DESCRIPTION OF USES: MEDLARS is a system of databases and information systems offered by the National Library of Medicine. MEDLARS is comprised of two computer subsystems, ELHILL and TOXNET, on which reside over 40 online databases containing over 16 million references

DATA UPDATE FREQUENCY: Varies for each database

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: National Library of Medicine

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Universities, medical schools, hospitals, government agencies, commercial and non-profit organizations, private individuals

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via magnetic tape or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat annual fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: Network of databases

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: MEDLINE - MEDLARS ONLINE

TYPES OF DATA STORED: Bibliographic citations

DESCRIPTION OF USES: Research in biomedicine, guide for obtaining full-text documents

DATA UPDATE FREQUENCY: Weekly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: National Library of Medicine

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, professionals, anyone searching for biomedical information

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via magnetic tape or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat annual fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: MERCK INDEX ONLINE

TYPES OF DATA STORED: Fulltext and quantitative information on chemical substances

DESCRIPTION OF USES: Analytical chemistry applications, researching chemical substances

DATA UPDATE FREQUENCY: Semi-annually

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: BRS Online Service

DATABASE SPONSOR: Merck & Co., Inc.

TECHNICAL POINT-OF-CONTACT: Online Support Department

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 703-442-0900/FAX 703-893-0490

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Chemists, pharmacists

METHODS OF ACCESSING THE DATA: Online via Internet; direct access via local telephone network

ACCESS FEES, IF APPLICABLE: Online hourly fees, online and offline prints, telecommunications fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: Gateway database system

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: MICROBIOLOGY DATABASE

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of available literature on a particular subject

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/(FAX)301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in specific fields

METHODS OF ACCESSING THE DATA: Magnetic tape local load; remote access via host vendors

ACCESS FEES, IF APPLICABLE: Local load-fixed annual fee/unlimited access; remote-consult host vendor

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX, or microcomputer

SECONDARY STORAGE: Magnetic tape

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 5 yrs-385.6; 10 yrs-705.0; annually-67.0

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: MOLECULAR AND CELLULAR BIOLOGY DATABASE

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of available literature on a particular subject, guide to ordering full-text documents

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/(FAX)301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in specific fields

METHODS OF ACCESSING THE DATA: Magnetic tape local load, remote access via host vendors

ACCESS FEES, IF APPLICABLE: Local load-fixed annual fee/unlimited access; remote-consult host vendor

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX, or microcomputer

SECONDARY STORAGE: Magnetic tape

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 5 yrs-921.6; 10 yrs-1,701.3; annually-128.5

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: The Nature of Genes

TYPES OF DATA STORED: Full-text, multi-media

DESCRIPTION OF USES: Multi-media tutorial for current understanding of molecular biology

DATA UPDATE FREQUENCY: One-time

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: SilverPlatter Information, Inc.

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia, researchers concerned with molecular biology and its applications to human genetics

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: One-time fee

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: Macintosh PC with multi-media capability

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1 CD-ROM

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: NIOSHTIC - NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH TECHNICAL INFORMATION CENTER

TYPES OF DATA STORED: Bibliographic information with abstracts

DESCRIPTION OF USES: Researching information on occupational safety and health

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: ORBIT

DATABASE SPONSOR: National Institute for Occupational Safety and Health, Tech. Info. Branch

TECHNICAL POINT-OF-CONTACT: Online Support Department

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 703-442-0900/FAX 703-893-04)

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Health and safety administrators, plant and facility managers

METHODS OF ACCESSING THE DATA: Direct access online via local telephone network

ACCESS FEES, IF APPLICABLE: Flat online hourly rate

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: NTIS BIBLIOGRAPHIC DATABASE

TYPES OF DATA STORED: Bibliographic citations

DESCRIPTION OF USES: Major resource for locating US Government sponsored research reports and studies in the physical sciences, technology engineering, biological sciences, medical and health sciences

DATA UPDATE FREQUENCY: Bi-weekly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: BRS Online Services

DATABASE SPONSOR: National Technical Information Service

TECHNICAL POINT-OF-CONTACT: Online Support Department

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-289-4277/FAX 703-893-0490

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, professionals, general public interested in the physical and applied sciences, technology engineering, biological, medical, and health sciences

METHODS OF ACCESSING THE DATA: Online via Internet; direct access via local telephone network

ACCESS FEES, IF APPLICABLE: Online hourly fees, online and offline prints, telecommunications fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC compatible, modem

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: OHM/TADS - Oil and Hazardous Materials/Technical Assistance Data System

TYPES OF DATA STORED: Full-text information

DESCRIPTION OF USES: Used as guidelines for emergency response procedures (such as oil or hazardous materials spills), also for chemical research and industrial hygiene applications

DATA UPDATE FREQUENCY: Irregular

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI International, Inc.)

DATABASE SPONSOR: Environmental Protection Agency

TECHNICAL POINT-OF-CONTACT: Customer Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737/FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Anyone concerned with chemical safety during emergency situations, professionals in industrial hygiene and occupational safety and health

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus hourly online and display fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: PC at local level after downloading or screen capturing

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: OSH-ROM

TYPES OF DATA STORED: Bibliographic

DESCRIPTION OF USES: International research on occupational safety and health, handling hazardous incidents, and handling hazardous materials

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: SilverPlatter Information, Inc.

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Professionals in occupational safety and health, academia, researchers concerned with occupational safety and health, emergency response, and handling hazardous materials

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, Macintosh PC, CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1 CD-ROM disc

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: PDQ - PHYSICIANS DATA QUERY

TYPES OF DATA STORED: Full-text

DESCRIPTION OF USES: Detailed descriptions of advances in cancer treatment and clinical trials, with emphasis covering major tumor types/prognosis, recent cancer treatments, ongoing investigational and standard protocols, and directories of physicians and organizations involved with research

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: National Cancer Institute

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, clinicians and individuals searching for up-to-date information on cancer related topics

METHODS OF ACCESSING THE DATA: Online via PC and modem (from NLM and host vendors), remote access via magnetic tape or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat annual fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: PIRANHA - PESTICIDE AND INDUSTRIAL CHEMICAL RISK ANALYSIS AND HAZARD ASSESSMENT

TYPES OF DATA STORED: Quantitative and full-text

DESCRIPTION OF USES: Ecological risk assessment using simulation models

DATA UPDATE FREQUENCY: Semi-annual

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Environmental Protection Agency

DATABASE SPONSOR: Environmental Protection Agency

TECHNICAL POINT-OF-CONTACT: Lawrence Burns

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 706-546-3511/FAX 706-546-3252

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Primarily government and industrial/consulting technical staff

METHODS OF ACCESSING THE DATA: PC CD-ROM, EPA WAN

ACCESS FEES, IF APPLICABLE: N/A

IV. DATABASE PLATFORM

DBMS TYPE: FoxPro, INFO

HARDWARE REQUIREMENTS: IBM PC, CD-ROM drive

SECONDARY STORAGE: CD-ROM and hard drive

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 20 mb and one CD-ROM

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: No public network access

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: POLLUTION ABSTRACTS (Online)

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of available literature on a particular subject, guide to ordering full-text documents

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/(FAX)301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in specific fields

METHODS OF ACCESSING THE DATA: Online-DIALOG Information Services; STN International, ESA-IRS, DATA-STAR (Switzerland)

ACCESS FEES, IF APPLICABLE: Remote-consult host vendor

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX, or microcomputer

SECONDARY STORAGE:

MEMORY REQUIRED TO STORE THE DATABASE (mbs):

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: POLLUTION/TOXICOLOGY DATABASE WITH ENVIRONMENTAL IMPACT STATEMENTS

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of available literature on a particular subject, guide to ordering full-text documents

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/(FAX)301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in specific fields

METHODS OF ACCESSING THE DATA: Magnetic tape local load; remote access via host vendors

ACCESS FEES, IF APPLICABLE: Local load-fixed annual fee/unlimited access; remote-consult host vendor

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX, or microcomputer

SECONDARY STORAGE: Magnetic tape

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 5 yrs-166.1; 10 yrs-302.4; annually-31.8

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: POLTOX I (CD-ROM)

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of available literature on a particular subject, guide to ordering full-text documents

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/(FAX)301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in specific fields

METHODS OF ACCESSING THE DATA: CD-ROM databases

ACCESS FEES, IF APPLICABLE: Annual subscription fee

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX, or microcomputer

SECONDARY STORAGE: CD-ROM Reader

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1966+/4 discs

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: POLTOX II : EMBASE

TYPES OF DATA STORED: Bibliographic

DESCRIPTION OF USES: Researching bibliographic records on pollution, toxicology, biomedicine, and pharmacology

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: Elsevier Science Publishers

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers and academia concerned with pollution, toxicology biomedicine, pharmacology, and related disciplines

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1 CD-ROM disc

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: POLTOX III : CAB

TYPES OF DATA STORED: Bibliographic

DESCRIPTION OF USES: Research concerning pollution and toxicology as it pertains to the agricultural industry

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: CAB International

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, and professionals concerned with the causes and effects of environmental pollution and toxic substances in the agricultural industry

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1 CD-ROM disc

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: PsycINFO

TYPES OF DATA STORED: Bibliographic with abstracts

DESCRIPTION OF USES: Researching literature on psychology and related disciplines, including psychiatry, sociology, anthropology, education, pharmacology, and linguistics

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: BRS Online Service

DATABASE SPONSOR: American Psychological Association

TECHNICAL POINT-OF-CONTACT: Online Support Department

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-289-4277/FAX 703-893-0490

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, professionals, and academia interested in psychology and the social sciences

METHODS OF ACCESSING THE DATA: Online via Internet; direct access via local telephone network

ACCESS FEES, IF APPLICABLE: Online hourly fees, online and offline prints, telecommunications fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible

SECONDARY STORAGE: Not applicable

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: Networked database

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: PsycLIT

TYPES OF DATA STORED: Abstract, bibliographic

DESCRIPTION OF USES: Research in psychology and the behavioural sciences

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: American Psychological Association

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, and professionals studying psychology and the behavioural sciences

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: MS-DOS, Windows

HARDWARE REQUIREMENTS: IBM PC, Macintosh PC, CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 2 CD-ROM discs

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: RREL TREATABILITY DATABASE

TYPES OF DATA STORED: Quantitative and fulltext information on chemical substances and remediation techniques applicable to those chemicals; also contains data on those substances, including physical/chemical properties, Freundlich Isotherm, aqueous and solid treatability, average contaminant concentrations, etc.

DESCRIPTION OF USES: Researching information on chemical substances and the effectiveness of the remedial action technologies that are commercially available

DATA UPDATE FREQUENCY: Annually

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: EPA

DATABASE SPONSOR: EPA Risk Reduction Engineering Laboratory

TECHNICAL POINT-OF-CONTACT: Glenn Shaul

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 513-569-7408/FAX 513-569-7787

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Federal, state, local and foreign governments; academia, industry; available to the public for free upon request

METHODS OF ACCESSING THE DATA: IBM PC

ACCESS FEES, IF APPLICABLE: None

IV. DATABASE PLATFORM

DBMS TYPE: DOS 2.0 to 3.3

HARDWARE REQUIREMENTS: IBM PC

SECONDARY STORAGE: Internal hard drive

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 8 mbs

INFORMATION SYSTEM TYPE: Autonomous database system

NETWORKS PROVIDING ACCESS TO THE DATABASE: Not applicable

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: RTECS - REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES

TYPES OF DATA STORED: Full-text and quantitative data

DESCRIPTION OF USES: Chemical research on potentially hazardous substances and their toxicity, mutagenicity, teratogenicity, carcinogenicity, and irritability

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI International, Inc.)

DATABASE SPONSOR: National Institute for Occupational Safety and Health (NIOSH)

TECHNICAL POINT-OF-CONTACT: Customer Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737/FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, professionals concerned with the toxic effects of chemical substances

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus online and display fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: PC at local level after downloading or screen capturing

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: SAFETY SCIENCES AND RISK ASSESSMENT DATABASE

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of available literature on a particular subject, guide to ordering full-text documents

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/(FAX)301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in specific fields

METHODS OF ACCESSING THE DATA: Magnetic tape local load; remote access via host vendors; online-STN International, FirstSearch (a service of OCLC)

ACCESS FEES, IF APPLICABLE: Local load-fixed annual fee/unlimited access; remote-consult host vendor

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX, or microcomputer

SECONDARY STORAGE: Magnetic tape

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 5 yrs-65.3; 10 yrs-115.8; annually-10.2

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: SCIENCE CITATION INDEX (also SciSearch online and magnetic tape)

TYPES OF DATA STORED: Bibliographic information: title, author, keywords, keywords plus, citations, (the footnotes or references that are printed with scholarly literature), reprint author address, publisher address

DESCRIPTION OF USES: Retrospective searching, bibliographic verification, competitive tracking and updates, cuurent awareness, personnel evaluations

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Institute for Scientific Information

DATABASE SPONSOR: Institute for Scientific Information

TECHNICAL POINT-OF-CONTACT: Technical Help Desk

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-336-4474/FAX 215-386-6362

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Scientists, researchers, graduate students, librarians, information specialists, information brokers in academic, corporate and government sectors world-wide

METHODS OF ACCESSING THE DATA: Hard copy, print, CD-ROM, online, magnetic tape

ACCESS FEES, IF APPLICABLE: Varies by format

IV. DATABASE PLATFORM

DBMS TYPE: Proprietary

HARDWARE REQUIREMENTS: Varies by format and platform; all platforms are available

SECONDARY STORAGE: Varies by format and platform

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Varies by format and edition

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: None; network contracts are negotiable

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: TERIS - TERATOGEN INFORMATION SYSTEM

TYPES OF DATA STORED: Full-text; consists of literature summaries, selected bibliography, risk assessment data

DESCRIPTION OF USES: Used by health care practitioners to counsel pregnant women regarding exposure to potential teratogens

DATA UPDATE FREQUENCY: Daily

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: University of Washington

DATABASE SPONSOR: University of Washington

TECHNICAL POINT-OF-CONTACT: Dr. Janine Polifka; Dept. of Pediatrics

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 206-543-2465/FAX 206-543-7921

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Health care practitioners (physicians, genetic counselors, etc.); hospitals, law offices

METHODS OF ACCESSING THE DATA: Via modem/connecting to 800# at University; also by copying database from floppy disc to PC; CD-ROM available from MICROMEDEX, Inc.

ACCESS FEES, IF APPLICABLE: Fixed annual fee - $1000/yr for unlimited use

IV. DATABASE PLATFORM

DBMS TYPE: DBASE III

HARDWARE REQUIREMENTS: IBM PC or compatible; CD-ROM drive for CD-ROM access

SECONDARY STORAGE: CD-ROM, on mainframe at University

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 640 RAM

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: TOXICOLOGY DATABASE

TYPES OF DATA STORED: Abstract, bibliographic information

DESCRIPTION OF USES: Current awareness, compiling comprehensive research bibliographies, overview of available literature on a particular subject, guide for ordering full-text documents

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Cambridge Scientific Abstracts

DATABASE SPONSOR: Cambridge Scientific Abstracts

TECHNICAL POINT-OF-CONTACT: Tina Long

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-961-6700/(FAX)301-961-6720

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia researchers, information professionals, students and faculty members, professionals in specific fields

METHODS OF ACCESSING THE DATA: Magnetic tape local load; remote access via host vendors

ACCESS FEES, IF APPLICABLE: Local load-fixed annual fee/unlimited access; remote-consult host vendor

IV. DATABASE PLATFORM

DBMS TYPE: Available in USMARC of ISO2709 format

HARDWARE REQUIREMENTS: Mainframe, mini-frame, UNIX, VAX, or microcomputer

SECONDARY STORAGE: Magnetic tape

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 5 yrs-76.2; 10 yrs-141.4; annually-14.2

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: TOXLINE - TOXICOLOGY INFORMATION ONLINE

TYPES OF DATA STORED: Bibliographic citations

DESCRIPTION OF USES: Research on the toxicological, pharmacological, biochemical and physiological effects of drugs and other chemicals

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: National Library of Medicine

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, professionals and individuals concerned with the toxicological, pharmacological, biochemical and physiological effects of drugs and other chemicals

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via magnetic tape or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat annual fees for leased magnetic tape

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: TOXLINE PLUS

TYPES OF DATA STORED: Bibliographic information

DESCRIPTION OF USES: Research in toxicology, pharmacology and clinical disciplines

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: ASHP, NLM, BIOSIS, Chemical Abstracts Service, Nat'l Chemicals Inspectorate

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, professionals in toxicology, pharmacology, and related disciplines

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 5 CD-ROM discs

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: TOXLIT - TOXICOLOGY LITERATURE

TYPES OF DATA STORED: Bibliographic citations

DESCRIPTION OF USES: Research on the toxicological, pharmacological, biochemical and physiological effects of drugs and other chemicals

DATA UPDATE FREQUENCY: Monthly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: National Library of Medicine

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, professionals, individuals concerned with the toxicological, pharmacological, biochemical, and physiological effects of drugs and other chemicals

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via magnetic tape or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat annual fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: TOXNET - TOXICOLOGY DATA NETWORK

TYPES OF DATA STORED: TOXNET is a computerized collection of files on toxicology, hazardous chemicals and related disciplines; includes CCRIS, DART, DBIR, EMICBACK, ETICBACK, GENE-TOX, HSDB, IRIS, RTECS, TRI, and TRIFACTS

DESCRIPTION OF USES: Researching information on toxicology, chemical substances and related subjects

DATA UPDATE FREQUENCY: Varies for each database; usually quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: National Library of Medicine

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, academia, professionals and individuals seeking toxicology information

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via magnetic tape or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat annual fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: TRI - TOXIC CHEMICALS RELEASE INVENTORY

TYPES OF DATA STORED: Quantitative data on annual estimated releases of toxic chemicals to the environment and amounts transferred to waste sites

DESCRIPTION OF USES: Researching industrial facilities and the wastes generated by them

DATA UPDATE FREQUENCY: Annually

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Environmental Protection Agency

DATABASE SPONSOR: Environmental Protection Agency

TECHNICAL POINT-OF-CONTACT: Kim Orr

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 202-260-6238/FAX 202-260-4655

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: EPA staff, environmental protection and hazardous waste professionals

METHODS OF ACCESSING THE DATA: Online from NLM

ACCESS FEES, IF APPLICABLE: Online hourly fee plus annual subscription fee

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: N/A

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Unknown

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: TRIFACTS - TOXIC CHEMICAL RELEASE INVENTORY FACT SHEETS

TYPES OF DATA STORED: Full-text, quantitative

DESCRIPTION OF USES: Intended as a companion to the TRI database; contains health, ecological effects, safety, and handling information for most of the chemicals listed in the TRI database

DATA UPDATE FREQUENCY: Irregular

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: National Library of Medicine

DATABASE SPONSOR: National Library of Medicine

TECHNICAL POINT-OF-CONTACT: Robert Mehnert; Ch. of Information Services

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 301-496-6308/FAX 301-496-4450

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia, researchers, and professionals concerned with hazardous substances

METHODS OF ACCESSING THE DATA: Online via PC and modem, local access via magnetic tape or terminals at the National Library of Medicine

ACCESS FEES, IF APPLICABLE: Online hourly fees, flat annual fees for leased magnetic tapes

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible, modem

SECONDARY STORAGE: Magnetic tape, NLM's mainframe

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: TSCATS - TOXIC SUBSTANCES CONTROL ACT TEST SUBMISSIONS

TYPES OF DATA STORED: Full-text and bibliographic indexing information related to health and safety studies submitted to the Environmental Protection Agency

DESCRIPTION OF USES: Chemical research, industrial hygiene

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Chemical Information Systems (division of PSI International, Inc.)

DATABASE SPONSOR: Environmental Protection Agency

TECHNICAL POINT-OF-CONTACT: Customer Support Staff

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-247-8737/FAX 410-296-0712

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Researchers, chemists, professionals in industrial hygiene and related disciplines

METHODS OF ACCESSING THE DATA: Online via PC and modem

ACCESS FEES, IF APPLICABLE: Fixed annual fee plus hourly online and display fees

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC or compatible

SECONDARY STORAGE: PC at local level after downloading or screen capturing

MEMORY REQUIRED TO STORE THE DATABASE (mbs): Not applicable

INFORMATION SYSTEM TYPE: TDRS

NETWORKS PROVIDING ACCESS TO THE DATABASE: Sprintnet (Telenet)

MUSC/EHAP ONE-DOOR ACCESS INFORMATION SYSTEM
DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATABASE NAME: WasteInfo

TYPES OF DATA STORED: Bibliographic

DESCRIPTION OF USES: Research on waste treatment, disposal, recycling, and associated environmental hazards

DATA UPDATE FREQUENCY: Quarterly

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: SilverPlatter Information, Inc.

DATABASE SPONSOR: Waste Management Information Bureau

TECHNICAL POINT-OF-CONTACT: Technical Support Dept.

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: 800-343-0064/FAX 617-769-8763

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Academia, researchers, professionals in waste treatment, disposal, recycling, and associated environmental hazards

METHODS OF ACCESSING THE DATA: CD-ROM Reader

ACCESS FEES, IF APPLICABLE: Fixed annual fee

IV. DATABASE PLATFORM

DBMS TYPE: Unknown

HARDWARE REQUIREMENTS: IBM PC, CD-ROM drive

SECONDARY STORAGE: CD-ROM

MEMORY REQUIRED TO STORE THE DATABASE (mbs): 1 CD-ROM disc

INFORMATION SYSTEM TYPE:

NETWORKS PROVIDING ACCESS TO THE DATABASE:

Environmental Hazards Assessment Program

One-Door Access System

Database Survey Report



FINAL

For The:

Medical University of South Carolina

June 30, 1994

Submitted by:

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Table of Contents

1.0	**Introduction**	**1**
1.1	Purpose	1
1.2	Background	2
1.3	Approach	3
1.4	Terminology	5
2.0	**Environmental/HealthDatabase Research**	**6**
2.1	Database Identification	6
2.2	Research Results	7
3.0	**Database Surveys**	**9**
3.1	Database Provider Survey	9
3.1.1	Database Survey Form Development and Distribution	9
3.1.2	Database Provider Survey Results	13
3.2	University Library Database Access Survey	14
3.2.1	University Library Database Access Survey Form Development and Distribution	14
3.2.2	University Library Database Access Survey Results	14
4.0	**Candidate Databases**	**20**
4.1	Analysis of Needs Assessment Feedback	20
4.2	Follow-up Survey of MUSC/EHAP	22
4.3	Final Selection of Candidate Databases	29
5.0	**Candidate Database Descriptions**	**40**
5.1	Technical Feasibility Considerations	40
5.2	Cost Considerations	42
5.3	Database Descriptions	43
5.3.1	Analytical Abstracts	43
5.3.2	BAKER	43
5.3.3	Biological and Agricultural Index	44
5.3.4	CAB Abstracts	44
5.3.5	CANCER-CD	44
5.3.6	CANCERLIT	44

5.3.7 CHEMICAL ABSTRACTS 45
5.3.8 Encyclopedia of Chemical Technology 45
5.3.9 Environmental Sciences and Pollution Management Database 45
5.3.10 HAZARDLINE 46
5.3.11 Hazardous Substances Data Bank 46
5.3.12 HAZDAT 46
5.3.13 HAZINF 46
5.3.14 IAR Cancer Disc 47
5.3.15 Integrated Risk Information System 47
5.3.16 MALLIN 47
5.3.17 MEDLINE 47
5.3.18 Merck Index Online 48
5.3.19 MSDS-CCOHS 48
5.3.20 OHS-MSDS 48
5.3.21 Risk Assistant 48
5.3.22 RODScan 49
5.3.23 RREL Treatability Database 49
5.3.24 Safety Sciences and Risk Assessment Database 49
5.3.25 TERIS 50
5.3.26 TOXLINE 50
5.3.27 TOXLIT 50
5.3.28 TSCATS 51

6.0 Conclusions 52
6.1 Recommendations 52
6.1.1 New Databases Versus Databases Currently Available at MUSC 52
6.1.2 Incorporation of Databases Local to MUSC to Promote Information Sharing 53
6.1.3 ODAS Working Group 54
6.1.4 Final Selection of Databases for Integration with the ODAS 54
6.1.5 Use of Periodical Surveys 55
6.2 Issues 55
6.2.1 Diversity of the User Community 56
6.2.2 Evolution of Requirements 56

APPENDIX A
PRODUCERS AND VENDORS OF ENVIRONMENTAL/HEALTH DATABASES 57

APPENDIX B
CHARACTERISTICS OF ENVIRONMENTAL/HEALTH DATABASES 63

APPENDIX C
UNIVERSITY LIBRARY DATABASE ACCESS FREQUENCY 69

APPENDIX D
DISTRIBUTION OF ENVIRONMENTAL/HEALTH DATABASE ACCESS BY UNIVERSITY LIBRARIES 75

APPENDIX E
ACRONYM DEFINITIONS 78

List of Figures

Figure 1-1 Database Identification and Analysis Approach 4

Figure 3-1 Database Survey Form 10

Figure 3-2 Database Survey Form Key 12

Figure 3-3 University Library Database Access Survey Form 15

Figure 3-4 Universities Surveyed 19

Figure 4-1 MUSC/EHAP Needs Assessment Interview Coverage 21

Figure 4-2 Needs Assessment Follow-Up Questionnaire 23

Figure 4-3 Summary of Information Requirements by MUSC Department 29

Figure 4-4 Requested Databases by MUSC Department, Risk Assessment/Risk Analysis 32

Figure 4-5 Requested Databases by MUSC Department, Toxicity Data/Toxic Substances 33

Figure 4-6 Requested Databases by MUSC Department, Human Exposure Data 34

Figure 4-7 Requested Databases by MUSC Department, Genetic Information/Genome Sequence Data 34

Figure 4-8 Requested Databases by MUSC Department, Chemical Substances, Profiles/ Analytical Chemistry 35

Figure 4-9 Requested Databases by MUSC Department, Material Safety Data Sheets 36

Figure 4-10 Requested Databases by MUSC Department, Hazardous Wastes/Waste Site Data/ Emergency Response Information 37

Figure 4-11 Requested Databases by MUSC Department, Epidemiology 38

Figure 4-12 Requested Databases by MUSC Department, Regulatory Data/Environmental Legislation 38

Figure 4-13 Databases Requested Most Frequently for "High" Priority Categories 39

1.0 Introduction

The Medical University of South Carolina's (MUSC) vision is to become the premier national resource for medical information and for environmental and health risk assessment. A key component to the success of the many missions of the Environmental Hazards Assessment Program (EHAP) is timely access to a large volume of data. The significant growth in the number of environmental and health information systems that has occurred over the past few years has made data access a challenge. As a result, the identification of relevant data for a specific research project or application can be very time consuming. This study will identify databases and information systems that are relevant to the MUSC/EHAP mission and determine the feasibility of integrating them with the One-Door Access System (ODAS).

1.1 Purpose

The goal of this study is to identify available environmental/health databases, evaluate their relevance to the needs of MUSC/EHAP, and recommend a set of candidate databases for integration with the ODAS. In addition, the intent of this study is to provide technical and cost information that will be required to make a final decision of whether to include a candidate database in the ODAS.

The concept of the ODAS is to provide efficient access to a host of existing information resources, including commercial, academic, industrial, and government databases. The objective of the ODAS is to allow users to retrieve data from disparate databases, residing on a variety of hardware and software platforms, without knowing the interface of each individual system. The ODAS will differ from many of the other "search and retrieval" tools in that it does not require users to specify the database to be searched prior to initiating a query. This is a key advantage, since users often do not know which databases contain information relevant to their query.

The initial implementation of the ODAS will integrate a fixed set of databases. As new data resources are required, they will be evaluated for integration into the system. The key to the success of this system is the usefulness of the data that it accesses. Therefore, the database survey effort is crucial to identifying viable databases for integration with the ODAS.

This study was performed in conjunction with the Information Access and Processing Requirements Analysis Task. Feedback from the requirements analysis effort was used to guide the research performed during the database survey effort. The requirements analysis team collected user needs, including the following:

- Databases currently accessed by MUSC/EHAP

- Databases required, but not currently accessed by MUSC/EHAP
- Current and planned hardware, software, and communications configurations at MUSC.

A detailed description of the requirements analysis results is presented in the Needs Assessment Report.

In addition to evaluating the databases requested during the requirements analysis effort, the database survey also included databases not currently known to MUSC/EHAP. In this way, new information sources can be evaluated by MUSC/EHAP. Even if a new source is not selected for integration with the ODAS, it may meet the unique needs of an individual department and can be procured separately.

1.2 Background

MUSC has increased its involvement in the environmental arena by instituting EHAP and dedicating itself to exploring and developing a new basis for risk assessment, risk management, and risk communication with a primary focus on human health. EHAP's mission is to develop an environmental program to ensure a healthy society in a healthy economic, political, and biological environment. Its contributions involve health care and health care professionals in education, research, and service.

A key EHAP objective is to establish an international computer network of approved data and informational support to develop a national basis for risk assessment, risk management, and risk communication. Using the EHAP information system as an entry platform, health professionals, students, and researchers will be able to access international databases containing information on health risk assessment. This database survey effort has been performed in support of this objective.

MUSC/EHAP includes many organizations with varying needs. Therefore, it is imperative that careful analysis be performed prior to implementing the one-door access solution. For this reason, the system is being developed using a phased approach. The first phase of development is the Needs Assessment, which consisted of the following three tasks:

- Information Access and Processing Requirements Analysis
- Database Identification and Analysis
- Prototype Development and Demonstration.

These tasks were performed simultaneously, and continuous feedback was exchanged between the task teams.

The primary goal of the Information Access and Processing Requirements Analysis task was to fully and accurately understand the information requirements of the major MUSC/EHAP components (academicians, clinicians, and physicians), state hospitals/clinics, and rural physicians. The requirements analysis was focused on the types of information required to assess and treat environmental/health hazards. Methods of information collection included personal interviews, phone interviews, questionnaires, and on-site research.

The purpose of the Database Identification and Analysis task was to identify and research a variety of environmental/health databases. Based on the information needs identified during the requirements analysis effort, a list of "candidate" databases was produced. Finally, databases were recommended for integration with the initial implementation of the ODAS based on feedback from the potential user community.

The purpose of the Prototype Development and Demonstration task was to use prototyping techniques to build user interface screens and key system capabilities that would demonstrate the one-door access concept. Another objective of the prototype development task was to build an evaluation tool for the potential ODAS user community. In this way, system objectives and requirements could be clearly defined prior to initiating a full-scale software development effort.

1.3 Approach

A vast number of environmental and medical related databases exist in government, academia, and industry. It would be an extensive task to research all of the information sources in depth and assess the feasibility of integrating them with the ODAS. Therefore, a structured approach was followed to efficiently and accurately identify information resources relevant to the EHAP mission. This structured approach is highlighted in Figure 1-1.

The first task was to conduct extensive research to identify available environmental and medical resources. Once a data source was identified, general information about its contents, users, sponsors, and creators was collected. This data was then summarized in matrix format, so that it could be used as a working tool for subsequent analysis steps.

Once the general research was completed, two separate surveys were conducted to collect more detailed information about the databases identified in the initial research. First, a Database Survey Form was developed and distributed to collect additional data content, user profile, and technical information for a subset of the databases researched. Second, a University Library Database Access Survey Form was developed and distributed. The purpose of this form was to learn what information sources were accessed by other medical universities, and the frequency of their access.

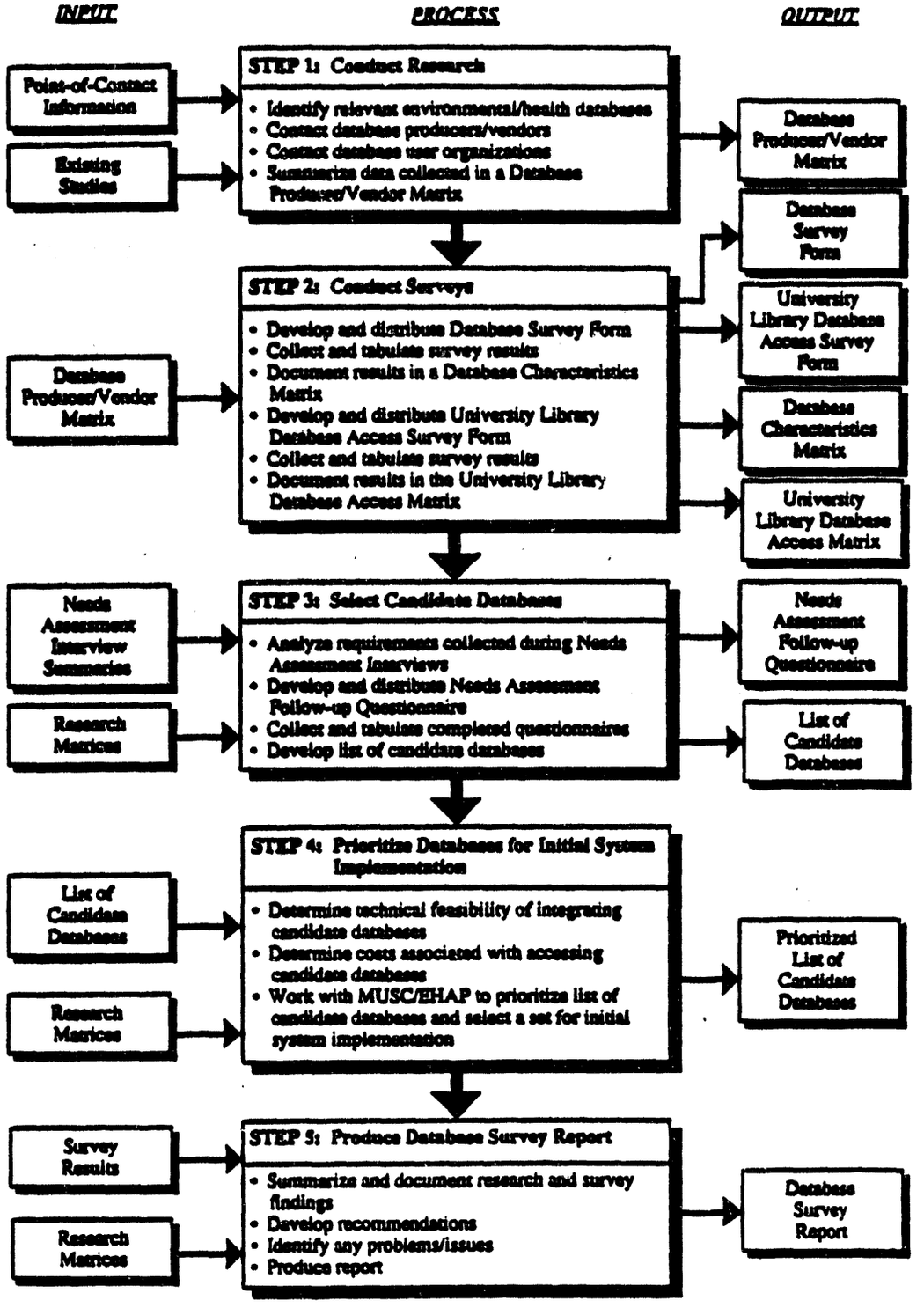


Figure 1-1. Database Identification and Analysis Approach.

Once the survey results were received and tabulated, a set of candidate databases was chosen. The purpose of selecting this set of candidate databases was to narrow down the list of databases identified in the initial research to a manageable number. The candidates represent the group of databases to be considered for integration with the ODAS. Criteria used to develop the list of candidates included feedback from the needs assessment interviews and technical feasibility requirements.

The final step of this effort was to work with MUSC/EHAP to select a set of databases for integration with the initial implementation of the ODAS. Criteria used to make this selection included prioritization of the candidates by the potential user community, technical issues, and cost issues.

1.4 Terminology

The term "database" can be interpreted in a variety of ways, depending on its context. It is often used in a general sense to describe any repository of data. In a more technical sense, it is used to describe an actual physical structure that stores data and relationships between data. The terms "information system" and "database" are often used interchangeably. However, an "information system" is actually an interface used to access a database, or set of databases.

During this study, a number of information sources were researched. Some of these sources were pure databases, residing independently on disk, tape, or CD-ROM. Other sources were information systems that provided access to one or more databases. For simplicity, the term "database" will be used in a general sense in this report. "Database" will be used to describe all of the varied sources of data that were researched.

2.0 Environmental/Health Database Research

The purpose of the environmental/health database research effort was to identify environmental/health data sources in government, commercial, and academic sectors relevant to the MUSC/EHAP mission. The goal was to provide MUSC with a broad list of data sources that could subsequently be narrowed through surveys, technical feasibility studies, and cost/benefit analyses. The following sections describe the specific steps performed during the initial research effort.

2.1 Database Identification

The identification of available environmental/health related databases began with the review of several publications, electronic records, and documentation obtained from the government, academia, and industry. The purpose of the review was to obtain points-of-contact (POC's) for environmental/health related databases. Specifically, POC's were identified from the following resources:

- Environmental Protection Agency (EPA) Access EPA (publication # EPA220B-93-008)
- Inventory of Exposure-Related Data Systems Sponsored by Federal Agencies (publication #EPA/600/R-92/078)
- U.S. Department of Health and Human Services publication Some Publicly Available Sources of Computerized Information on Environmental Health and Toxicology.

In addition, POC information obtained during previous environmental database research efforts was used.

Contacts were made with database vendors and organizations to request information on their available products and services. Numerous telephone calls were made to Federal health agencies, professional organizations, and nonprofit organizations to establish contacts, request information on products and services offered, and establish contacts for additional information that might be useful in identifying data sources of interest to MUSC.

After requesting information from the various organizations and contacts identified, interviews were conducted with randomly selected hospitals, medical centers, and medical university libraries to request information about which databases are accessed by each facility. The goal was to identify the types of databases currently used in the medical community, compare database usage among medical institutions, and obtain additional contacts useful in identifying information sources relevant to the EHAP initiative.

2.2 Research Results

During the database identification process, a large amount of information was received concerning different environmental/health related databases, their producers, and vendors. It became evident that many of these databases have more than one vendor, and occasionally more than one producer or sponsor. Therefore, gathering information about a particular database became a complex task. It was subsequently determined that the most efficient and sensible way to depict the producers and vendors for each database was in a matrix format. The resulting matrix, shown in Appendix A, lists the databases identified and the different providers. Appropriate boxes are marked indicating producers with a "P" and vendors with an "V" for each database. This matrix is a useful tool for locating specific environmental/health databases and comparing services among different producers and vendors.

In all, 127 environmental/health related databases were identified in the research effort. The database producers and vendors are grouped into three categories: government, nonprofit, and commercial. Of the databases identified, 71 were sponsored by commercial organizations, 50 by government agencies, and 12 by nonprofit organizations. Six of the databases identified were sponsored by organizations in more than one category.

To better understand the environmental/health database community, it is important to distinguish the difference between database producers and database vendors. A database producer, as referred to in this report, pertains to those entities which have produced one or more databases and may provide access to additional databases. A database vendor will indicate those entities which distribute one or more databases. Government and nonprofit producers of databases are generally not considered database vendors. They often distribute databases through one or more commercial organizations under exclusive contracting and licensing agreements. The National Library of Medicine (NLM) is an exception to this rule, since it provides access to other databases in addition to the ones it produces.

One of the most challenging aspects of researching environmental/health databases is that a single database can often be obtained from numerous sources in a variety of formats and versions. Common methods in which environmental/health databases are distributed include the following:

- Federal agency-produced databases distributed by commercial vendors. One example is NLM's Hazardous Substances Data Bank available in the following vendor provided products:
  - CAS/STN
  - Data-Star
  - MICROMEDEX
  - ORBIT
  - SilverPlatter.

- Federal agency-produced databases distributed through separate federal agencies. Examples include NLM's Hazardous Substances Data Bank which is distributed by the Agency for Toxic Substances and Disease Control (ATSDR), and EPA's IRIS database, which is distributed by NLM

- Portions of Federal agency-produced databases made publicly available, such as ATSDR's in-house HAZDAT database, which will be made publicly available on the Internet in Spring, 1994

- Commercially produced databases, including the Chemical Abstracts database which is available through the following vendors: CAS/STN, BRS Online Services, DIALOG, Data-Star, ORBIT, and QUESTEL

- Databases grouped with other databases to become a system of databases complimenting one another. For example, OSH-ROM is a group of databases covering information on occupational safety and health.

A great deal of confusion often results when researching databases for purchase since it is often difficult to determine if a particular database is available from multiple sources. Additional complexities include functional and price comparisons among vendor products.

3.0 Database Surveys

Two separate surveys were conducted to gather information about databases considered pertinent to the MUSC/EHAP mission. The first survey was the database provider survey, and the second was the university library database access survey. The goal of the database provider survey was to compile accurate, verified information concerning the characteristics of the environmental/health databases identified. The university library database access survey was conducted to gain an understanding of the environmental/health related databases accessed by university libraries around the country that have a medical orientation.

3.1 Database Provider Survey

The database provider survey enabled the collection of detailed information about environmental/health databases identified as candidates for integration with the ODAS. The findings documented in this report are based, in part, on the results given by the providers of these databases. The following sections describe the methods used in the development and distribution of the Database Survey Form and provide a summary of the results.

3.1.1 Database Survey Form Development and Distribution

The purpose of the database provider survey was to gather information about environmental/health related databases in the commercial, public, and private sectors. The first task involved establishing contacts with database providers, and inviting them to participate in the survey. Next, the Database Survey Form was designed to gather specific database information for each database while remaining as brief as possible to ensure a high response level. A sample of the Database Survey Form is shown in Figure 3-1.

In addition, a Database Survey Form Key was included. The Database Survey Form Key, shown in Figure 3-2, provides supplementary information about survey questions to aid providers completing the form. To efficiently document information on each database and facilitate comparisons between the numerous databases identified, a set of common parameters was used to acquire the characteristics of each database. These parameters included data types, topics covered, access options, and update frequency.

The Database Survey Form and Database Survey Form Key were distributed by facsimile to the providers of the 127 environmental/health related databases identified in Section 2.2 of this report. Recipients of the forms included database management personnel and technical POC's who agreed to participate in the survey prior to its distribution.

DATABASE SURVEY FORM

I. DESCRIPTION OF DATABASE

DATA BASE NAME: _____

_____

TYPES OF DATA STORED: _____

_____

_____

DESCRIPTION OF USES: _____

_____

_____

_____

_____

_____

DATA UPDATE FREQUENCY: _____

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: _____

DATABASE SPONSOR: _____

TECHNICAL POINT-OF-CONTACT: _____

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER: _____

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: _____

_____

_____

_____

_____

_____

METHODS OF ACCESSING THE DATA: _____

_____

_____

ACCESS FEES, IF APPLICABLE: _____

Figure 3-1. Database Survey Form.

IV. DATABASE PLATFORM

DBMS TYPE: _____

_____

HARDWARE REQUIREMENTS: _____

_____

_____

SECONDARY STORAGE: _____

_____

MEMORY REQUIRED TO STORE THE DATABASE: _____

INFORMATION SYSTEM TYPE: _____

_____

NETWORKS PROVIDING ACCESS TO THE DATABASE: _____

Figure 3-1. Database Survey Form (continued).

DATABASE SURVEY FORM KEY

I. DESCRIPTION OF DATABASE

DATABASE NAME: Acronym and full name

TYPES OF DATA STORED: Abstract, bibliographic, full-text, quantitative

DESCRIPTION OF USES: Specific uses of the database

DATA UPDATE FREQUENCY: How often is the database updated (i.e., daily, weekly, monthly, quarterly, annually)?

II. DATABASE POINTS-OF-CONTACT

DATABASE OWNER: Company/corporation, agency, etc.

DATABASE SPONSOR: DOE, EPA, DOD, commercial/private, university

TECHNICAL POINT-OF-CONTACT: Point-of-contact for technical information about the database

TECHNICAL POINT-OF-CONTACT'S PHONE/FAX NUMBER:

III. DATABASE USERS AND ACCESS

DESCRIPTION OF CUSTOMERS/USERS: Who uses the database; who has access to it, and who is the most frequent user (i.e., industry, government, academia, researchers)?

METHODS OF ACCESSING THE DATA: How is the data accessed (i.e., via LAN, through DIALOG)?

ACCESS FEES, IF APPLICABLE: What are the payment methods (i.e., one-time fee, online by the minute) and amounts?

IV. DATABASE PLATFORM

DBMS TYPE: Database management system (the software system that was used to create the database, i.e., FOXPRO, Oracle, DBASE III)

HARDWARE REQUIREMENTS: What hardware is needed to access and search the database (i.e., IBM PC, Macintosh, modem, CD-ROM drive)?

SECONDARY STORAGE: Internal hard drive, external hard drive, CD-ROM, magnetic tape, etc.

MEMORY REQUIRED TO STORE THE DATABASE (mbs):

INFORMATION SYSTEM TYPE: Autonomous file system, autonomous database system, bulletin board system, networked file system, gateway file system, gateway database system, etc.

NETWORKS PROVIDING ACCESS TO THE DATABASE: Internet, etc.

Figure 3-2. Database Survey Form Key.

3.1.2 Database Provider Survey Results

The completed Database Survey Forms received were converted to electronic format and are included in Attachment 1 to this report. More than one-half of the Database Survey Forms have been received to date. In certain cases, follow-up discussions were conducted to clarify individual survey responses.

A matrix was developed to illustrate key characteristics of the databases surveyed (see Appendix B). This matrix displays information about each database, including topics covered, number of records, year coverage began, update frequency, points-of-contact, access options, sponsor affiliation, data type, and indicators as to whether the database is a simulation model or an information system. The matrix facilitates general comparisons between the numerous databases and indicates trends in the information management community. It also serves as an initial reference tool for identifying databases which may contain data useful to MUSC/EHAP.

There are several trends notable in Appendix B, including projections which can be made for the environmental/health database community. For example, nearly two-thirds of the databases surveyed contain information on chemical substances such as toxicity values, chemical/physical properties, Material Safety Data Sheets (MSDS), and human exposure analysis. It can be expected that databases containing information on chemical substances will continue to emerge and expand rapidly. For example, the DOE has placed a great deal of emphasis on the necessity for hazardous waste information.

According to this survey, databases providing specific coverage of toxicology and risk assessment are also in increasing demand. This can be attributed to public interest in health issues, the industrial outcry for more acceptable environmental regulations, and the desire among risk management professionals to acquire more accurate methods of risk calculation. A major portion of risk and human exposure data is becoming available through government sources, such as the EPA's IRIS database.

Databases containing toxicology information most commonly provide data on chemical substances and their associated toxicity levels. In addition, they provide exposure level and human health information based on laboratory studies and human exposure data. The majority of this information is quantitative data that has been recognized and approved by groups of respected experts in the field of risk assessment. It was learned in this study that significantly more toxic substance exposure data exists for animals than for humans. In addition, the Needs Assessment Report indicates the overall demand for human exposure data is quite high. Research also indicates that databases containing toxicological and risk assessment data are expected to grow in number and popularity as new approaches to risk assessment arise.

This study has shown there are many epidemiological and cancer research databases in existence. These types of databases typically contain bibliographic references to journal articles, research papers, and publications. In addition, they often provide quantitative and full-text data on teratology, mutagens, genetic data, treatment protocols, and exposure data. Based on the survey results received to date, bibliographic databases are used most frequently by academia, clinicians, and researchers. The quantitative and full-text databases are more often used by epidemiologists, oncologists, and toxicologists. There are several CD-ROM databases that are gaining popularity for cancer research. Examples of available CD-ROM databases include SilverPlatter's MEDLINE, the International Agency for Cancer Research (IACR)'s IARCancer Disk, and Elsevier's CANCER-CD.

3.2 University Library Database Access Survey

The purpose of the university library database access survey was to determine the environmental/ health related databases utilized most frequently at selected university libraries around the country. In addition to reflecting trends in database use at these institutions, the goal was also to inform MUSC/EHAP of the databases other university libraries are using, and to identify additional databases relevant to the EHAP mission. The following sections present a description of the methods used to accomplish this survey and a summary of the survey results.

3.2.1 University Library Database Access Survey Form Development and Distribution

After processing the Database Survey Forms, the next step was to gather specific information from medical-oriented university libraries regarding database usage. This was accomplished by establishing contact with university library personnel and inviting them to participate in a database access survey. University candidates were chosen based on several factors, including geographic location, institutional reputation, and library size (number of volumes contained).

The University Library Database Access Survey Form, shown in Figure 3-3, was designed to gather specific information such as databases used and frequency of use from the list of university candidates selected. Figure 3-4 shows the list of universities selected for the survey. The completed survey results were tabulated into a matrix shown in Appendix C.

3.2.2 University Library Database Access Survey Results

As of the production date of this report, completed survey forms were still being received and processed by the research team. To date, 11 of the 25 universities surveyed have returned completed survey forms. Follow-up telephone calls are being conducted by the research team to collect additional completed surveys.

UNIVERSITY LIBRARY DATABASE ACCESS SURVEY FORM

Please indicate which databases/information systems are accessed and their relative frequency of access (actual use) by marking an "H" for high, "M" for moderate and an "L" for low use in the spaces provided. Leaving a space blank will indicate that the database/information system is not accessed or it is not used although it may be accessed.

NOTE: The purpose of this survey is to gain an understanding of which medical and environmental health related databases are being accessed at major universities and their relative frequency of use. If there are databases/information systems that you feel are of importance to this survey that are not included in this list, please feel free to write them in at the bottom of the list and indicate their relative use.

___ AGRICOLA (NTIS, SilverPlatter)
___ AGRIS (SilverPlatter)
___ AGRISEARCH (SilverPlatter)
___ AIDS & Cancer Research Database (Cambridge Scientific Abstracts/CSA)
___ Analytical Abstracts (SilverPlatter)
___ BAKER MSDS Database (Chemical Information Systems/CIS-PSI Int'l, Inc.)
___ Biological and Agricultural Index (H.W. Wilson, SilverPlatter)
___ BIOSIS Previews - Biological Abstracts (BRS, CAS/STN, DIALOG, Data-Star, OCLC, ORBIT, SilverPlatter)
___ Biotechnology and Bioengineering Database (CSA)
___ Biotechnology Abstracts (Derwent Publications, Ltd., DIALOG, ORBIT, SilverPlatter)
___ BIOTECHSEEK (Nat'l Library of Medicine/NLM)
___ CAB Abstracts (CAS)
___ CABCD (SilverPlatter, CAS/STN)
___ CANCER-CD (Elsevier, SilverPlatter)
___ CANCERLIT (NLM, BRS, DIALOG, Data-Star, SilverPlatter)
___ CAS Registry (CAS)
___ CATLINE (NLM)
___ Computerized Clinical Information System/CCIS (MICROMEDEX)
___ Chemical Carcinogenesis Research Information System/CCRIS (NLM, CIS, DIALOG)
___ CHEM-BANK (NLM, NTIS, SilverPlatter)
___ Chemical Engineering & Biotechnology Abstracts (CAS/STN)
___ Chemical Hazards Information System/CHEMHAZIS (CIS)
___ Chemical Abstracts (BRS, CAS/STN, DIALOG, Data-Star, ORBIT, Questel)
___ Chemical Information System (CIS)
___ ChemID (NLM)
___ CHEMLINE (NLM, CAS/STN)
___ CHEMLIST (CAS/STN)
___ CHEMREACT (CAS/STN)
___ CHEMSAFE (CAS/STN)
___ Combined Health Information Database/CHID (BRS)

Figure 3-3. University Library Database Access Survey Form.

___ Chemical Hazard Response Information System/CHRIS (CIS, MICROMEDEX, SilverPlatter)
___ Clinical Toxicology of Commercial Products/CTCP (CIS)
___ Comprehensive Core Medical Library/CCML (BRS)
___ Conference Paper Database (CSA)
___ Computerized Research Information on Scientific Projects/CRISP (NLM, BRS)
___ Chemical Safety News Base/CSNB (CAS/STN)
___ Current Awareness in Biological Sciences (BRS)
___ Current Contents (Institute for Scientific Information/ISI, BRS, DIALOG, Data-Star)
___ Current Contents Search (ISI, BRS, DIALOG, Data-Star)
___ Developmental and Reproductive Toxicology/DART (NLM, NIEHS)
___ Directory of Biotechnology Information Resources/DBIR (NLM)
___ Derwent Biotechnology Abstracts (Derwent, ORBIT)
___ Drug Information Fulltext (BRS, CIS, DIALOG, ORBIT)
___ Drug Information Fulltext/Int'l Pharmaceutical Abstracts (SilverPlatter)
___ DRUGUPDATES (CAS/STN)
___ EINECS plus-CD (SilverPlatter)
___ EMBASE (BRS, Data-Star, DIALOG, Exerpta Medica, ORBIT, CAS/STN)
___ EM Science Chemical Information System/EMCIS (EM Science)
___ Emergency Response Notification System/ERNS (EPA)
___ Environmental Mutagen Information Center Backfile/EMICBACK (NLM, EPA, NIEHS, ATSDR)
___ Encyclopedia of Chemical Technology (BRS, DIALOG, Kirk-Othmer)
___ ENVIROFATE (CIS)
___ ENVIROLINE (R.R. Bowker, DIALOG, Data-Star, ORBIT)
___ Environmental Bibliography (DIALOG)
___ Environmental Sciences and Pollution Management Database (CSA)
___ Environmental Teratology Information Center Backfile/ETICBACK (NLM, EPA, NIEHS, ATSDR)
___ EXAMS II/Exposure Analysis Modelling System (EPA)
___ Expanded Life Sciences Collection Plus Marine Biology and Bioengineering (CSA)
___ EXPERTNET (ExpertNet, Ltd.)
___ GENBANK (CAS/STN)
___ GENE-TOX (NLM, EPA)
___ Genetics Database (CSA)
___ GENETOX (CIS)
___ Gastrointestinal Absorption Database (CIS)
___ HAZARDLINE (BRS, Occupational Health Services/OHS)
___ Hazardous Substances Data Bank (NLM, ATSDR)
___ Hazardous Waste Collection Database (EPA, NTIS)
___ Hazardous Substance Release/Health Effects Database/HAZDAT (ATSDR)
___ Hazardous Chemicals Information and Disposal/HAZINF (CIS)
___ HEALSAFE (CSA, CAS/STN)
___ IARCancer Disc (SilverPlatter)
___ International Pharmaceutical Abstracts (Data-Star, SilverPlatter)
___ Integrated Risk Information System/IRIS (NLM, CIS, EPA, SilverPlatter)

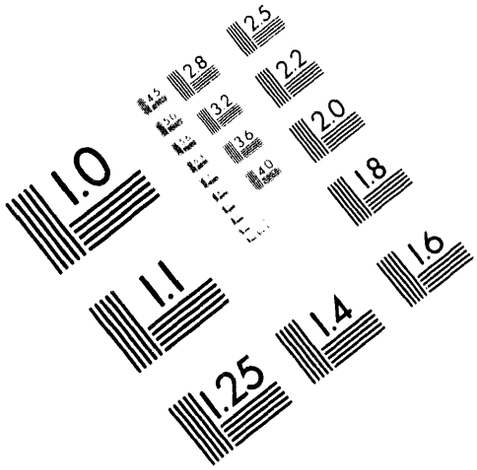
Figure 3-3. University Library Database Access Survey Form (continued).

___ International Register of Potentially Toxic Chemicals/IRPTC (EPA)
___ Life Sciences Collection (CSA, BRS, CAS/STN, DIALOG, SilverPlatter)
___ MALLIN MSDS Database (CIS)
___ Medical Literature Analysis and Retrieval System/MEDLARS (NLM, BRS, CAS/STN, Data-Star, DIALOG, OCLC, Questel, SilverPlatter)
___ MEDLINE/MEDLARS Online (NLM, BRS, CAS/STN, Data-Star, DIALOG, OCLC, Questel, SilverPlatter)
___ Multimedia Environmental Pollution Assessment System/MEPAS (DOE)
___ Merck Index (BRS, CIS, DIALOG, Questel)
___ Microbiology Database (CSA)
___ Molecular and Cellular Biology Database (CSA)
___ Canadian Center for Occupational Health and Safety MSDS Database/MSDS-CCOHS (CAS/STN)
___ Nat'l Institute for Occupational Safety and Health Technical Information Center Database/NIOSHTIC (ORBIT, SilverPlatter, NIOSH)
___ NTIS Bibliographic Database (NTISBRS, CAS/STN, Data-Star, DIALOG, SilverPlatter)
___ OCLC Environmental Library (Online Computer Library Center/OCLC, SilverPlatter)
___ OCLC Online Union Catalog (OCLC, SilverPlatter)
___ Oil and Hazardous Materials Technical Assistance Data System (CIS, MICROMEDEX, EPA)
___ OSH-ROM (BRS, DIALOG, SilverPlatter, NIOSH)
___ PSYCINFO (BRS)
___ PDQ/Physicians Data Query (NLM, BRS, Data-Star, DIALOG, SilverPlatter)
___ Pesticide and Industrial Chemical Risk Analysis and Hazard Assessment Database/PIRANHA (EPA)
___ Pollution Abstracts (CAS/STN, CSA, DIALOG)
___ Pollution/Toxicology Database with Environmental Impact Statements (CSA)
___ POLTOX I (CSA, SilverPlatter)
___ POLTOX II: EMBASE (SilverPlatter)
___ POLTOX III: CAB (SilverPlatter)
___ PsycLIT (BRS, SilverPlatter)
___ REPRORISK (MICROMEDEX)
___ REPROTOX (Reproductive Toxicology Center)
___ RISKLINE-on TOXLINE (NLM, SilverPlatter)
___ Risk Reduction Engineering Laboratory (RREL) Treatability Database (EPA)
___ Registry of Toxic Effects of Chemical Substances/RTECS (NLM, CIS, DIALOG, Data-Star, CAS/STN, Silver Platter)
___ Safety Sciences and Risk Assessment Database (CSA)
___ Science Citation Index (ISI, Data-Star)
___ Teratogen Information System/TERIS (MICROMEDEX, Univ. of Washington)
___ The Etiology of Cancer-Tutorial (SilverPlatter)
___ The Nature of Genes-Tutorial (SilverPlatter)
___ Toxicology, Occupational Medicine & Environmental Series Plus/TOMES Plus (MICROMEDEX)
___ Toxic Chemical Release Inventory/TRI (NLM, EPA)
___ Toxic Substances Research (EPA)

Figure 3-3. University Library Database Access Survey Form (continued).

— Toxicology Database (CSA)
— TOXLINE (NLM, BRS, DIALOG, Data-Star, SilverPlatter)
— TOXLINE PLUS (NLM, SilverPlatter)
— TOXLIT (NLM, EPA)
— TOXNET (NLM)
— TRIFACTS (NLM)
— Toxic Substances Control Act Test Submissions/TSCATS (EPA, CIS)
— WasteInfo (SilverPlatter)

Figure 3-3. University Library Database Access Survey Form (continued).





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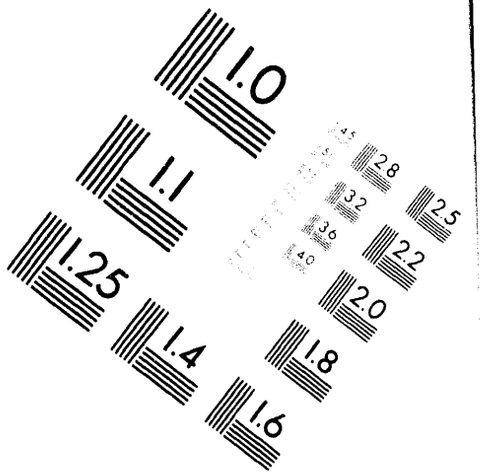

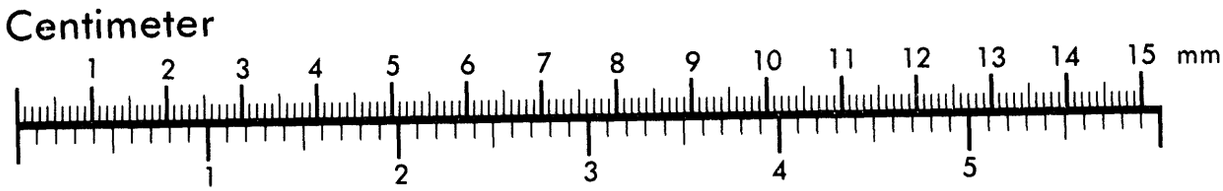

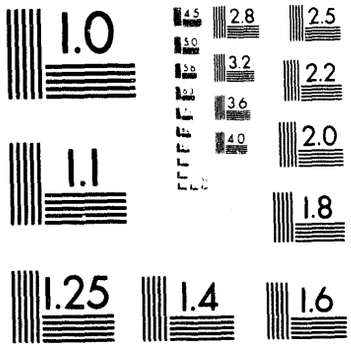

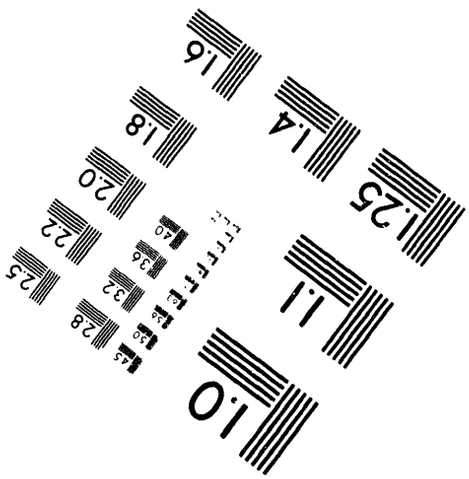

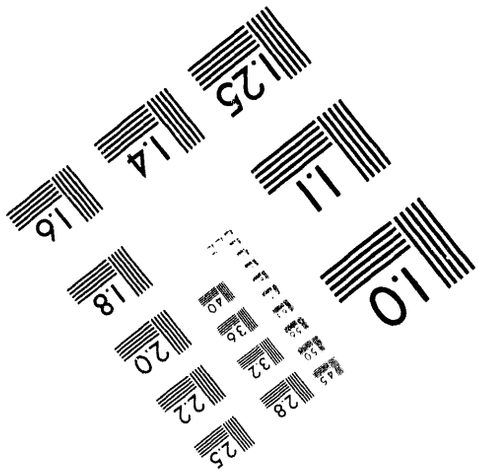

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6 of 8

The results received from the survey to date are displayed in Appendix C. The matrix indicates which databases are most frequently accessed by university libraries. Appendix D shows the distribution of environmental/health database access by the university libraries surveyed.

The NLM databases are very popular in terms of university library access. The most frequently used NLM databases include MEDLARS/MEDLINE, Physician's Data Query, CANCERLIT, and TOXLINE. Sharing relatively equal popularity are commercial databases, such as BIOSIS Previews - Biological Abstracts, Current Contents, Science Citation Index, EMBASE, and the OCLC Online Union Catalog.

UNIVERSITIES SURVEYED

Boston University School of Public Health Medical Library
Duke University Medical Center
Georgetown University School of Medicine
George Washington University Medical Center
Houston Academy of Medicine - Texas Medical Center Library
Johns Hopkins University School of Medicine
Medical College of Georgia
Medical College of Pennsylvania
Mercer School of Medicine
New York Academy of Medicine
Rutgers University
SUNY Health Sciences Center at Brooklyn College of Medicine
University of Alabama School of Medicine
University of New York at Buffalo
University of California at Los Angeles
University of Connecticut Health Center
University of Illinois College of Medicine
University of Maryland School of Medicine
University of Mississippi
University of North Carolina School of Medicine
University of Nebraska Medical Center
University of Pennsylvania School of Medicine
University of Virginia School of Medicine
University of Washington

Figure 3-4. Universities Surveyed.

4.0 Candidate Databases

The studies performed during the database research and survey efforts, described in Section 2.0 and Section 3.0, resulted in the identification of a large number of databases related to environmental/ health. In order to analyze a reasonable number of the 127 databases originally identified, a subset had to be selected. The subset represents the "candidate" databases that will be considered for integration with the ODAS.

The following steps were used to select the candidate databases:

- Analyze feedback from the needs assessment interviews
- Conduct follow-up survey to validate interview results and obtain data prioritization information
- Select database integration candidates based on MUSC/EHAP priorities.

The activities performed for each of these steps are described in the following sections.

4.1 Analysis of Needs Assessment Feedback

The Information Access and Processing Requirements Analysis effort included conducting needs assessment interviews. The purpose of these interviews was to gain an understanding of the common and unique data and processing requirements of the potential ODAS user community. A summary of the people interviewed is shown in Figure 4-1. A detailed description of the interview results can be found in the Needs Assessment Report.

Based on the interview results, the following categorization of information needs was developed:

- Genetic Information/Genome Sequence Data
- Toxicity Data/Toxic Substances
- Chemical Substances, Profiles/Analytical Chemistry
- Epidemiology
- Human Exposure Data

MUSC/EHAP NEEDS ASSESSMENT INTERVIEW COVERAGE

NAME OF INTERVIEWEE	SPECIFIC DISCIPLINE	UNIVERSITY AFFILIATION	OCCUPATIONAL ORIENTATION		
			ACADEMIA	CLINICAL	RESEARCH
Dr. Stanley Schuman	Occupational/Environmental Medicine; Agromedicine	MUSC		H	M
Sam Caldwell	Occupational/Environmental Medicine; Agromedicine	MUSC		H	M
Mike Hughes	Poison Control/Agromedicine	University of Mississippi		M	M
Dr. Robert J. Kennedy	Environmental Health	MUSC	H		L
William P. Hotle	Environmental Health	MUSC	H		L
Dr. Pam Bolte	Nursing/Environmental Medicine	MUSC	H		L
Dr. Janardan Pandey	Microbiology	MUSC	L/M		H
Dr. Michael Schmidt	Microbiology	MUSC	L/M		H
Dr. Jean-Michel Gouet	Microbiology	MUSC	L/M	L	H
Dr. David Jollow	Pharmacology	MUSC	M/H		M/H
Dr. David McMillan	Pharmacology	MUSC	M/H		M/H
Dr. JoEllyn McMillan	Pharmacology	MUSC	M/H		M/H
Dr. Pat Meier	Pharmaceutical Sciences	MUSC	H	L	H
Dr. John Early	College of Pharmacy	MUSC	H		M/H
Dr. David Hoel	Biometry/Epidemiology	MUSC	M/H		H
Dr. Daniel Lackland	Biometry/Epidemiology	MUSC	H		M
Dr. Daniel Knapp	Mass Spectrometry	MUSC			H
Dr. John Cate	Anatomical Pathology	MUSC		H	
Dr. John Wheat	Occupational Medicine.	University of Alabama	H	M/H	M/H
Dr. Stuart Nelson	Medical Internist	Medical College of Georgia	H	H	L

H - high emphasis
M - medium emphasis
L - low emphasis

Figure 4-1. MUSC/EHAP Needs Assessment Interview Coverage.

- Risk Assessment/Risk Analysis
- Regulatory Data/Environmental Legislation
- Material Safety Data Sheets
- Hazardous Wastes/Waste Site Data/Emergency Response Information.

The next step was to associate databases with information categories. To do this, the "Characteristics of Environmental/Health Databases" matrix, shown in Appendix B, was used to select databases relevant to each category. The databases identified for each category are shown in Figure 4-2, which is the Needs Assessment Follow-Up Questionnaire.

4.2 Follow-up Survey of MUSC/EHAP

Throughout the database selection process, it is imperative to continue soliciting and incorporating input from the potential ODAS user community. For this reason, a follow-up questionnaire was developed to collect priority information. The follow-up questionnaire was also designed to identify databases currently in use at MUSC, and any new databases that might be useful.

The follow-up questionnaire, shown in Figure 4-2, contains two parts. The first part requests the potential user to assign a priority rating of high, medium, or low to each data category. Space is provided for commenting on the specific data categories selected. The second part of the survey is designed to gain information regarding the potential user's current activity, familiarity, and interest associated with each database listed within a category.

The results of Part 1 of the follow-up questionnaire are summarized in Figure 4-3. As shown, there is a wide range of data access needs. Each MUSC department surveyed has a unique set of priorities. For example, the Risk Assessment/Risk Analysis data category was given a "high" priority rating by the Department of Environmental Health Sciences, a "medium" priority rating by the Department of Family Medicine, and a "low" priority rating by Mass Spectrometry Research. In order to select databases that will meet the collective needs of several departments, it is important to consider data categories that were assigned a priority of "high" by multiple departments.

The results of Part 2 of the follow-up questionnaire are summarized in Figures 4-4 through 4-12. The matrices shown in these figures reflect the interest that various MUSC departments have in accessing specific databases within each data category. These matrices are an effective tool for quickly identifying common requirements across the departments.

EHAP INFORMATION SYSTEM NEEDS ASSESSMENT FOLLOW-UP QUESTIONNAIRE

PART I: CATEGORIZATION OF INFORMATION REQUIREMENTS

DATA CATEGORY	PRIORITY (H, M, L)	COMMENTS
Risk Assessment/Risk Analysis		
Toxicity Data/Toxic Substances		
Human Exposure Data		
Genetic Information/Genome Sequence Data		
Chemical Substances, Profiles/Analytical Chemistry		
Material Safety Data Sheets		
Hazardous Wastes/Waste Site Data/ Emergency Response Information		
Epidemiology		
Regulatory Data/Environmental Legislation		
ADDITIONAL DATA CATEGORIES REQUIRED? (INDICATE PRIORITIES)		

H = high M = medium L = low

Figure 4-2. Needs Assessment Follow-Up Questionnaire.

EHAP INFORMATION SYSTEM NEEDS ASSESSMENT FOLLOW-UP QUESTIONNAIRE

PART II: DATABASE/INFORMATION SYSTEM SELECTION

DATABASE/ INFORMATION SYSTEM NAME	TOPICS COVERED															DATA TYPE						MUSC ACCESS		NEW DATA SOURCES	
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environmen. General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology	Risk Assessment	Toxicology	Simulation Model	System of Databases	Abstract	Bibliographic	Full-text	Quantitative	Do You Currently Access the Database at MUSC? (Yes/No)	If "Yes", How is it Accessed? (local, online, etc.)	Are You Familiar with the Database? If "Yes", Positive/Negative Comments?	Are You Interested in Accessing the Database? (Yes/No)
DATA CATEGORY: RISK ASSESSMENT/ RISK ANALYSIS																									
EXAMS II					X	X								X	X	X				X	X				
Exposure Models Library					X	X								X	X	X	X			X	X				
IRIS					X	X	X							X	X					X	X				
MEDLINE		X	X	X	X	X	X	X	X		X		X	X	X			X	X						
PATRIOT	X				X	X								X	X	X				X	X				
PCGEMS					X	X								X	X	X				X	X				
PIRANHA	X				X	X								X	X					X	X				
REPRORISK			X					X	X					X	X					X	X				
REPROTOX				X				X	X		X			X	X					X					
Risk Assistant					X									X	X	X	X			X	X				
Safety Sciences and Risk Assessment Database						X			X	X		X		X				X	X						
DATA CATEGORY: TOXICITY DATA/ TOXIC SUBSTANCES																									
CCRIS					X		X	X	X	X		X			X				X	X	X				
Clinical Toxicology of Commercial Products					X										X					X					
HAZDAT					X	X			X					X	X					X	X				
IRIS					X	X	X							X	X					X	X				
Pollution/Toxicology Database w/ EIS's					X	X								X	X			X	X						
POLTOX I						X			X				X		X			X	X						
TOMES Plus			X		X	X	X	X	X	X	X	X		X	X					X	X				
Toxicology Database					X				X				X	X	X										
TOXLINE			X		X	X	X	X	X		X	X	X	X	X			X	X						
TOXLIT				X	X	X	X		X				X	X	X			X	X						
TOXNET					X	X	X	X	X		X			X	X		X			X	X				

H = high M = medium L = low

Figure 4-2. Needs Assessment Follow-Up Questionnaire (continued).

EHAP INFORMATION SYSTEM NEEDS ASSESSMENT FOLLOW-UP QUESTIONNAIRE

PART II: DATABASE/INFORMATION SYSTEM SELECTION

DATABASE/ INFORMATION SYSTEM NAME	TOPICS COVERED														DATA TYPE						MUSC ACCESS		NEW DATA SOURCES	
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environment, General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology	Risk Assessment	Toxicology	Simulation Model	System of Databases	Abstract	Bibliographic	Full-text	Quantitative	Do You Currently Access the Database at MUSC? (Yes/No)	If "Yes", How is it Accessed? (local, online, etc.)	Are You Familiar with the Database? If "Yes", Positive/Negative Comments?	Are You Interested in Accessing the Database? (Yes/No)
TSCATS					X	X								X	X				X	X					
DATA CATEGORY: HUMAN EXPOSURE DATA																									
GIABS					X		X							X	X					X	X				
Hazardous Substances Data Bank			X		X	X			X	X		X	X	X	X					X	X				
HAZDAT					X	X			X					X	X					X	X				
RTECS					X		X	X	X					X	X					X	X				
DATA CATEGORY: GENETIC INFO./ GENOME SEQUENCE DATA																									
EMICBACK				X	X		X	X	X		X			X	X			X	X						
ETICBACK					X		X	X	X		X			X	X			X	X						
GENBANK								X	X											X	X	X			
GENE-TOX					X		X	X	X						X					X	X				
Genetics Database						X		X			X		X		X			X	X						
GENETOX			X				X	X	X											X	X				
The Nature of Genes			X	X			X	X	X											X					
DATA CATEGORY: CHEMICAL SUBSTANCES, PROFILES/ ANALYTICAL CHEMISTRY																									
Analytical Abstracts						X												X	X						
Biological and Agricultural Index	X	X			X	X	X		X	X		X							X	X					
CAB Abstracts					X	X	X											X							

H = high M = medium L = low

Figure 4-2. Needs Assessment Follow-Up Questionnaire (continued).

EHAP INFORMATION SYSTEM NEEDS ASSESSMENT FOLLOW-UP QUESTIONNAIRE

PART II: DATABASE/INFORMATION SYSTEM SELECTION

DATABASE/ INFORMATION SYSTEM NAME	TOPICS COVERED															DATA TYPE						MUSC ACCESS		NEW DATA SOURCES	
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environmen. General	Epidemiology	Genesis	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology	Risk Assessment	Toxicology	Simulation Model	System of Databases	Abstract	Bibliographic	Full-text	Quantitative	Do You Currently Access the Database at MUSC? (Yes/No)	If "Yes", How is it Accessed? (local, online, etc.)	Are You Familiar with the Database? If "Yes", Positive/Negative Comments?	Are You Interested in Accessing the Database? (Yes/No)
CCIS			X		X	X	X	X	X	X	X	X		X	X		X		X	X	X				
CCRIS					X		X	X	X	X		X			X				X	X	X				
CHEM-BANK					X	X				X		X		X	X		X			X	X				
CHEMHAZIS					X				X	X		X			X			X		X					
Chemical Abstracts					X										X			X	X		X				
Chemical Engineering and Biotechnology Abstracts				X	X													X	X						
Chemical Info. System		X			X	X	X	X	X	X		X	X	X	X		X		X	X	X				
ChemID			X		X	X														X	X				
CHEMLINE					X															X	X				
CHEMLIST					X	X												X							
CHEMREACT					X																X				
CHEMSAFE					X					X		X								X	X				
Clinical Toxicology of Commercial Products					X										X					X					
EINECS plus-CD					X															X	X				
EMCIS					X	X						X								X	X				
Encyclopedia of Chemical Technology	X				X								X							X	X				
Hazardous Substances Data Bank			X		X	X			X	X		X	X	X	X					X	X				
IRIS					X	X	X							X	X					X	X				
IRPTC					X	X			X					X	X			X		X	X				
Merck Index Online					X				X				X		X					X	X				
POLTOX III: CAB	X				X	X									X			X	X						
RREL Treatability Database					X	X														X	X				
RTECS					X		X	X	X					X	X					X	X				
TOMES Plus			X		X	X	X	X	X	X	X	X		X	X					X	X				
Toxic Chemicals Release Inventory					X	X		X							X					X	X				

H = high M = medium L = low

Figure 4-2. Needs Assessment Follow-Up Questionnaire (continued).

EHAP INFORMATION SYSTEM NEEDS ASSESSMENT FOLLOW-UP QUESTIONNAIRE
PART II: DATABASE/INFORMATION SYSTEM SELECTION

DATABASE/ INFORMATION SYSTEM NAME	TOPICS COVERED															DATA TYPE						MUSC ACCESS		NEW DATA SOURCES	
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environment, General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology	Risk Assessment	Toxicology	Simulation Model	System of Databases	Abstract	Bibliographic	Full-text	Quantitative	Do You Currently Access the Database at MUSC? (Yes/No)	If "Yes", How is it Accessed? (local, online, etc.)	Are You Familiar with the Database? If "Yes", Positive/Negative Comments?	Are You Interested in Accessing the Database? (Yes/No)
DATA CATEGORY: MATERIAL SAFETY DATA SHEETS																									
BAKER					X					X		X			X					X	X				
MALLIN					X					X		X			X					X	X				
MSDS-CCOHS					X					X		X								X	X				
OHS-MSDS					X					X		X								X	X				
DATA CATEGORY: HAZ. WASTES/ WASTE SITE DATA/ EMERGENCY RESPONSE																									
Envir. Sciences and Pollution Mgt. Database		X		X	X	X			X					X	X			X	X						
ENVIROFATE					X	X														X	X				
Environmental Bibliography						X			X		X								X						
ERNS					X	X														X	X				
HAZARDLINE					X	X			X	X		X			X					X	X				
Hazardous Substances Data Bank			X		X	X			X	X		X	X	X	X					X	X				
Hazardous Waste Collection Database					X	X												X	X	X					
HAZDAT					X	X			X					X	X					X	X				
HAZINF					X					X										X	X				
HRIS					X	X	X							X	X					X	X				
OCLC Environmental Library						X													X						
OHMTADS					X	X				X		X								X	X				
Pollution Abstracts					X	X								X	X			X	X						
Pollution/Toxicology Database w/ EIS's					X	X								X	X			X	X	X					

H = high M = medium L = low

Figure 4-2. Needs Assessment Follow-Up Questionnaire (continued).

EHAP INFORMATION SYSTEM NEEDS ASSESSMENT FOLLOW-UP QUESTIONNAIRE

PART II: DATABASE/INFORMATION SYSTEM SELECTION

DATABASE/ INFORMATION SYSTEM NAME	TOPICS COVERED															DATA TYPE						MUSC ACCESS		NEW DATA SOURCES	
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environment, General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology/	Risk Assessment	Toxicology	Simulation Model	System of Databases	Abstract	Bibliographic	Full-text	Quantitative	Do You Currently Access the Database at MUSC? (Yes/No)	If "Yes", How is it Accessed? (local, online, etc.)	Are You Familiar with the Database? If "Yes", Positive/Negative Comments?	Are You Interested in Accessing the Database? (Yes/No)
RREL Treatability Database					X	X														X	X				
TOMES Plus			X		X	X	X	X	X	X	X	X		X	X					X	X				
Toxic Chemicals Release Inventory					X	X		X							X					X	X				
TSCATS					X	X								X	X			X	X						
WasteInfo					X	X								X				X	X						
DATA CATEGORY: EPIDEMIOLOGY																									
AIDS and Cancer Research Database			X				X		X		X		X					X	X						
CANCER-CD			X				X	X	X									X	X						
CANCERLIT					X		X	X	X		X				X			X	X						
Current Awareness in Biological Science			X	X	X		X	X	X		X		X		X				X						
EMICBACK				X	X		X	X	X		X			X	X			X	X						
ETICBACK					X		X	X	X		X			X	X			X	X						
GENE-TOX					X		X	X	X						X				X	X					
GENETOX			X				X	X	X											X	X				
IARCancer Disc					X	X	X	X	X		X			X	X					X	X				
TERIS					X		X	X	X					X	X					X					
The Etiology of Cancer			X				X	X	X		X									X					
DATA CATEGORY: REGULATORY DATA/ ENVIRONMENTAL LEGISLATION																									
EARTHLAW						X														X					
RODSCAN						X														X					
WESTLAW						X														X					

H = high M = medium L = low

Figure 4-2. Needs Assessment Follow-Up Questionnaire (continued).

DATA CATEGORY	HIGH PRIORITY	MEDIUM PRIORITY	LOW PRIORITY
Risk Assessment/Risk Analysis	Enviro. Health Sciences Biometry & Epidemiology	Family Medicine Pharmacology	Mass Spectrometry Research Pharm. Sciences
Toxicity Data/Toxic Substances	Family Medicine Pharmacology	Enviro. Health Sciences Mass Spectrometry Research Biometry & Epidemiology Pharm. Sciences	
Human Exposure Data	Family Medicine Biometry & Epidemiology Pharmacology	Enviro.Health Sciences Mass Spectrometry Research	Pharm. Sciences
Genetic Information/Genome Sequence Data	Mass Spectrometry Research		Family Medicine Enviro. Health Sciences Biometry & Epidemiology Pharmacology Pharm. Sciences
Chemical Substances, Profiles/Analytical Chemistry	Family Medicine Mass Spectrometry Research Pharmacology	Enviro. Health Sciences	Biometry & Epidemiology
Material Safety Data Sheets	Family Medicine Pharm. Sciences	Enviro. Health Sciences	Mass Spectrometry Research Biometry & Epidemiology Pharmacology
Hazardous Waste/Waste Site Data/Emergency Response Information	Enviro. Health Sciences Biometry & Epidemiology	Family Medicine Pharmacology Pharm. Sciences	Mass Spectrometry Research
Epidemiology	Family Medicine Biometry & Epidemiology	Enviro. Health Sciences Pharmacology Pharm. Sciences	Mass Spectrometry Research
Regulatory Data/Environmental Legislation	Enviro. Health Sciences Pharm Sciences	Pharmacology	Family Medicine Mass Spectrometry Research Biometry & Epidemiology
Population Demographics	Biometry & Epidemiology		
Protein Sequence Data	Mass Spectrometry Research		
Crystal Structure Data	Mass Spectrometry Research		
Engineering and Physics Literature	Mass Spectrometry Research		
Patent Literature	Mass Spectrometry Research		

Figure 4-3. Summary of Information Requirements by MUSC Department.

4.3 Final Selection of Candidate Databases

Based on the results of the Needs Assessment Follow-Up Questionnaire, a final list of candidate databases for integration with the ODAS was chosen. The selection process involved three p[illegible]y steps. First, the information categories most frequently marked "high" in Part 1 of the questi[illegible]e

were selected. Second, for each of these high priority categories, Part 2 of the follow-up questionnaire was reviewed. The databases most frequently marked "Yes" under the column "Are you interested in accessing the database" were then selected. Finally, the databases selected for integration with the ODAS Prototype were considered.

At the time of production of this document, all of the questionnaire results had not been received. To date, the two categories that were given a "high" priority most often are Human Exposure Data and Chemical Substances, Profiles/Analytical Chemistry. The set of categories rated "high" with the second highest frequency include Risk Assessment/Risk Analysis, Toxicity Data/Toxic Substances, Material Safety Data Sheets, Hazardous Waste/Waste Site Data/Emergency Response Information, Epidemiology, and Regulatory Data/Environmental Legislation.

For each of the highly requested data categories listed in the previous paragraph, the corresponding matrix (see Figures 4-4 through 4-12) was reviewed to select the most frequently requested databases. Figure 4-13 summarizes the results of this review. As shown, certain databases, such as IRIS and HAZDAT, were requested under multiple categories. Databases such as these should be considered as viable candidates for integration, since they satisfy a wide range of needs. However, a technical analysis will be required to determine whether or not each candidate is feasible for integration.

The set of databases currently integrated with the ODAS Prototype should be included in the list of candidates until after the hands-on evaluation is complete. These include IRIS, RREL, OHS-MSDS, TSCATS, HAZDAT, and MEDLINE. These databases should be considered as candidates for the following reasons:

- The hands-on evaluation period will provide the potential ODAS users with the opportunity to determine the value of the databases integrated with the prototype
- These databases have already been acquired, some for a fee (i.e., TSCATS was $350)
- Database structures and content have already been analyzed.

In addition, these databases were selected for the prototype, due to their relevance to EHAP.

In summary, the list of candidate databases that have been selected out of the original 127 databases researched include the following:

- Analytical Abstracts
- BAKER
- Biological and Agricultural Index
- CAB-Abstracts

- CANCER-CD
- CANCERLIT
- Chemical Abstracts
- Encyclopedia of Chemical Technology
- Environmental Sciences and Pollution Management Database
- HAZARDLINE
- Hazardous Substances Data Bank
- HAZDAT
- HAZINF
- IAR Cancer Disc
- IRIS
- MALLIN
- MEDLINE
- Merck Index Online
- MSDS-CCOHS
- OHS-MSDS
- Risk Assistant
- RODSCAN
- RREL Treatability Database
- Safety Sciences and Risk Assessment Database
- TERIS
- TOXLINE
- TOXLIT
- TSCATS.

This is a "living" list of candidates, and it will change as additional survey results and prototype feedback is received. In addition, new databases are continuously being made available to the public, and should be analyzed for inclusion in this list.

REQUESTED DATABASES BY MUSC DEPARTMENT
RISK ASSESSMENT/RISK ANALYSIS

DEPARTMENT(>) DATABASE(v)	Family Medicine	Pharmacology	Environmental Health Sciences	Biometry/ Epidemiology	Mass Spectronomy	Pharmaceutical Sciences	Anatomical Pathology	College of Nursing	Microbiology	College of Pharmacy
EXAMS II	YES	NO	NO	NO	NO	YES				
PATRIOT	YES	NO	NO	NO	NO	NO				
PCGEMS	YES	NO	NO	NO	NO	NO				
PIRANHA	YES	NO	NO	NO	NO	NO				
Risk Assistant	YES	NO	YES	NO	NO	NO				
IRIS	YES	NO	NO	YES	NO	YES				
MEDLINE	YES	NO	NO	NO	NO	YES				
REPRORISK	YES	NO	NO	NO	NO	NO				
REPROTOX	YES	NO	NO	NO	NO	NO				
Safety Sciences and Risk Assessment Database	YES	NO	YES	NO	NO	NO				
Exposure Models Library	YES	NO	NO	NO	NO	NO				

Figure 4-4. Requested Databases by MUSC Department, Risk Assessment/Risk Analysis.

REQUESTED DATABASES BY MUSC DEPARTMENT
TOXICITY DATA/TOXIC SUBSTANCES

DEPARTMENT (>) DATABASE(v)	Family Medicine	Pharmacology	Environmental Health Sciences	Biometry/ Epidemiology	Mass Spectronomy	Pharmaceutical Sciences	Anatomical Pathology	College of Nursing	Microbiology	College of Pharmacy
CCRIS	YES	NO	NO	NO	YES	NO				
Clinical Toxicology of Commercial Products	YES	NO	NO	NO	YES	NO				
HAZDAT	YES	NO	NO	YES	YES	YES				
IRIS	YES	NO	NO	YES	YES	YES				
Pollution/Toxicology Database w/ EIS's	YES	NO	NO	NO	YES	NO				
POLTOX I	YES	NO	NO	NO	YES	NO				
TOMES Plus (MICROMEDEX)	YES	NO	NO	NO	YES	NO				
Toxicology Database	YES	NO	NO	NO	YES	NO				
TOXLINE	YES	YES	NO	NO	YES	YES				
TOXLIT	YES	NO	NO	NO	YES	YES				
TOXNET	YES	YES	NO	NO	YES	YES				
TSCATS	YES	NO	NO	NO	YES	NO				

Figure 4-5. Requested Databases by MUSC Department, Toxicity Data/Toxic Substances.

REQUESTED DATABASES BY MUSC DEPARTMENT
HUMAN EXPOSURE DATA

DEPARTMENT(>) DATABASE(v)	Family Medicine	Pharmacology	Environmental Health Sciences	Biometry/ Epidemiology	Mass Spectrometry	Pharmaceutical Sciences	Anatomical Pathology	College of Nursing	Microbiology	College of Pharmacy
GIABS	YES	NO	NO	NO	NO	NO				
Hazardous Substances Data Bank	YES	NO	NO	YES	NO	NO				
HAZDAT	YES	NO	NO	YES	NO	YES				
RTECS	YES	NO	NO	NO	NO	NO				

Figure 4-6. Requested Databases by MUSC Department, Human Exposure Data.

REQUESTED DATABASES BY MUSC DEPARTMENT
GENETIC INFORMATION/GENOME SEQUENCE DATA

DEPARTMENT(>) DATABASE(v)	Family Medicine	Pharmacology	Environmental Health Sciences	Biometry/ Epidemiology	Mass Spectrometry	Pharmaceutical Sciences	Anatomical Pathology	College of Nursing	Microbiology	College of Pharmacy
EMICBACK	YES	NO	NO	NO	NO	NO				
ETICBACK	YES	NO	NO	NO	NO	NO				
GENBANK	NO	NO	NO	NO	YES	YES				
GENE-TOX	YES	YES	NO	NO	NO	NO				
Genetics Database	NO	NO	NO	NO	NO	NO				
GENETOX	NO	YES	NO	NO	NO	NO				
The Nature of Genes	NO	NO	NO	NO	NO	NO				

Figure 4-7. Requested Databases by MUSC Department, Genetic Information/Genome Sequence Data.

REQUESTED DATABASES BY MUSC DEPARTMENT
CHEMICAL SUBSTANCES, PROFILES/ANALYTICAL CHEMISTRY

DEPARTMENT(s) DATABASE(v)	Family Medicine	Pharmacology	Environmental Health Sciences	Biometry/ Epidemiology	Mass Spectronomy	Pharmaceutical Sciences	Anatomical Pathology	College of Nursing	Microbiology	College of Pharmacy
Analytical Abstracts	YES	NO	NO	NO	YES	NO				
Biological and Agricultural Index	YES	NO	NO	NO	NO	YES				
CAB Abstracts	YES	NO	NO	NO	NO	YES				
CCIS	YES	NO	NO	NO	NO	NO				
CCRIS	YES	NO	NO	NO	NO	NO				
CHEM-BANK	YES	NO	NO	NO	NO	NO				
CHEMHAZIS	YES	NO	NO	NO	NO	NO				
Chemical Abstracts	YES	YES	NO	NO	YES	YES				
Chemical Engineering & Biotechnology Abstracts	YES	NO	NO	NO	NO	NO				
Chemical Information System	YES	NO	NO	NO	NO	NO				
ChemID	YES	NO	NO	NO	NO	NO				
CHEMLINE	YES	NO	NO	NO	NO	NO				
CHEMLIST	YES	NO	NO	NO	NO	NO				
CHEMREACT	YES	NO	NO	NO	NO	NO				
CHEMSAFE	YES	NO	NO	NO	NO	NO				
Clinical Toxicology of Commercial Products	YES	NO	NO	NO	NO	NO				
EINECS - Plus CD	YES	NO	NO	NO	NO	NO				
EMCIS	YES	NO	NO	NO	NO	NO				
Encyclopedia of Chemical Technology	YES	NO	NO	NO	NO	YES				
Hazardous Substances Data Bank	YES	NO	NO	NO	NO	NO				
IRIS	YES	NO	NO	NO	NO	YES				
IRPTC	YES	NO	NO	NO	NO	NO				
Merck Index Online	YES	NO	NO	NO	NO	YES				
POLTOX III: CAB	YES	NO	NO	NO	NO	NO				
RREL Treatability Database	YES	NO	NO	NO	NO	NO				
RTECS	YES	NO	NO	NO	NO	NO				
TOMES Plus	YES	NO	NO	NO	NO	NO				
Toxic Chemicals Release Inventory	YES	NO	NO	NO	NO	NO				

Figure 4-8. Requested Databases by MUSC Department, Chemical Substances, Profiles/Analytical Chemistry.

REQUESTED DATABASES BY MUSC DEPARTMENT
MATERIAL SAFETY DATA SHEETS

DEPARTMENT(>) DATABASE(v)	Family Medicine	Pharmacology	Environmental Health Sciences	Biometry/ Epidemiology	Mass Spectronomy	Pharmaceutical Sciences	Anatomical Pathology	College of Nursing	Microbiology	College of Pharmacy
BAKER	YES	NO	NO	NO	NO	YES				
MALLIN	YES	NO	NO	NO	NO	YES				
MSDS-CCOHS	YES	NO	NO	NO	NO	YES				
OHS-MSDS	YES	NO	YES	NO	NO	YES				

Figure 4-9. Requested Databases by MUSC Department, Material Safety Data Sheets.

REQUESTED DATABASES BY MUSC DEPARTMENT
HAZARDOUS WASTES/WASTE SITE DATA/EMERGENCY RESPONSE INFORMATION

DEPARTMENT(>) DATABASE(v)	Family Medicine	Pharmacology	Environmental Health Sciences	Biometry/ Epidemiology	Mass Spectronomy	Pharmaceutical Sciences	Anatomical Pathology	College of Nursing	Microbiology	College of Pharmacy
Envir. Sciences & Pollution Mgt. Database	YES	NO	YES	YES	NO	NO				
ENVIROFATE	YES	NO	YES	NO	NO	NO				
Environmental Bibliography	YES	NO	YES	NO	NO	NO				
Emergency Response Notification System	YES	NO	YES	NO	NO	NO				
HAZARDLINE	YES	NO	YES	YES	NO	NO				
Hazardous Substances Data Bank	YES	NO	YES	NO	NO	NO				
Hazardous Waste Collection Database	YES	NO	YES	NO	NO	NO				
HAZDAT	YES	NO	YES	YES	NO	NO				
HAZINF	YES	NO	YES	YES	NO	NO				
IRIS	YES	NO	YES	YES	NO	YES				
OCLC Environmental Library	NO	NO	YES	NO	NO	NO				
OHMTADS	YES	NO	YES	NO	NO	NO				
Pollution Abstracts	YES	NO	YES	NO	NO	NO				
Pollution/Toxicology Database w/ EIS's	YES	NO	YES	NO	NO	NO				
RREL Treatability Database	NO	NO	YES	NO	NO	NO				
TOMES Plus	YES	NO	YES	NO	NO	NO				
Toxic Chemicals Release Inventory	YES	NO	YES	NO	NO	NO				
TSCATS	YES	NO	YES	NO	NO	NO				
WasteINFO	NO	NO	YES	NO	NO	NO				

Figure 4-10. Requested Databases by MUSC Department, Hazardous Wastes/Waste Site Data/Emergency Response Information.

REQUESTED DATABASES BY MUSC DEPARTMENT
EPIDEMIOLOGY

DEPARTMENT(>) DATABASE(v)	Family Medicine	Pharmacology	Environmental Health Sciences	Biometry/ Epidemiology	Mass Spectronomy	Pharmaceutical Sciences	Anatomical Pathology	College of Nursing	Microbiology	College of Pharmacy
AIDS and Cancer Research Database	NO	NO	NO	YES	NO	NO				
CANCER-CD	YES	NO	NO	YES	NO	NO				
CANCERLIT	YES	NO	NO	YES	NO	NO				
Current Awareness in Biological Science	YES	NO	NO	NO	NO	NO				
EMICBACK	YES	NO	NO	NO	NO	NO				
ETICBACK	YES	NO	NO	NO	NO	NO				
GENE-TOX	YES	NO	NO	NO	NO	NO				
GENETOX	YES	NO	NO	NO	NO	NO				
IARCancer Disk	YES	NO	NO	YES	NO	NO				
TERIS	YES	NO	NO	YES	NO	NO				
The Etiology of Cancer	NO	NO	NO	NO	NO	NO				

Figure 4-11. Requested Databases by MUSC Department, Epidemiology.

REQUESTED DATABASES BY MUSC DEPARTMENT
REGULATORY DATA/ENVIRONMENTAL LEGISLATION

DEPARTMENT(>) DATABASE(v)	Family Medicine	Pharmacology	Environmental Health Sciences	Biometry/ Epidemiology	Mass Spectronomy	Pharmaceutical Sciences	Anatomical Pathology	College of Nursing	Microbiology	College of Pharmacy
EARTHLAW	NO	NO	NO	NO	NO	NO				
RODSCAN	NO	NO	YES	NO	NO	NO				
WESTLAW	NO	NO	NO	NO	NO	NO				

Figure 4-12. Requested Databases by MUSC Department, Regulatory Data/Environmental Legislation.

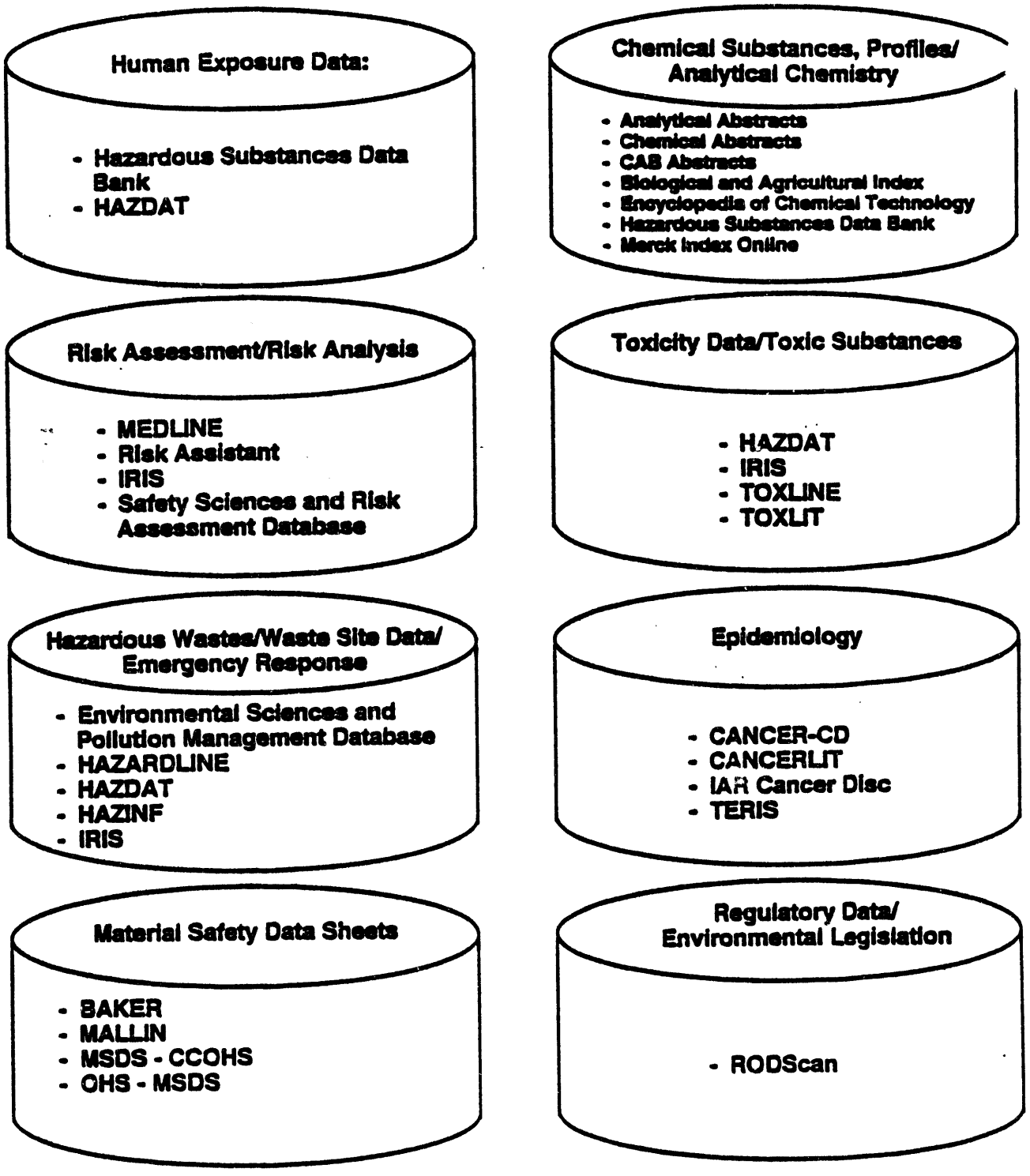

Figure 4-13. Databases Requested Most Frequently For "High" Priority Cat ies.

5.0 Candidate Database Descriptions

The ODAS will be an evolving system, that will expand as user needs grow and change. The initial goal is to develop a base system that is operational and supportive to the EHAP organizations. Therefore, an initial set of databases will be selected for inclusion in the base system implementation. This initial set will be chosen from the list of candidate databases, described in Section 4.0. This section presents technical and cost factors to consider when selecting databases for integration with the ODAS. It also provides a description of each candidate database.

5.1 Technical Feasibility Considerations

Before a candidate database can be selected for integration with the ODAS, a technical feasibility study must be performed, to ensure that there are no technical constraints that will prevent integration. A technical issue to consider when selecting a database is the source format of the data. Extensive research of the available information sources revealed the following three major types of data formats:

- Data in raw format
- Data embedded in an information system package, but stored in non-proprietary format
- Data embedded in an information system package, and stored in proprietary format
- Multiple databases containing the same data.

Each of these data formats requires a different integration strategy.

Data existing in raw format is the simplest to integrate. The format usually follows some industry standard that can be parsed and accessed. This type of data is usually provided by government and nonprofit organizations. It is often available at little or no cost, and requires fewer design enhancements/modifications during the integration process. One drawback to the raw data format is that organizations providing the data often have budget constraints or are being funded by grants. Once the database is developed, it is not always maintained or supported.

Data that is embedded in an information system package is more complicated to manage and sometimes impossible to access, since relationships with the information system vendor must be established and maintained. Vendors spend a great deal of time and money developing products to access databases and are usually not readily willing to give others direct access to their databases. There is a general feeling that any "value-added" to their data access should be part of their product. For example, CD Plus was approached to discuss the ODAS concept. It was explained that MUSC/

EHAP was building a "one-door" prototype to access multiple databases, including those accessed through CD Plus. CD Plus responded that they were in the database access business as well, and if additional databases for access are required, CD Plus would investigate incorporating them.

In addition, when a vendor's proprietary information is incorporated as part of another system, there exists an enormous configuration management task to continuously incorporate vendor changes with the system. Although industry trends towards open systems technology do not necessarily provide a cure for accessing existing proprietary databases, they offer significant hope for future data integration capabilities.

Some vendors have recognized the need for direct access to their data by other software systems. One example is SilverPlatter Information, Inc. SilverPlatter provides direct access to over 150 of their data sources through the Data Exchange Protocol (DXP). DXP enables queries from remote systems to be executed on SilverPlatter proprietary databases. This is highly beneficial since the ODAS can formulate queries for a suite of databases without requiring separate query formatting techniques for each. In this way, the ODAS is not concerned with the specific structures of the data it queries. However, some vendors intentionally prevent access to their data by embedding proprietary information, such as their company name, within the data. Integrating this type of data with the ODAS is virtually infeasible.

Another technical consideration is the data type. There are numerous large databases that are textual or bibliographic in content. Databases, such as MEDLINE, have category descriptors added to the data that are used by search functions to locate data in a variety of ways. Many organizations have spent a great deal of time and money developing these search functions to be the most competitive. Consideration must be given to the cost/benefit of accessing raw textual databases and developing new search functions, or using a search technique that already exists. In addition, there are a number of large databases that are incorporated in information systems that have no text search capabilities. Users must scroll through pages of data in such systems in order to access required information.

Information systems that access a variety of databases within their system must also be evaluated. There are some information systems that have integrated a variety of publicly available databases. In these cases, the data has been so closely correlated that an attempt to access the data directly, bypassing the organization's system, renders the information to be virtually useless.

Many databases selected as candidates for integration with the ODAS may contain the same information. Excess repetitive data causes poor system performance and provides no added value in data retrieval. Database integration candidates must be carefully analyzed so that duplicate information is not accessed by the ODAS.

Finally, there are a number of technical considerations surrounding the stability of the data, including its quantity, quality, and format. Minor changes in a data format could cause serious "ripple-effect" changes in the systems that access the data. Prior to integration with the ODAS, the information source must be established and have a track record of stability.

These technical concerns must be addressed during the selection process of viable candidates for the ODAS. Even some of the most useful information for the ODAS may not be accessible due to the complexity of the integration and maintenance effort. The long-term goal of the ODAS is to continue expanding its base of useful, non-duplicative data sources. Careful analysis of candidate data sources for simplicity of data integration is crucial to the success of the system.

5.2 Cost Considerations

Cost constraints are an important issue when considering databases for integration. Although many databases may be obtained at no charge, or for a nominal fee, other databases are quite expensive. MUSC has already made financial commitments to numerous information sources and access tools. For example, a significant investment has recently been made to purchase CD Plus, which provides access to a number of databases, including Medline, MiniMedline, Current Contents, and CINAHL. Due to vendor proprietary issues, it is difficult to bypass the vendor's processing mechanism, and directly access these databases.

In certain cases, however, vendors have provided mechanisms to facilitate queries directly to their data. An example of such a vendor is SilverPlatter Information, Inc. Direct access to Analytical Abstracts and other SilverPlatter database structures can be gained through their proprietary query software called Data Exchange Protocol (DXP). The ODAS can formulate and send sophisticated queries in DXP format and store the query results locally as a portion of an integrated end-user result. There are many benefits that can be achieved by utilizing data access methods such as these. Some of the major benefits include the following:

- Reduced overhead responsibility for the ODAS Knowledge Base since access to multiple data sources can be accommodated through common query formats (either proprietary or non-proprietary)
- Direct interoperability with remote data sources without prior knowledge of remote data structures
- Reduced amount of data stored locally within the ODAS local database.

Additional benefits gained from integrating data that can be manipulated independently from vendor systems are a reduction in ODAS development costs and complexity, and an increase in flexibility for acquiring data.

Many data sources, such as BAKER, are available through a dial-up service at a certain rate per hour, with an additional subscription fee required. It is not recommended that these data sources be considered for integration due to the complexity of the cost tracking and system design issues. Research has suggested that with the amount of data sources available on CD-ROM alone, data available through dial-up services is likely to be available on CD-ROM as well.

5.3 Database Descriptions

This section provides detailed descriptions of each of the 28 candidate databases selected from the original 127 researched. Based on research results to date, these candidates provide the information most pertinent to the MUSC/EHAP mission. Each database is described in terms of its content, information volume, and update frequency.

5.3.1 Analytical Abstracts

The Analytical Abstracts database provides worldwide coverage of analytical chemistry from the Royal Society of Chemistry. Specific information provided includes methods for chemical analysis with detailed, up-to-date bibliographic records. Additional subjects incorporated include Biochemistry, Energy, Industry, Pharmaceutical, and Science and Technology. Analytical Abstracts provides in-depth coverage from 1980 to the present, including quarterly updates and international literature from the field of analytical chemistry.

Analytical Abstracts provides electronic access to over 1,100 journals published in over 20 languages. In addition, books, conference proceedings, standards, and technical reports are covered. A total of over 170,000 data records are provided with approximately 12,000 updates occurring annually.

5.3.2 BAKER

BAKER is a database of MSDSs prepared in accordance with guidelines issued by the US Occupational Safety and Health Administration (OSHA) by the J. T. Baker Chemical Company of Phillipsburg, New Jersey. One chemical substance is covered in each database record. Information contained in the BAKER database includes chemical name, formula, molecular weight, common synonyms, precautionary labeling data, and physical property data such as boiling point and solubility. Additional information coverage includes fire and explosion hazard data, health hazard data, reactivity data, spill and disposal procedures, protective equipment, and storage/handling procedures. BAKER contains information on approximately 20,000 chemicals and is updated quarterly.

5.3.3 Biological and Agricultural Index

The Biological and Agricultural Index is an electronic bibliography of periodicals in the biological and agricultural sciences/disciplines produced by the H.W. Wilson Company. The specific information areas covered in this index include animal husbandry, biochemistry, biotechnology, botany, ecology, entomology, environmental science, genetics, nutrition, physiology, veterinary medicine, and zoology. The Biological and Agricultural Index provides in-depth coverage from July, 1983 to the present. Updates to the database are issued on a monthly basis.

5.3.4 CAB Abstracts

CAB Abstracts is a comprehensive bibliographic database of agricultural and biological information containing all records in the 26 primary abstract journals published by the commonwealth Agricultural Bureaux. It is produced by CAB International, Farnham Royal, Slough, U.K. Over 8,500 journals in 37 different languages are provided in the database. In addition, CAB Abstracts contains books, reports, theses, conference proceedings, patents, annual reports, and guides. Approximately 130,000 items are indexed on an annual basis. Coverage is from 1972 to the present, and updates occur monthly. Abstracts for significant papers are provided, while less important works are reported in bibliographic format.

Specific information contained in CAB Abstracts includes agricultural engineering, animal breeding, animal disease, arid lands, dairy science, forestry, horticulture, nutrition, and veterinary science. In addition, CAB Abstracts provides coverage on entomology, plant breeding, plant pathology, rural recreation and tourism, soils and fertilizers, weeds, and world agricultural economics.

5.3.5 CANCER-CD

The information contained in CANCER-CD originates from information collected from the Elsvier Science Publishers and NLM. CANCER-CD contains references to, abstracts of, and commentaries on worldwide literature on cancer and related subjects. In addition to cancer data, the database provides specific information on drugs, health sciences, pharmaceutical, and public health. CANCER-CD contains over 7,525,000 citations from 1984 to the present and is updated quarterly.

5.3.6 CANCERLIT

CANCERLIT is a comprehensive bibliographic database containing citations and abstracts of published cancer literature selected from biomedical journals, proceedings, books, reports, and doctoral theses. It is produced by NLM in conjunction with the National Cancer Institute. Topics covered include all aspects of experimental and clinical cancer therapy, chemical information,

carcinogens, mechanisms of carcinogenesis, and viral agents. In addition, information is provided on biochemistry, immunology, physiology, mutagen, and mutagen testing. CANCERLIT provides coverage from 1963 to the present, including monthly updates, each containing approximately 6,000 new references. A total of over 335,000 data records are provided in CANCERLIT.

5.3.7 CHEMICAL ABSTRACTS

CHEMICAL ABSTRACTS is a database produced by the Chemical Abstracts Service (CAS), American Chemical Society that provides worldwide coverage of chemical sciences literature from over 9,000 journals. In addition, it provides patent information, conference proceedings, and government research reports. Sponsored by CAB International, CHEMICAL ABSTRACTS provides coverage of over 11 million bibliographic database records from 1967 to the present, with updates occurring every two weeks.

5.3.8 Encyclopedia of Chemical Technology

The Encyclopedia of Chemical Technology (formally called the Kirk-Othmer Encyclopedia of Chemical Technology) is a comprehensive collection of applied chemical science and industrial technology information provided by Wiley Electronic Publishing. Specific coverage includes methods, materials, and the latest scientific advances in every branch of the useful arts of chemistry.

The Encyclopedia of Chemical Technology database provides information on a wide range of subject areas, including agricultural chemicals, energy, drugs, fibers and textiles, food, and fossil fuels. Additional information provided in the database includes glass and ceramics, metals/ metallurgy, semiconductors, and electronic materials. The database contains over 25,000 records and is updated approximately every four years.

5.3.9 Environmental Sciences and Pollution Management Database

The Environmental Sciences and Pollution Management Database is a comprehensive, multi-disciplinary coverage of relevant fields across the environmental sciences produced by Cambridge Scientific Abstracts. Specific journal, conference proceedings, and monograph information is provided for ecology, environmental impact statements, toxicology, health and safety science, aquatic pollution, and environmental quality. Additional information is provided on agricultural and environmental biotechnology, bacteriology, risk, industrial and applied microbiology, and environmental engineering. Over 13,000 primary and secondary sources are provided in the Environmental Sciences and Pollution Management Database. Coverage includes 1984 to the present, which encompasses 357,700 records updated quarterly.

5.3.10 HAZARDLINE

HAZARDLINE, produced by Occupational Health Services, Inc., provides comprehensive data on more than 4,000 hazardous substances. Specific information in HAZARDLINE has been compiled from government agencies, industry studies, books, and journal articles. Thirty-one available data categories provide information on physical properties, toxicology, emergency response, waste disposal, and regulations. HAZARDLINE is updated continuously.

5.3.11 Hazardous Substances Data Bank

The Hazardous Substances Data Bank (HSDB), provided by NLM, contains approximately 120,000 citations and abstracts related to occupational safety and health literature worldwide. This includes information on toxicology and the environmental effects of chemicals. It covers emergency handling procedures, environmental impacts, detection methods, manufacturing information, and regulatory requirements. Provided sources include standard texts and monographs, government documents, technical reports, and journals. HSDB provides in-depth current coverage of health and safety data including quarterly updates. A total of over 4,300 data records are provided in the database.

5.3.12 HAZDAT

HAZDAT is the ATSDR's comprehensive hazardous substance release/health effects database system. Source documents include environmental and health data contained in Agency products such as public health assessments, health consultations, toxicological profiles, and data from the EPA site characterization documents. Specific information provided in HAZDAT includes site characteristics, site activities and events, contaminants found, contaminant media, and population affected. HAZDAT also contains data from the EPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS). HAZDAT contains over 162,000 records and is updated annually.

5.3.13 HAZINF

The HAZINF database is based on Hazardous Chemicals Information and Disposal Guide, authored by M. A. Armour, L. M. Browne, and G. L. Weir of the Chemistry Department of the University of Alberta. HAZINF provides information for accessing and responding to hazards associated with chemical substances, particularly as they occur in the laboratory environment. Information on 22 substances is covered in the database. HAZINF has not been updated since 1988, and no further updates will be made in the future.

5.3.14 IAR Cancer Disc

The IAR Cancer Disc database series, developed by the International Agency for Research on Cancer, provides information that facilitates the clarification of the link between exposure to environmental chemicals and the development of human cancer and genetic defects. Information such as the carcinogenic potential of over 700 chemicals, complex mixtures, and lifestyle factors is provided. In addition, subject areas such as genetics, health and safety, health sciences, occupational health and safety, public health, and toxicology are provided. IAR Cancer Disc provides coverage of information from 1971 to the present and is updated annually.

5.3.15 Integrated Risk Information System

The Integrated Risk Information System (IRIS) has been developed and sponsored by the EPA. IRIS is considered a primary vehicle for communicating chronic non-cancer and cancer health hazard information for over 500 substances. The database contains hazard identification, dose response information, and chemical specific risk information in both text and quantitative formats. In addition, IRIS provides data on EPA's consensus opinion concerning potential adverse and chronic human health affects related to chemical hazard identification and dose response assessment. This includes approximately 500 chemicals and more than 600 chemical risk summaries.

The IRIS data categories include substance identification/use, chemical and physical properties, non-carcinogenic assessment - lifetime exposure, carcinogenicity assessment - lifetime exposure, and drinking water health advisories/acute toxicity. Other coverage includes EPA exposure standards and regulations, substance identification and uses, chemical properties, and references. The IRIS database is updated on a monthly basis.

5.3.16 MALLIN

MALLIN, produced by Mallinckrodt, Inc., is a collection of MSDSs prepared in accordance with guidelines issued by OSHA. The database contains 1,543 MSDSs. While the contents of the records vary depending on the information available for a given substance, the records generally contain chemical name, formula, molecular weight, common synonyms, and precautionary labeling data. Information is also provided for physical properties (e.g. boiling point, solubility, etc.), fire and explosion hazards, health hazards, reactivity, spill and disposal procedures, protective equipment, and chemical storage and handling. MALLIN is updated on a quarterly basis.

5.3.17 MEDLINE

MEDLINE is a bibliographic database produced by NLM covering the fields of medicine, nursing, dentistry, veterinary medicine, and the pre-clinical sciences. MEDLINE provides doctors,

medical researchers, allied health professionals, medical and life science students, and interested lay persons with information covering all aspects of biomedicine. This includes allied health fields, biological and physical sciences, humanities, and information sciences as they relate to medicine and health care.

The many subject access points in MEDLINE include the Medical Subject Headings (MESH). MEDLINE contains all citations published in Index Medicus, and corresponds in part to the international Nursing Index and the Index to Dental Literature. Citations include the English abstract when published with the article. The coverage is from 1966 to the present. The database is updated bi-weekly and contains approximately 7 million records.

5.3.18 Merck Index Online

The Merck Index Online is an interdisciplinary database containing concise descriptions of chemicals, drugs, and biologicals. The database is produced by Merck and Co., Inc. It includes information on isolation, preparation, synthesis, structure, chemical and physical properties, biological activity, toxicity, and medical and non-medical uses for compounds and selected derivatives. Pertinent literature references are also provided. The database was created in 1984 and is updated annually.

5.3.19 MSDS-CCOHS

The Canadian Centre for Occupational Health and Safety (CCOHS) MSDS database contains information for more than 90,000 products manufactured or used in Canadian and US workplaces. The data sheets are prepared and supplied by over 550 producers/distributors and contain product information, manufacturer/supplier address, emergency contact information, and the full text of the MSDS. The MSDS-CCOHS database is updated on a quarterly basis.

5.3.20 OHS-MSDS

The OHS-MSDS database, produced by Occupational Health Services Inc., contains health and safety data for approximately 17,000 single substances and 74,000 mixtures. These substances comprise more than 90 percent of the most frequently used industrial chemicals. The OHS-MSDS database contains information such as trade names, company names, and MSDS full text. OHS-MSDS originated in 1984 and is updated on a quarterly basis.

5.3.21 Risk Assistant

Risk Assistant is a system sponsored by the EPA, the New Jersey Department of Environmental Protection and Energy, the California EPA, and the Delaware Department of Natural Resources. It is copyrighted by the Hampshire Research Institute. Risk Assistant provides an array of analytical

tools, databases, and information handling capabilities for individuals who wish to assess chemical health risks. The system requires an estimate of the nature, concentration, and air emission of chemicals present at a site. In addition, the system can assist in analysis and communication of risk. The 2.09 version of the Risk Assistant system incorporates the ISC-LT air model and additional scenarios for dermal exposure. Risk assistant is released periodically in versions.

5.3.22 RODScan

RODScan, provided by Morgan, Lewis, and Bockius, allows users to search over 1000 EPA Superfund Records of Decision (RODs). After the EPA designates a Superfund site, it issues a ROD. Typically each ROD contains information such as the site name, location, characteristics, contaminants present, alternatives for site clean-up, and projected costs of these alternatives. In addition, a ROD contains the EPA's official decision concerning how a specific Superfund site is to be cleaned up. The information in RODs is used by attorneys for advising clients on voluntary clean-ups, and as a means of identifying potential liabilities in acquiring property. RODScan provides the complete text and official EPA abstract for all RODs. The database is updated quarterly and displays the most recent ROD first.

5.3.23 RREL Treatability Database

The Risk Reduction Engineering Laboratory (RREL) Treatability database, produced by the EPA, contains 1,217 chemical compounds and over 15,800 sets of treatability data. The purpose of the database is to provide a thorough review of the effectiveness of proven treatment technologies in the removal/destruction of chemicals in various types of media. This media includes municipal and industrial wastewater, drinking water, groundwater, soil, debris, sludge, and sediment.

The chemicals contained in the RREL Treatability database are often those regulated under the Clean Water Act, Safe Drinking Water Act, Resource Conservation and Recovery Act, Toxic Substances Control Act, Superfund Amendments and Reauthorization Act, and other environmental laws enacted by Congress. For each chemical, the RREL Treatability database contains information on physical/chemical properties, aqueous and solid treatability data, Freundlich isotherm data, environmental database information sources, and data references, including a reference abstract. The RREL Treatability database is distributed free of charge and is updated on an annual basis.

5.3.24 Safety Sciences and Risk Assessment Database

The Safety Sciences and Risk Assessment Database, produced by Cambridge Scientific Abstracts, provides comprehensive abstract and bibliographic information across the fields of public health, safety, and industrial hygiene. The database covers the primary sources abstracted for health and safety science, and risk magazines. The database contains 442 primary sources and 5,500

secondary sources. This includes journals, monographs, and conference proceedings. In addition, the database contains 40,800 records in the "current plus 5 years previous" timeframe, and 72,400 records in the "current plus 10 years previous" timeframe. The Safety Sciences and Risk Assessment Database is updated on a quarterly basis.

5.3.25 TERIS

The Teratogen Information System (TERIS) was developed by the University of Washington, and provides current information on the teratogenic effects of more than 700 drugs and environmental agents. TERIS contains agent summaries derived from thorough literature reviews. The database consists of literature summaries and selected bibliography and risk assessment data. The summaries rate reproductive risk and explain data used to develop the ratings. The database is used by health care practitioners to counsel pregnant women regarding exposure to potential teratogens. The data in TERIS is updated on a daily basis.

5.3.26 TOXLINE

TOXLINE, provided by NLM, covers toxicological information from a set of 16 diverse sources. It provides references to published material, such as journal articles, monographs, technical reports, thesis letters, meeting abstracts, papers, reports, and research in progress. Topics covered include adverse drug reactions, air pollution, carcinogenisis via chemicals, drug toxicity, and food contamination. Additional topics covered include occupational hazards, pesticides and herbicides, toxicological analysis, and water treatment.

Nearly all of TOXLINE's bibliographic citations include abstracts, indexing terms, and CAS Registry Numbers. TOXLINE contains bibliographic files with citations from 1965 to present, and excludes data from proprietary sources. The TOXLINE database contains over two million records and is updated on a monthly basis. Approximately 9,300 new citations are added to TOXLINE each month.

5.3.27 TOXLIT

TOXLIT, provided by NLM, is a database that contains bibliographic citations on subjects such as toxicology, pharmacology, biochemical and physiological effects of drugs and other chemicals. The TOXLIT database consists primarily of journal articles, meeting papers, monographs, and patents. At present, the citations are derived exclusively from chemical abstracts. TOXLIT contains over 1.6 million records and is updated on a monthly basis. Approximately 8,600 new citations are added to TOXLIT each month.

5.3.28 TSCATS

The Toxic Substances Control Act Test Submissions (TSCATS) database is sponsored by the EPA and is owned by Chemical Information System (CIS). TSCATS enables users to identify unpublished health and safety studies submitted to the EPA under various sections of the Toxic Substance Control Act. TSCATS, which is updated quarterly, presently includes over 47,190 citations on more than 5,680 chemical substances. The database can be searched by chemical name, CAS Registry Number, submitting organization name, study purpose, observed effects, and a variety of other parameters.

6.0 Conclusions

As shown in this report, there are numerous environmental/health related databases. A key to the success of the ODAS is the integration of databases that will best meet the collective needs of the academicians, clinicians, and researchers supporting the EHAP mission. The Database Identification and Analysis Task has proven invaluable in identifying candidate databases for integration with the ODAS. This section presents recommendations and issues that should be considered prior to selection of a final set of databases.

6.1 Recommendations

The number of environmental/health databases is growing rapidly, and the technical and cost issues associated with accessing these databases vary greatly. This report documents the process used to select candidate databases for integration with the initial implementation of the ODAS. The selection process has resulted in a number of recommendations for consideration, prior to selecting a final set of databases for integration.

6.1.1 New Databases Versus Databases Currently Available at MUSC

A key component to the success of the ODAS is the informational value of the databases it will access. The process of identifying useful information sources for integration with the system requires analysis of the requirements identified during the Information Access and Processing Requirements Analysis effort and the Database Identification and Analysis effort. Based on the information gathered during both of these efforts, several conclusions have been reached.

There are numerous software vendors that have developed and marketed search products for accessing one or more databases. For example, MEDLINE at MUSC may be accessed via the Knowledge Finder software on a Macintosh platform and through MUSCLS, which accesses a mini version of MEDLINE received from Georgetown University in MUMPS format. MEDLINE will also soon be available through the CD Plus product, which was recently purchased by MUSC.

Although access to popular databases such as MEDLINE and TOXLINE represents a high priority need, it is important that time and money not be spent "reinventing" search techniques that are already available. Many vendors have worked for years to develop and enhance their search capabilities, and MUSC has made financial commitments to several of these products. At the same time, it is important that the user community have convenient access to commercially available search and retrieval products, which often function on limited platforms.

Several recommendations have been formulated to address this issue. A long term solution is provide direct access to NLM databases, such as MEDLINE, via the NLM Unified Medical Language System (UMLS). NLM databases will be obtained on CD-ROM and accessed directly. In this solution, the UMLS Knowledge Sources will be used to help "narrow" the scope of user queries. For a complete description of the UMLS, see the Needs Assessment Report.

It is important to note that the UMLS products are still under development. Therefore, a short-term solution will be required to access the required NLM databases. A recommended short term solution is to provide an interface to external search products, such as CD Plus, through the ODAS windowing environment. In this way, users can invoke the commercial software to perform searches on databases, such as MEDLINE, from within the ODAS application.

As described above, there are numerous vendors that supply search capabilities for the NLM databases. MUSC has invested in a number of these products, including CD Plus and Knowledge Finder. There are many databases other than MEDLINE that are not as easily accessible, including the IRIS, RREL, and ATSDR databases. Access to these databases may require remote communications. Therefore, when prioritizing databases for integration with the ODAS, the "ease of access" currently available for required databases must be evaluated.

The development of the prototype has enabled the ODAS development team to research and experiment with several design options. The team has concluded that it is more efficient to load certain databases locally than access them externally. Databases that should be loaded locally include those that are not available on-line, and those that are fairly static (i.e., updated annually). This will help to optimize the system response time when performing complicated searches. It should be noted that conversion routines may be required to convert databases from their native format to the local database format.

6.1.2 Incorporation of Databases Local to MUSC to Promote Information Sharing

Databases developed locally at MUSC to store and retrieve research results should also be considered for integration with the ODAS. Several of the needs assessment interviewees expressed an interest in accessing data compiled by MUSC researchers. For example, Mike Hughes of the University of Mississippi was interested in accessing the agrimedicine information that Dr. Schuman and Sam Caldwell have compiled and stored in a local database at MUSC.

The integration of databases developed locally at MUSC with the ODAS could promote information sharing with other universities, government, and industry. This information sharing would be supportive of important initiatives, such as the Crossroads of Humanity Series, which brings together individuals from all walks of life to address important environmental health issues

The ability to share environmental/health information will also help to establish and strengthen relationships among universities focusing on risk assessment. The survey conducted with university libraries received a high level of response. This is a favorable indication that other universities are interested sharing information.

6.1.3 ODAS Working Group

Access to environmental/health databases is crucial to supporting the EHAP mission. However, as shown in this report, specific data requirements are broad and diverse. Therefore, it would be beneficial to establish an ODAS Working Group to serve as a forum for discussing system issues and priorities. The ODAS Working Group should perform the following functions:

- Serve as a liaison between the user community and the development team
- Prioritize user requirements for implementation
- Discuss and resolve technical and cost issues
- Serve as the ODAS Configuration Control Board (CCB) once system baselines have been established. In this role, the group should document system problems, evaluate and approve recommendations for system enhancements, evaluate and approve suggestions for new databases, and prioritize all software and data changes.

The ODAS Working Group should include representatives from the EHAP Office, the user community, the Center for Computing and Information Technology (CCIT), the MUSC Library, and the ODAS development team.

6.1.4 Final Selection of Databases for Integration with the ODAS

It is recommended that the following steps be performed to finalize the selection of databases for integration with the initial ODAS implementation:

- Review the technical issues, cost issues, and database descriptions presented in Section 5.0 of this report, and eliminate nonviable candidates
- Present candidate database descriptions to the potential ODAS user community and analyze feedback received during the hands-on evaluation of the ODAS Prototype
- Prioritize candidate databases for initial integration.

The data collected during the above steps should be reviewed by representatives from the EHAP Program Office, the CCIT, the user community, the MUSC Library, and the ODAS development team.

Although data has already been collected from the needs assessment interviews and the Needs Assessment Follow-Up Questionnaire, the potential ODAS user community should continue to be involved in the selection process. The database descriptions provided in Section 5.3 should be presented to the potential ODAS user community for review. In addition, the next phase of the ODAS Prototype development effort will include a "hands-on" evaluation period. The intent of this evaluation period is to allow users to gain a better understanding of the ODAS concept, so that they can provide focused recommendations concerning future system development and database integration issues.

Finally, a list of viable candidate databases should be prioritized for integration with the ODAS. An important factor to consider in this prioritization process is the databases that have already been either fully or partially integrated with the prototype. These include IRIS, RREL, OHS-MSDS, TSCATS, HAZDAT, and MEDLINE. A great deal of effort has already been expended to acquire, analyze, and integrate these databases, or portions of these databases. Therefore, if these databases receive favorable feedback during the prototype evaluation period, they should be assigned a high priority for integration with the operational ODAS.

6.1.5 Use of Periodical Surveys

New sources of environmental/health data are being created at a rapid pace both nationally and internationally. In addition, existing data sources are continuously being updated and methods of accessing existing sources are frequently modified and improved. For these reasons, it is imperative that periodical database surveys are conducted to update the research contained in this report. This will ensure that MUSC/EHAP has the most current availability, cost, and access information related to environmental/health databases. The results of these periodical surveys should be presented to the ODAS Working Group for review and consideration.

6.2 Issues

Prior to selecting databases for integration with the ODAS, there are several issues to consider. Technical and cost issues are described in detail in Section 5.1 and Section 5.2. The following sections present additional issues to consider when selecting and prioritizing databases for integration with the ODAS.

6.2.1 Diversity of the User Community

A key MUSC/EHAP objective is to establish an international computer network of approved data and informational support to develop a national basis for risk assessment, risk management, and risk communication. For this reason, the ODAS user community could potentially be very large. There are many connectivity issues associated with providing access to such a large user community. In addition, such a diverse set of users results in a wide range of information access and processing requirements. Therefore, it is imperative that a plan be developed for integrating the requirements of the various user groups and establishing connectivity to the ODAS. This plan should include a prioritization of user requirements and a schedule for system installation and training at the various user sites.

6.2.2 Evolution of Requirements

The requirements represented in this report were collected through interviews, questionnaires, research, and informal discussions. As a result, the requirements are varied and cover a wide range of areas. The next phase of the ODAS development effort will involve a hands-on evaluation period, in which potential users can experiment with the ODAS Prototype. Hopefully, this evaluation period will provide users with the opportunity to review their requirements and provide the ODAS development team with focused comments, suggestions, and potential problems. As a result, the needs assessment process is evolutionary and should continue throughout the next iteration of the ODAS Prototype.

APPENDIX A

PRODUCERS AND VENDORS OF ENVIRONMENTAL/HEALTH DATABASES

PRODUCERS AND VENDORS OF ENVIRONMENTAL/HEALTH DATABASES

| DATABASE OR INFORMATION SYSTEM NAME | GOVERNMENT | | | | | | | | | | | | | | NON-PROFIT | | | | | | COMMERCIAL | | | | | | | | | | | | | |

PRODUCERS AND VENDORS OF ENVIRONMENTAL/HEALTH DATABASES

| DATABASE OR INFORMATION SYSTEM NAME | GOVERNMENT | | | | | | | | | | | | | NON-PROFIT | | | | | | COMMERCIAL | | | | | | | | | | | | |

PRODUCERS AND VENDORS OF ENVIRONMENTAL/HEALTH DATABASES

| DATABASE OR INFORMATION SYSTEM NAME | GOVERNMENT | | | | | | | | | | | | | NON-PROFIT | | | | | | COMMERCIAL | | | | | | | | | | | | |

PRODUCERS AND VENDORS OF ENVIRONMENTAL/HEALTH DATABASES

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PRODUCERS AND VENDORS OF ENVIRONMENTAL/HEALTH DATABASES

| DATABASE OR INFORMATION SYSTEM NAME | GOVERNMENT | | | | | | | | | | | | | NON-PROFIT | | | | | | COMMERCIAL | | | | | | | | | | | | |

APPENDIX B

CHARACTERISTICS OF ENVIRONMENTAL/HEALTH DATABASES

CHARACTERISTICS OF ENVIRONMENTAL/HEALTH DATABASES

DATABASE OR INFORMATION SYSTEM NAME	TOPICS COVERED															CHARACTERISTICS					POINT OF CONTACT		ACCESS				SPONSOR				DATA			
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environment, General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology	Risk Assessment	Toxicology	# of Records (x 1,000)	Year Coverage Began	Update Frequency	Simulation Model	System of Databases	Point of Contact	PCC's Phone #	InterNet	Online	Mounted Locally	CD-ROM	Commercial	Government	Non-Profit	University	Abstract	Bibliographic	Full-Text	Quantitative
AGRICOLA	X															3,000+	1970	Q			SilverPlatter	800-343-0064				X	X	X				X		
AGRIS	X				X											2,000+	1975	Q			SilverPlatter	800-343-0064				X	X	X				X		
AGRISEARCH	X				X											40+	1984	A		X	SilverPlatter	800-343-0064				X	X	X	X			X	X	
AIDS & Cancer Research DB			X				X		X		X		X			153+	1983	M			CSA	301-961-6750	X	X	X		X				X	X			
Analytical Abstracts					X											170+	1980	Q			SilverPlatter	800-343-0064		X		X	X		X		X	X			
BAKER					X					X		X			X	20+	NA	Q			CIS, Inc/PSI Int'l, Inc.	800-247-8737		X			X						X	X
Biological & Agricultural Index	X	X		X	X	X		X	X		X					U	1983	M			H.W. Wilson Co.	718-588-8400		X	X	X	X				X	X			
BIOSIS Previews - Biological Abstracts		X	X	X					X		X		X			8,900+	1988	B/W			BRS Online/InfoPro	703-442-0900		X			X				X	X			
Biotechnology & Bioengineering DB		X		X	X			X	X		X		X			400+	1983	M			CSA	301-961-6750	X	X	X		X				X	X			
Biotechnology Abstracts		X		X												140+	1982	Q			SilverPlatter	800-343-0064				X	X				X	X			
BIOTECHSEEK		X		X												2.7+	1991	M			NLM	301-496-6308		X	X			X			X	X			
CAB Abstracts	X			X	X	X										2,100+	1979	M			CAS/STN Int'l	800-848-6533		X			X				X				
CABCD	X					X										830+	1984	A			SilverPlatter	800-343-0064				X	X				X	X			
CANCER-CD			X				X	X	X							7,525+	1984	Q			SilverPlatter	800-343-0064				X	X	X			X	X			
CANCERLIT					X		X	X	X		X				X	335+	1963	M			NLM	301-496-6308		X	X	X		X			X	X			
CATLINE			X						X							700+	U	W			NLM	301-496-6308		X	X			X			X	X			
CCIS			X		X	X	X	X	X	X	X	X		X	X	U	1989	Q		X	MICROMEDEX, Inc.	800-525-9083		X			X					X	X	X	X
CCRIS					X		X	X	X	X		X			X	1.50	1983	B/A			CIS, Inc/PSI Int'l, Inc.	800-247-8737		X				X					X	X	X
CHEM-BANK					X	X				X		X		X	X	110+	NA	Q		X	SilverPlatter	800-343-0064				X	X	X					X	X	X
Chem. Engineering & Biotechnology Abstracts				X	X											167+	1975	M			CAS/STN Int'l	800-848-6533		X			X				X	X			
CHEMHAZIS					X				X	X		X			X	2.3+	NA	I			CIS, Inc/PSI Int'l, Inc.	800-247-8737		X			X				X		X		
Chemical Abstracts					X										X	11,000+	1967	B/W			CAS/STN Int'l	800-848-6533		X			X				X	X			X
Chemical Info. System		X			X	X	X	X	X	X		X	X	X	X	U	1984	U		X	CIS, Inc/PSI Int'l, Inc.	800-247-8737		X			X					X	X	X	X
ChemID			X		X	X										270+	U	Q			NLM	301-496-6308		X	X			X					X	X	X
CHEMLINE					X											1,142+	U	B/M			NLM	301-496-6308		X	X		X	X					X	X	X
CHEMLIST					X	X										162+	1979	W			CAS/STN Int'l	800-848-6533		X			X				X				

NA - Not Applicable
DB - Database
U - Unknown

A - Annually B/A - Bi-annually B/M - Bi-monthly B/W - Bi-weekly D - Daily
I - Irregular M - Monthly N - None Q - Quarterly W - Weekly

CRC

CHARACTERISTICS OF ENVIRONMENTAL/HEALTH DATABASES

DATABASE OR INFORMATION SYSTEM NAME	TOPICS COVERED															CHARACTERISTICS					POINT OF CONTACT		ACCESS				SPONSOR				DATA			
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environment, General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Science	Occupational Safety	Pharmacology	Risk Assessment	Toxicology	# of Records(x 1,000)	Year Coverage Begin	Update Frequency	Simulation Model	System of Databases	Point of Contact	POC's Phone #	Internet	Online	Mounted Locally	CD-ROM	Commercial	Government	Non-Profit	University	Abstract	Bibliographic	Full-Text	Quantitative
CHEMREACT					X											370+	1975	A			CAS/STN Int'l	800-848-6533		X			X						X
CHEMSAFE					X					X		X				13+	NA	B/A			CAS/STN Int'l	800-848-6533		X			X					X	X
CHID							X		X		X					95+	1973	Q			BRS Online/InfoPro	703-442-0900		X			X			X	X	X	
CHRIS					X					X		X				1.2+	NA	I			CIS, Inc/PSI Int'l, Inc.	800-247-8737		X			X	X				X	X
Clinical Toxicology of Commercial Products					X										X	23+	NA	N			CIS, Inc/PSI Int'l, Inc.	800-247-8737		X			X					X	
Comprehensive Core Medical Library									X		X		X			U	U	W			BRS Online/InfoPro	703-442-0900		X			X				X	X	
Conference Paper DB				X		X			X		X					671+	1983	B/M			CSA	301-961-6750	X	X	X		X				X	X	X	
CRISP			X	X					X		X					U	1986	M			BRS Online/InfoPro	703-442-0900		X			X	X			X	X	
CSNB									X	X		X			X	30+	1981	M			CAS/STN Int'l	800-848-6533		X			X		X		X		
Current Awareness in Biological Science			X	X	X		X	X	X		X		X		X	U	NA	M			BRS Online/InfoPro	703-442-0900		X			X				X		
Current Contents Search				X	X	X			X		X		X			U	1990	W		X	ISI	800-336-4474		X			X				X		
DART					X		X	X	X		X			X	X	13+	1989	U			NLM	301-496-6308		X	X			X			X	X	
DBIR		X		X							X					1.90	NA	M			NLM	301-496-6308		X	X			X			X		X	
Derwent Biotechnology Abstracts		X		X				X								150+	1982	B/W			CAS/STN Int'l	800-848-6533		X			X				X	X		
Drug Info. Fulltext					X				X				X			1+	NA	A			CIS, Inc/PSI Int'l, Inc.	800-247-8737		X					X			X		
Drug Info. Full text/IPA					X				X				X			200+	U	Q			SilverPlatter	800-343-0064				X	X		X		X	X		
DRUGUPDATES													X			5+	1977	M			CAS/STN Int'l	800-848-6533		X			X					X		
EINECS plus-CD					X											100+	NA	I			SilverPlatter	800-343-0064				X	X	X				X	X	
EMBASE				X					X				X			350+/yr	1974	W			CAS/STN Int'l	800-848-6533		X			X				X		
EMCIS					X	X						X				4+	U	Q			EM Science	800-222-0342			X	X	X					X	X	
Emergency Response Notification System					X	X										207+	1987	Q			CIS, Inc/PSI Int'l, Inc.	800-247-8737		X			X	X				X	X	
EMICBACK				X	X		X	X	X		X			X	X	75+	1980	I			NLM	301-496-6308		X	X			X			X	X		
Encyclopedia of Chemical Technology	X				X								X			25+	NA	I			DIALOG	800-334-2564		X			X					X	X
ENVIROFATE					X	X										13+	1984	I			CIS, Inc/PSI Int'l, Inc.	800-247-8737		X			X					X	X
ENVIROLINE						X			X							187+	1971	M			R.R. Bowker	800-323-3288		X			X				X		
Environmental Bibliography						X			X		X					U	1973	B/M			DIALOG	800-334-2564		X			X					X		

NA - Not Applicable
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DATABASE OR INFORMATION SYSTEM NAME	TOPICS COVERED																CHARACTERISTICS					POINT OF CONTACT		ACCESS				SPONSOR				DATA			
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environment, General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology	Risk Assessment	Toxicology	# of Records(x 1,000)	Year Coverage Began	Update Frequency	Simulation Model	System of Databases	Point of Contact	POC's Phone #	InterNet	Online	Mainfrm Locally	CD-ROM	Commercial	Government	Non-Profit	University	Abstract	Bibliographic	Full-Text	Quantitative
Environmental Sciences & Pollution Mgt DB	X	X		X	X	X			X					X	X	357+	1984	Q			CSA	301-961-6750	X	X	X		X				X	X		
ETICBACK					X		X	X	X		X			X	X	50+	1950	I			NLM	301-496-6308		X	X			X			X	X		
EXAMS II					X	X								X	X	NA	NA	A	X		EPA/Lawrence Burns	706-546-3511				X		X				X	X
Expanded LSC plus Marine Biol & Bioengrg.		X		X		X			X		X					U	U	M			CSA	301-961-6750	X	X	X		X				X	X		
EXPERTNET									X				X			1+	1983	BM			ExpertNet, Ltd.	800-888-8310		X	X		X						X	
GENBANK								X	X							147+	1982	W			CAS/STN Intl	800-848-6533		X			X		X			X	X	X
GENE-TOX					X		X	X	X						X	2.90	NA	U			NLM	301-496-6308		X	X			X				X	X	
Genetics DB						X		X			X		X		X	305+	1983	M			CSA	301-961-6750	X		X		X				X	X		
GENETOX			X				X	X	X							4.3+	NA	I			CIS, Inc/PSI Intl, Inc.	800-247-8737		X			X						X	X
GIABS					X		X							X	X	3.1+	1987	I			CIS, Inc/PSI Intl, Inc.	800-247-8737		X			X						X	X
HAZARDLINE					X	X			X	X		X			X	4+	NA	M			OHS	800-445-6737		X			X						X	X
Hazardous Substances Data Bank			X		X	X			X	X		X	X	X	X	4.3+	NA	Q			NLM	301-496-6308		X	X			X						X	X
Hazardous Waste Collection DB					X	X										U	U	U			EPA/Felice Sacks	202-382-5804			X			X			X	X	X	
HAZDAT					X	X			X					X	X	182	U	A			ATSDR/Sandy Susten	404-639-6795			X			X					X	X
HAZINF					X					X						.2+	NA	N			CIS, Inc/PSI Intl, Inc.	800-247-8737		X			X						X	X
HEALSAFE						X			X	X		X				83+	1981	Q			CAS/STN Intl	800-848-6533		X			X				X	X		
IARCancer Disc					X	X	X	X	X		X	X		X	X	.7+	1971	A			SilverPlatter	800-343-0064			X	X	X	X					X	X
Int'l Pharmaceutical Abstracts					X				X				X			202+	1970	Q			SilverPlatter	800-343-0064				X	X		X		X	X		
IRIS					X	X	X		X					X	X	I	NA	M			EPA/Linda Tuxen	202-260-6949		X				X				X	X	
IRPTC					X	X			X					X	X	U	U	U			EPA/Emma McNamara	202-260-1522			X			X			X	X	X	
Life Sciences Collection			X	X	X		X	X	X		X		X		X	1,887+	1979	Q			CSA	301-961-6750		X		X	X				X	X		
MALLIN					X					X		X			X	1.54+	NA	Q			CIS, Inc/PSI Intl, Inc.	800-247-8737		X			X						X	X
MEDLARS		X	X	X	X	X	X	X	X		X		X	X	X	16,000+	NA	NA		X	NLM	301-496-6308		X	X			X			X	X	X	X
MEDLINE		X	X	X	X	X	X	X	X		X		X	X	X	7,000+	1966	BW			NLM	301-496-6308		X	X	X		X			X	X		
MEPAS						X			X					X		NA	NA	NA			DOE				X			X						X
Merck Index					X				X				X		X	U	1984	A			BRS Online/InfoPro	703-442-0900		X			X						X	X

NA - Not Applicable
DB - Database
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A - Annually B/A - Bi-annually B/M - Bi-monthly B/W - Bi-weekly D - Daily
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CRC

CHARACTERISTICS OF ENVIRONMENTAL/HEALTH DATABASES

DATABASE OR INFORMATION SYSTEM NAME	TOPICS COVERED															CHARACTERISTICS					POINT OF CONTACT		ACCESS				SPONSOR				DATA			
	Agricultural Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environment, General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology	Risk Assessment	Toxicology	# of Records(x 1,000)	Year Coverage Began	Update Frequency	Simulation Model	System of Database	Point of Contact	POC's Phone #	Internet	Online	Mounted Locally	CD-ROM	Commercial	Government	Non-Profit	University	Abstract	Bibliographic	Full-Text	Quantitative
Microbiology DB		X	X	X	X								X			440+	1983	M			CSA	301-961-6750	X	X	X		X				X	X		
Molecular & Cellular Biology DB			X	X	X	X	X	X	X		X					1,063+	1983	M			CSA	301-961-6750	X	X	X		X				X	X		
MSDS-CCOHS					X					X		X				90+	NA	Q			CAS/STN Int'l	800-848-6533		X			X					X	X
NIOSHTIC			X		X		X		X	X		X			X	178+	NA	Q			ORBIT Online/InfoPro	703-442-0900		X			X	X		X	X		
NTIS Bibliographic DB				X	X	X			X		X					620+	1964	B/W			BRS Online/InfoPro	703-442-0900		X		X	X			X	X		
OCLC Environmental Library						X										300+	1980	A			OCLC/Teri Zimmerman	800-999-6568		X		X	X				X		
OCLC Online Union Catalog				X	X	X	X	X	X	X	X	X	X	X		28,000+	U	D		X	OCLC/Teri Zimmerman	800-999-6568		X	X	X	X				X		
OHMTADS					X	X				X		X				1.4+	U	I			CIS, Inc/PSI Int'l, Inc.	800-247-8737		X			X	X				X	X
OHS-MSDS					X					X		X				91+	1984	Q			OHS, Inc.	800-445-6737		X	X		X					X	X
OSH-ROM					X	X			X	X		X		X		350+	1980	Q			DIALOG	800-334-2564				X	X				X		
PSYCINFO									X		X		X			U	1967	M			BRS Online/InfoPro	703-442-0900				X	X			X	X	X	
Physicians Data Query			X				X		X				X			NA	NA	M			NLM	301-496-6308		X	X			X				X	
PIRANHA	X				X	X					X			X	X	NA	NA	A	X		EPA/Lawrence Burns	706-546-3511				X		X				X	X
Pollution Abstracts					X	X								X	X	189+	1970	M			CSA	301-961-6750		X			X			X	X		
Pollution/Toxicology DB w/ EIS's					X	X								X	X	189+	1983	M			CSA	301-961-6750	X	X	X		X			X	X	X	
POLTOX I						X			X				X		X	U	1981	Q			CSA	301-961-6750				X	X			X	X		
POLTOX II:EMBASE			X		X	X	X		X				X	X	X	270+	1984	Q			SilverPlatter	800-343-0064				X	X			X	X		
POLTOX III:CAB	X				X	X									X	100+	1983	Q			SilverPlatter	800-343-0064			X	X	X			X	X		
PsycLIT									X							570+	1974	Q			SilverPlatter	800-343-0064			X	X	X		X	X	X		
REPRORISK			X					X	X					X	X	U	NA	Q			MICROMEDEX, Inc.	800-525-8083			X	X	X					X	X
REPROTOX				X				X	X		X			X	X	U	U	U			RTC												
Risk Assistant					X				X					X	X	U	NA	I	X	X	EPA/Lawrence Burns	706-546-3511			X	X		X					X
RISKLINE (on TOXLINE)					X	X								X	X	27+	1966	Q			SilverPlatter	800-343-0064				X	X	X			X	X	X
RODSCAN					X	X				X		X				1000+	U	Q			RODScan Hotline	800-541-3201			X		X			X		X	X
RREL Treatability DB					X	X										10+	NA	A			EPA/Glenn Shaul	513-569-7408			X		X		X			X	X
RTECS					X		X	X	X					X	X	118+	1971	Q			CIS, Inc/PSI Int'l, Inc.	800-247-8737		X			X	X				X	X

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CRC

CHARACTERISTICS OF ENVIRONMENTAL/HEALTH DATABASES

DATABASE OR INFORMATION SYSTEM NAME	TOPICS COVERED																CHARACTERISTICS					POINT OF CONTACT		ACCESS				SPONSOR				DATA			
	Agriculture Science	Bioengineering	Biomedical Science	Biotechnology	Chemical Substances	Environment, General	Epidemiology	Genetics	Health, General	Industrial Hygiene	Life Sciences	Occupational Safety	Pharmacology	Risk Assessment	Toxicology	# of Records (x 1,000)	Year Coverage Begun	Update Frequency	Simulation Model	System of Databases	Point of Contact	POC's Phone #	Internet	Online	Mainframe Liability	CD-ROM	Commercial	Government	Non-Profit	University	Abstract	Bibliographic	Full-Text	Quantitative
Safety Sciences & Risk Assessment DB						X			X	X		X		X		72+	1983	Q			CSA	301-881-6750	X	X	X		X			X	X	X		
Science Citation Index		X	X	X	X	X		X	X		X		X		X	U	1974	W			ISI	800-336-4474		X	X	X	X					X		
TERIS (on REPRORISK)					X		X	X	X					X	X	.7+	NA	D			Janine E. Pellin, Ph.D.	206-543-2486		X	X	X	X		X				X	
The Etiology of Cancer			X				X	X	X		X					NA	NA	NA			SilverPlatter	800-343-0064				X	X						X	
The Nature of Genes			X	X			X	X	X							NA	NA	NA			SilverPlatter	800-343-0064				X	X		X	X			X	
TOMES Plus			X		X	X	X	X	X	X	X	X		X	X	U	1980	Q		X	MICROMEDEX, Inc.	800-525-6063			X	X	X						X	X
Toxic Chemical Release Inventory (TRI)					X	X		X							X	U	1987	A			EPA/Ruby Boyd	202-260-6367			X	X		X					X	X
Toxicology DB					X				X				X	X	X	89+	1984	M			CSA	301-881-6750	X		X		X				X	X		
TOXLINE			X		X	X	X	X	X		X	X	X	X	X	2,000+	1965	M			NLM	301-496-6308		X	X			X			X	X		
TOXLINE Plus			X		X	X	X	X	X		X	X	X	X	X	1,200+	1985	Q			SilverPlatter	800-343-0064				X	X	X	X		X	X		
TOXLIT				X	X	X	X		X				X	X	X	1,600+	1981	M			NLM	301-496-6308		X	X	X		X			X	X		
TOXNET					X	X	X	X	X					X	X	3.7+	1976	NA		X	NLM	301-496-6308	X	X	X			X					X	X
TRIFACTS					X	X			X	X		X				0.23	NA	I			NLM	301-496-6308		X	X			X					X	X
TSCATS					X	X								X	X	48+	NA	Q			CIS, Inc/PSI Int'l, Inc.	800-247-8737		X			X	X				X	X	
WasteInfo					X	X								X		75+	1973	Q			SilverPlatter	800-343-0064			X	X	X	X			X	X		

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APPENDIX C

UNIVERSITY LIBRARY DATABASE ACCESS FREQUENCY

UNIVERSITY LIBRARY DATABASE ACCESS FREQUENCY

DATABASE OR INFORMATION SYSTEM NAME	UNIVERSITIES SURVEYED																										
	Boston U.	Duke U.	Georgetown	GWU	Houston A M	Johns Hopkins	M C of Georgia	M C of PA	Mercer Sch. of Med.	NY Acad. of Med.	SUNY-Brooklyn	U. of Alabama	U. at Buffalo/NY	UCLA	U. of CT Health Ctr	U. of Illinois	U. of Maryland	U. of Mississippi	U. of NC	U. of NE Med Ctr	U. of PA Sch of M	U. of Virginia	U. of Washington	Rutgers University
AGRICOLA							L									M		L			L			
AGRIS																								
AGRISEARCH																								
AIDS & Cancer Research Database							L									H								
Analytical Abstracts																								
BAKER																								
Biological & Agricultural Index																H								
BIOSIS Previews - Biological Abstracts			L	L			L	L	L		L		L	M		M		L			M			
Biotechnology Abstracts													L			L								
Biotechnology and Bioengineering DB																L								
BIOTECHSEEK				M									L	L							L			
CAB Abstracts							L									H		L						
CABCD																								
CANCER-CD																					L			
CANCERLIT			L	H			M	L	M		M		H	H		H					L			
CAS Registry							L									H								
CATLINE			M	M			L	L	H		H		H	L		H								
CCINFO Disk								L																
CCIS			H	H				M																
CCRIS			L	L									L											
CHEM-BANK																								
Chem. Engineering & Biotechnology Abstracts																								
CHEMHAZIS																								
Chemical Abstracts			L				L	L			L		L			H		M						
Chemical Info. System																								
ChemID			L	L									L	L		H								
CHEMLINE			L	L			L		L				L	L		M								

L - access and low usage
M - access and medium usage
H - access and high usage

* Blank columns represent universities that were surveyed, but have not returned the completed form

UNIVERSITY LIBRARY DATABASE ACCESS FREQUENCY

DATABASE OR INFORMATION SYSTEM NAME	UNIVERSITIES SURVEYED																									
	Boston U.	Duke U.	Georgetown	GWU	Houston A M	Johns Hopkins	M C of Georgia	M C of PA	Mercer Sch. of Med.	NY Acad. of Med.	SUNY-Brooklyn	U. of Alabama	U. at Buffalo/NY	UCLA	U. of CT Health Ctr	U. of Illinois	U. of Maryland	U. of Mississippi	U. of NC	U. of NE Med Ctr	U. of PA Sch of M	U. of Virginia	U. of Washington	Rutgers University
CHEMLIST																								
CHEMREACT																								
CHEMSAFE																								
CHID				L	L		L						L								L			
CHRIS			L													L								
Clinical Toxicology of Commercial Products																								
Comprehensive Core Medical Library			L	M	L								L			L					L			
Conference Paper DB																								
CRISP				L	L		L	L								L								
CSNB																								
Current Awareness in Biological Science																								
Current Contents			H	M	L		M		L				H	H		H		L			L			
DART				L									L			L								
DBIR				M	L								L											
Derwent Biotechnology Abstracts					L																			
Drug Info. Fulltext				L	L								L											
Drug Info. Fulltext/MPA																		H						
DRUGUPDATES																								
EINECS plus-CD																								
EMBASE			M	M	M		L		L		L		M			H					L			
EMCIS																								
Emergency Response Notification System																								
EMICBACK			L	L																				
Encyclopedia of Chemical Technology																								
ENVIROFATE																								
ENVIROLINE																L								

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UNIVERSITY LIBRARY DATABASE ACCESS FREQUENCY

DATABASE OR INFORMATION SYSTEM NAME	UNIVERSITIES SURVEYED																									
	Boston U.	Duke U.	Georgetown	GWU	Houston A M	Johns Hopkins	M C of Georgia	M C of PA	Mount Sch. of Med.	NY Acad. of Med.	SUNY-Brooklyn	U. of Alabama	U. at Buffalo/NY	UCLA	U. of CT Health Ctr	U. of Illinois	U. of Maryland	U. of Mississippi	U. of NC	U. of NE Med Ctr	U. of PA Sch of M	U. of Virginia	U. of Washington	Rutgers University
Environmental Bibliography																								
Environmental Sciences & Pollution Mngt DB																								
ETICBACK			L	L	L																			
EXAMS II																								
Expanded LSC plus Marine Biol. & Bioengnr.																								
EXPERTNET																		L						
GENBANK			M		M		L		L		M					L								
GENE-TOX				L	L																			
Genetics Database																								
GENETOX																								
GIABS																								
HAZARDLINE					L		L																	
Hazardous Substances Data Bank				L	M		L		L				L	M		L					L			
Hazardous Waste Collection DB																								
HAZDAT																								
HAZINF																								
HEALSAFE																								
IARCancer Disc																								
Int'l Pharmaceutical Abstracts				L	L		L	L	L				L			H		H						
IRIS			L	L									L			L								
IRPTC			L																					
Life Sciences Collection														L				H						
MALLIN																								
MEDLARS			H	H	H		H	H	H		H		H	M		H					H			
MEDLINE			H				H						H	H		H		H			H			
MEPAS																								

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	Boston U.	Duke U.	Georgetown	GWU	Houston A M	Johns Hopkins	M C of Georgia	M C of PA	Mount Sch. of Med.	NY Acad. of Med.	SUNY-Brooklyn	U. of Alabama	U. at Buffalo/NY	UCLA	U. of CT Health Ctr	U. of Illinois	U. of Maryland	U. of Mississippi	U. of NC	U. of NE Med Ctr	U. of PA Sch of M	U. of Virginia	U. of Washington	Rutgers University
Merck Index					L																			
Microbiology DB																								
Molecular and Cellular Biology Database																								
MSDS-CCOHS																								
NIOSHTIC				M	L																			
NTIS Bibliographical DB				L			L											L						
OCLC Environmental Library																								
OCLC Online Union Catalog			L		L		H	L	H		H		H			H		H						
OHMTADS																								
OSH-ROM				M																				
PsycINFO			M	M	H		H		M		M		H	H		H								
Physicians Data Query			M	H	M		M	M	M		L		H	L		H					L			
PIRANHA																								
Pollution Abstracts																								
Pollution/Toxicology DB with EIS's																								
POLTOX I																								
POLTOX II: EMBASE																								
POLTOX III: CAB																								
PsycLIT			M		H			H					H	H		H		H			M			
REPRORISK			M	L																				
REPROTOX			L				L																	
RISKLINE (on TOXLINE)													L											
RREL Treatability DB																								
RTECS				L	M									L		M					L			
Safety Sciences and Risk Assessment DB																								
Science Citation Index			M		M		M	L	M				L	L		H		M			L			
TERIS (on REPRORISK)			M	L																				

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H - access and high usage

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UNIVERSITY LIBRARY DATABASE ACCESS FREQUENCY

DATABASE OR INFORMATION SYSTEM NAME	UNIVERSITIES SURVEYED																									
	Boston U.	Duke U.	Georgetown	GWU	Houston A M	Johns Hopkins	M C of Georgia	M C of PA	Mount Sinai Sch. of Med.	NY Acad. of Med.	SUNY-Brooklyn	U. of Alabama	U. at Buffalo/NY	UCLA	U. of CT Health Ctr	U. of Illinois	U. of Maryland	U. of Mississippi	U. of NC	U. of NE Med Ctr	U. of PA Sch of M	U. of Virginia	U. of Washington	Rutgers University
The Etiology of Cancer																								
The Nature of Genes																								
TOMES Plus			M	H																				
Toxic Chemical Release Inventory			L	L	L				L				L	L										
Toxicology Database																								
TOXLINE			L	M	M		L		M				L	L		H		L			L			
TOXLINE Plus																								
TOXLIT			L	L			L						L	L		H								
TOXNET			L	L	M				L					M							L			
TRIFACTS				L					L				L											
TSCATS																								
Wastelnfo																							*	

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H - access and high usage

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APPENDIX D

DISTRIBUTION OF ENVIRONMENTAL/ HEALTH DATABASE ACCESS BY UNIVERSITY LIBRARIES

Database Name	# of University Libraries Accessing Database
MEDLARS/MEDLINE	11
BIOSIS Previews - Biological Abstracts	11
Physician's Data Query	11
CANCERLIT	10
Current Contents	10
Science Citation Index	10
TOXLINE	10
CATLINE	9
EMBASE	9
OCLC Online Union Catalog	9
PsycINFO	9
Hazardous Substances Data Bank	8
International Pharmaceutical Abstracts	8
PsycLIT	8
Chemical Abstracts	7
CHEMLINE	7
Comprehensive Core Medical Library	6
GENBANK	6
Toxic Chemicals Release Inventory	6
TOXLIT	6
TOXNET	6
ChemID	5
CRISP	5
RTECS	5
AGRICOLA	4
BIOTECHSEEK	4
IRIS	4
CAB Abstracts	3
CCIS	3
CCRIS	3
DART	3
DBIR	3
Drug Information Fulltext	3
ETICBACK	3
NTIS Bibliographic Database	3
TRIFACTS	3
AIDS and Cancer Research Database	2
Biotechnology Abstracts	2

Database Name	# of University Libraries Accessing Database
CAS Registry	2
CHRIS	2
EMICBACK	2
GENE-TOX	2
HAZARDLINE	2
Life Sciences Collection	2
NIOSHTIC	2
REPRORISK	2
REPROTOX	2
TERIS	2
TOMES Plus	2
Biological and Agricultural Index	1
Biotechnology & Bioengineering Database	1
CANCER-CD	1
CCINFO Disk	1
Derwent Biotechnology Abstracts	1
Drug Info. Fulltext/Int'l Pharmaceutical Abstracts	1
ENVIROLINE	1
EXPERTNET	1
IRPTC	1
Merck Index	1
OSH-ROM	1
RISKLINE	1

APPENDIX E

ACRONYM DEFINITIONS

AMIA	American Medical Informatics Association
APA	American Psychological Association
ATSDR	Agency for Toxic Substances and Disease Registry
BRS	Brs Online Service
CAS	Chemical Abstracts Service
CCB	Configuration Control Board
CCIS	Computerized Clinical Information System
CCIT	Center for Computing and Information Technology
CCOHS	Canadian Center for Occupational Health and Safety
CCRIS	Chemical Carcinogenesis Research Information System
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CHEMHAZIS	Chemical Hazards Information System
CHID	Combined Health Information Database
CHRIS	Chemical Hazard Response Information System
CIS	Chemical Information System
CRISP	Computerized Research Information on Scientific Projects
CSA	Cambridge Scientific Abstracts
CSNB	Chemical Safety News Base
DART	Developmental and Reproductive Toxicology
DBIR	Directory of Biotechnology Information Resources

DHHS	Department of Health and Human Services
DXP	Data Exchange Protocol
EHAP	Environmental Hazards Assessment Program
EINECS	European Inventory of Existing Commercial Chemical Substances
EIS	Environmental Impact Statement
EM	Environmental Restoration and Waste Management
EMCIS	EM Science Chemical Information System
EMICBACK	Environmental Mutagen Information Center Backfile
EPA	Environmental Protection Agency
ESI	Environmental Studies Institute
ETICBACK	Environmental Teratology Information Center Backfile
EXAMS II	Exposure Analysis Modelling System
FAO of the UN	Food and Agriculture Organization of the United Nations
GENE-TOX	Genetic Toxicity
GENETOX	Genetic Toxicology
GIABS	Gastrointestinal Absorption Database
GWU	George Washington University
HAZDAT	Hazardous Substance Release/Health Effects Database
HAZINF	Hazardous Chemicals Information and Disposal
Houston A M	Houston Academy of Medicine
HSDB	Hazardous Substance Data Bank

IACR	International Agency for Cancer Research
IRIS	Integrated Risk Information System
IRPT	International Register of Potentially Toxic Chemicals
ISI	Institute for Scientific Information
LAN	Local Area Network
LSC	Life Sciences Collection
M C of Georgia	Medical College of Georgia
MEDLARS	Medical Literature Analysis and Retrieval System
MEDLINE	MEDLARS Online
MEPAS	Multimedia Environmental Pollution Assessment System
MESH	Medical Subject Headings
MSDS	Material Safety Data Sheets
MUSC	Medical University of South Carolina
MUSCLS	Medical University of South Carolina Library System
NCBI	National Center for Biotechnology Information
NCI	National Cancer Institute
NIEHS	National Institute of Environmental Health and Safety
NIH	National Institutes of Health
NIOSH	National Institute of Occupational Safety and Health
NIOSHTIC	National Institute of Occupational Safety and Health Technical Information Center

NISC	National Information Services Corporation
NLM	National Library of Medicine
NTIS	National Technical Information Service
OCLC	Online Computer Library Center
ODAS	One-Door Access System
OHMTADS	Oil and Hazardous Material Technical Assistance Data System
OHS	Occupational Health Services, Inc.
OSHA	Occupational Safety and Health Administration
PIRANHA	Pesticide and Industrial Chemical Risk Analysis and Hazard Assessment System
PSYCINFO	Psychology Information
POLTOX	Pollution and Toxicology Information System
REPRORISK	Reproductive Risk Information System
ROD	Record of Decision
RREL	Risk Reduction Engineering Laboratory
RSC	Royal Society of Chemistry
RTC	Reproductive Toxicology Center
RTECS	Registry of Toxic Effects of Chemical Substances
STN	Scientific and Technical Network
TERIS	Teratogen Information System

TOMES	Toxicology, Occupational Medicine & Environmental Series
TOXLINE	Toxicology Information Online
TOXLIT	Toxicology Literature
TOXNET	Toxicology Data Network
TSCATS	Toxic Substances Control Act Test Submissions Online Database
U of CT Health Ctr	University of Connecticut Health Center
U of NC	University of North Carolina
U of PA Sch of M	Un. .rsity of Pennsylvania School of Medicine
UMLS	Unified Medical Language System
USUHS	Uniformed Services University of the Health Sciences
WMIB	Waste Management Information Bureau

SOUTH CAROLINA STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM

ENVIRONMENTAL MEDICINE CURRICULUM COMMITTEE (EMCC)

LIST OF EMCC FACULTY AND DATES OF SITE VISITS

Site	*Date*	*Faculty*
Anderson	7/20/93	Dr. Hunter E. Woodall
Charleston	7/27/93	Dr. Clive D. Brock Dr. William M. Simpson*
Columbia	7/30/93	Dr. Ernest McCutcheon Dr. Philip W. Stone*
Florence	7/8/93	Dr. Hilton P. Terrell
Greenville	7/13/93	Dr. D. Scott Grubbs
Greenwood	7/19/93	Dr. David E. Ruiz
Spartanburg	7/12/93	Dr. Mark T. Godenick

* *Additional faculty members who volunteered to serve on the EMCC .*

ENVIRONMENTAL
&
OCCUPATIONAL MEDICINE

CURRICULUM SURVEY

STATEWIDE FAMILY PRACTICE
RESIDENCY SYSTEM

Environmental and Occupational Medicine Curriculum Survey

Objective

The objective of this survey was to document the existing EOM curriculum among the seven family practice residencies of the South Carolina Statewide Family Practice Residency System.

Significant Findings

▸Five residencies have required EOM curriculum for either first, second or third year residents while only two sites had no required curriculum. The required curriculum varied among the sites and ranged from noon conferences to one month rotations. Anderson was the only site with required curriculum for all three residency years.

▸Three sites reported that their residents are required to make EOM site visits. These include second year residents at Anderson and Columbia and first year residents at Greenville.

▸All seven residencies have EOM topics presented at noon conferences. Only three (Anderson, Charleston and Greenville) have allocated a specific number of noon conferences for EOM.

▸Four sites (Charleston, Columbia, Greenwood and Greenville) offer electives in EOM. Greenwood's elective is not offered on site.

ENVIRONMENTAL & OCCUPATIONAL MEDICINE CURRICULUM SURVEY
EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

1. Do your residents have required EOM curriculum?

Anderson[a]	✔		✔		✔	
Charleston[b]		✔	✔		✔	
Columbia[c]		✔	✔			✔
Florence		✔		✔		✔
Greenwood		✔		✔		✔
Greenville[d]	✔			✔		✔
Spartanburg		✔		✔		✔
Total	2	5	3	4	2	5

[a] 1yr = 3 to 4 lectures (lunch time) per year for all resident classes.
2 yr = Lectures as above with one month rotation on community/environmental medicine.
3 yr = Lectures and month as above; Hospital Employee Health & UPS.

[b] seminars during Family Medicine rotations in September & October

[c] one day each week during a one month outpatient rotation

[d] 1 yr = Orientation to Community Medicine Month (5 hours of site visits at two plants and EOM readings.)
2 yr = DOT physicals & Workers Compensation cases (no specific hours)

ENVIRONMENTAL & OCCUPATIONAL MEDICINE CURRICULUM SURVEY

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

2. Are your residents required to make at least one EOM site visit per year?

Residency Site	Residents					
	1st YR		2nd YR		3rd YR	
	Yes	No	Yes	No	Yes	No
Anderson		✔	✔			✔
Charleston		✔		✔		✔
Columbia		✔	✔			✔
Florence		✔		✔		✔
Greenwood		✔		✔		✔
Greenville	✔			✔		✔
Spartanburg		✔		✔		✔
Total	1	6	2	5	0	7

CURSUM.02

ENVIRONMENTAL & OCCUPATIONAL MEDICINE CURRICULUM SURVEY

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

3. Are EOM topics presented at noon conferences?

Anderson	✔		radon, farm hazards, food quality, "WHAC-ing" your patients
Charleston	✔		multiple chemical sensitivity
Columbia	✔		occupational dermatoses, TB as an occupational disease, introduction to EOM
Florence	✔		
Greenwood	✔		occupational injuries
Greenville	✔		returning employees to work, industrial hygiene
Spartanburg	✔		lead poisoning, radon
Total	7		

CURSUM.03

ENVIRONMENTAL & OCCUPATIONAL MEDICINE CURRICULUM SURVEY

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

4. Has your noon conference coordinator allocated a specific number of noon conferences for EOM topics?

Residency Site	Yes	No	Target Year
Anderson	✔		3-4
Charleston	✔		12
Columbia		✔	
Florence		✔	
Greenwood		✔	
Greenville	✔		2-4
Spartanburg		✔	
Total	3	4	17

ENVIRONMENTAL & OCCUPATIONAL MEDICINE CURRICULUM SURVEY

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

5. Do your residents have the opportunity to take electives in EOM?

Residency Site	Yes	No	Residents per Year (n)
Anderson[a]		✔	
Charleston[b]	✔		1-2
Columbia[c]	✔		
Florence		✔	
Greenwood[d]	✔		
Greenville	✔		1-3
Spartanburg		✔	
Total	4	3	2-5

[a] Required EOM curriculum.
[b] agromedicine; content is dependent on resident's interest
[c] one month elective; content is dependent on resident's interest
[d] self arranged; not available on site.

CURSUM.05

ENVIRONMENTAL & OCCUPATIONAL MEDICINE CURRICULUM SURVEY

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

SUMMARY - ALL RESIDENCIES (n = 7)

Question	Yes	No
1. Do your residents have required EOM Curriculum?	4	3
2. Are your residents required to make at least one EOM site visit per year?	3	4
3. Are EOM topics presented at noon conferences?	7	0
4. Has your noon conference coordinator allocated a specific number of noon conferences for EOM topic?	3	4
5. Do your residents have the opportunity to take electives in EOM?	4	3

CURSUM.SUM

ENVIRONMENTAL
&
OCCUPATIONAL MEDICINE

PATIENT CHART REVIEW

STATEWIDE FAMILY PRACTICE
RESIDENCY SYSTEM

Patient Chart Review for Environmental and Occupational Medicine

Objective

The objective of this project was to review a random sample of patient charts for selected EOM criteria. Fifty patient charts were examined at each site, except for Charleston which reviewed 20, for a total of 320 records. Patients under age 18 were excluded.

Significant Findings

▸In the last two years, the patient's occupation was listed in only 29% of the records.

▸In the last two years, the patient's job/work place was described in only 38 charts (12%).

▸The third EOM criteria reviewed was the question, "Was there an EOM concern described in the past two years?" Thirty-three charts (10%) noted an EOM concern by patients during the period.

▸The final criteria reviewed was whether the patient had ever been treated for a recognized EOM problem. A total of 52 patients, 16%, had received treatment. Twenty-three of the recorded problems were musculoskeletal injuries including low back pain, carpal tunnel syndrome, bursitis, tendinitis, and muscle strain. Other EOM problems included asthma, noise induced hearing loss, job stress, contact dermatitis and work related trauma.

PATIENT CHART REVIEW for ENVIRONMENTAL & OCCUPATIONAL MEDICINE

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

SUMMARY

Site / Chart	[illegible]		[illegible]		[illegible]		[illegible]	
	YES				YES	NO	YES	NO
Anderson /50	10	40	4	46	0	50	0	50
Columbia/50	10	40	4	46	4	46	13[a]	37
Charleston/20	10	10	4	16	4	16	3[b]	17
Florence/50	15	35	5	45	11	39	16[c]	34
Greenville/50	16	34	6	44	8	42	8[d]	42
Greenwood /50	22	28	9	41	6	44	6[e]	44
Spartanburg /50	10	40	6	44	-	-	6[f]	44
Total 320/(100%)	93/(29)	227/(71)	38/(12)	282/(88)	33/(10)	287/(90)	52/(16)	268/(84)

[a] asthma, LFT's, low-back pain, dermatitis (2), work-related stress (2), anemia, hearing loss and skin cancer, muscle strain, carpal tunnel syndrome, COPD and renal insufficiency, renal insufficiency

[b] cumulative trauma/repetitive motion, low back pain, contact dermatitis

[c] muscle pain from lifting, job stress (2), hay fever, sciatica & job stress, allergic rhinitis (4), contusion & other unspecified job injury, carpal tunnel syndrome, low-back strain, muscle strain, tick bite, tension headache, back pain

[d] carpal tunnel syndrome, multiple injuries, dermatitis, low-back strain, heat stress (job), tendinitis (thumb), low-back pain, bursitis

[e] job related knife cut, r.wrist overuse syndrome, job stress, bursitis, COPD (coal miner), pedal edema from standing

[f] bursitis, LS strain (3), cervical strain, carpal tunnel syndrome

PATSUM.CHT (rev 12/6/93)

ENVIRONMENTAL & OCCUPATIONAL MEDICINE CURRICULUM

ENVIRONMENTAL MEDICINE CURRICULUM COMMITTEE / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM

FORMAT	EOM ELECTIVE CURRICULUM - MODULES*								EOM ELECTIVES: CLINICAL / SITE VISITS / PROJECTS
	ERGO-NOMICS	NIHL	ACUTE & CHRONIC CHEMICAL EXPOSURE	EOM DERMA-TITIS	EOM LUNG DISEASE	IMPACT OF SUB-STANCE ABUSE	LOW DOSE RISKS	WORK. COMP. & OTHER LEGAL	
SELF-STUDY ELECTIVE 8 HOURS	1 HOUR	1 HOUR	1 HOUR	1 HOUR	1 HOUR	1 HOUR	1 HOUR	1 HOUR	NONE
ONE WEEK ELECTIVE 30 HOURS	"	"	"	"	"	"	"	"	1. THREE 1/2 DAYS WITH PRIVATE OCC. MED. PHYSICIAN. 2. INDUSTRY/FARM/HOSPITAL SITE VISIT ARRANGED BY THE RESIDENT. 3. VISIT WORK HARDENING, BACK SCHOOL PROGRAMS (PT GROUPS). 4. 1/2 DAY WITH AGROMEDICINE STAFF AND/OR AGMED MONOGRAPHS. 5. FOUR 1/2 DAYS FP PATIENT CARE.
ONE MONTH ELECTIVE 120 HOURS	"	"	"	"	"	"	"	"	1. ONE 1/2 DAY PER WEEK FOR CRITICAL REVIEW OF LITERATURE ON A TOPIC ASSIGNED BY THE ROLE MODEL FACULTY MEMBER. 2 ONE 1/2 DAY PER WEEK FOR CASE PRESENTATION AT NOON OR TOPIC CONFERENCE. 3. THREE 1/2 DAYS PER WEEK WITH PRIVATE OCC. MED. PHYSICIAN. 4. TWO 1/2 DAYS PER WEEK IN EMPLOYEE HEALTH SERVICES. 5. FOUR 1/2 DAYS PER WEEK FP PATIENT CARE.

EOM LONGITUDINAL CORE CURRICULUM		LONGITUDINAL CURRICULUM MODULES*					
		EOM HISTORY TAKING	COMMU-NICATING EOM RISKS TO PATIENTS	DATA BASES & CONSUL-TANTS	EOM SITE VISIT	EOM IN PRIVATE PRACTICE	
1ST YEAR	OBJECTIVE - TEACH THE USE OF "WHACS" WITH CHART AUDIT OF AT LEAST 50% COMPLIANCE; OSCE EXAM	1 HOUR					
2ND YEAR	OBJECTIVE - SITE VISIT WITH ROLE MODEL FACULTY - 1/2 OF RESIDENCY COHORT AT A TIME. PREPARE A SITE EVALUATION ASSESSMENT REPORT; OSCE EXAM		1 HOUR	1 HOUR	1 HOUR		
3RD YEAR	OBJECTIVE - INCORPORATING EOM AS AN INTEGRAL PART OF PRIVATE PRACTICE; OSCE EXAM					2 HOURS	

** Modules will be designed and edited by the EMCC and will consist of slide lectures, scripts,and interactive pc program., Revised 3/11/94.*

ENVIRONMENTAL
&
OCCUPATIONAL MEDICINE

SURVEY OF FAMILY

MEDICINE RESIDENTS

STATEWIDE FAMILY PRACTICE
RESIDENCY SYSTEM

Environmental and Occupational Medicine Survey of Family Medicine Residents

Objective

The objective of this survey was to document the residents' perceptions of EOM and their desire for EOM curriculum. A total of 130 residents responded to the survey.

Significant Findings

▸The residents were asked to rank order a list of 12 perceived difficulties with EOM. They were also permitted to write in their own reasons. The difficulties, with 1 being the worst, as perceived by the residents were:

1. lack of experience
2. too much paper work
3. perceived secondary gains by patients
4. too time consuming
5. hassles with industry and special interests groups
6. lack of role models
7. potential ethical issues
8. fear of legal repercussions
9. too many industries and health concerns
10. too much media attention
11. irrelevant for my patients
12. irrelevant for family medicine

▸The residents were also asked to comment on what they liked most and what they liked least about EOM. "Prevention" and the "relevancy of EOM" to family medicine were frequently cited as reasons why the residents liked EOM. "Paper work," "EOM is too broad," and "lack of experience" were often listed as reasons why the residents do not like EOM.

▸The final question asked of the residents was, "Would you consider spending elective time in EOM?" Seventy-six percent of the respondents said yes.

ENVIRONMENTAL & OCCUPATIONAL SURVEY of FAMILY MEDICINE RESIDENTS

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

2. Please rank order your perceived difficulties with environmental and occupational medicine with (1) being the worst problem:

ALL FP RESIDENTS (n = 130 Respondents)

1	273	2.46	lack of experience
2	329	3.58	too much paper work
3	373	4.10	perceived secondary gain by patients
4	339	4.13	too time consuming
5	362	4.16	hassles with industry & interest groups
6	341	4.26	lack of role models
7	423	5.57	potential ethical issues
8	392	5.60	fear of legal repercussions
9	421	5.77	too many industries/health concerns
10	465	8.02	too much media attention
11	557	9.44	irrelevant for my patients
12	537	10.53	irrelevant for family medicine

RESSUM2.ALL

ENVIRONMENTAL & OCCUPATIONAL SURVEY of FAMILY MEDICINE RESIDENTS

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

2. Please rank order your perceived difficulties with environmental and occupational medicine with (1) being the worst problem:

ANDERSON FP RESIDENTS (n = 22 Respondents)

1	38	2.23	lack of experience
2	43	2.68	too much paper work
3	55	3.43	perceived secondary gain by patients
4	62	4.42	too time consuming
5	71	5.07	hassles with industry & interest groups
6	58	5.27	lack of role models
7	72	5.53	too many industries/health concerns
8	68	5.66	fear of legal repercussions
9	65	6.50	potential ethical issues
10	76	8.44	too much media attention
11	117	10.63	irrelevant for my patients
12	89	11.12	irrelevant for family medicine

RESSUM2.AND

ENVIRONMENTAL & OCCUPATIONAL SURVEY of FAMILY MEDICINE RESIDENTS

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

2. Please rank order your perceived difficulties with environmental and occupational medicine with (1) being the worst problem:

CHARLESTON FP (n = 11 Respondents)

1	30	2.73	lack of experience
2	30	3.75	lack of role models
3	34	3.78	too much paper work
4	38	4.22	too time consuming
5	38	4.22	hassles with industry & interest groups
6	42	4.67	perceived secondary gain by patients
7	33	4.71	too many industries/health concerns
8	46	5.75	fear of legal repercussions
9	53	6.63	potential ethical issues
10	68	8.50	too much media attention
11	56	9.33	irrelevant for my patients
12	61	10.17	irrelevant for family medicine

RESSUM2.CHS

ENVIRONMENTAL & OCCUPATIONAL SURVEY of FAMILY MEDICINE RESIDENTS

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

2. Please rank order your perceived difficulties with environmental and occupational medicine with (1) being the worst problem:

COLUMBIA FP (n = 14 Respondents)

1	14	1.27	lack of experience
2	7	2.33	lack of role models
3	5	2.50	too much paper work
4	25	2.78	perceived secondary gain by patients
5	12	3.0	hassles with industry & interest groups
6	9	3.0	too time consuming
7	15	3.75	too many industries/health concerns
8	25	4.17	potential ethical issues
9	17	5.67	fear of legal repercussions
10	12	6	irrelevant for my patients
11	8	8	irrelevant for family medicine
12	12	12	too much media attention

RESSUM2.COL

ENVIRONMENTAL & OCCUPATIONAL SURVEY of FAMILY MEDICINE RESIDENTS

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

2. Please rank order your perceived difficulties with environmental and occupational medicine with (1) being the worst problem:

FLORENCE FP RESIDENTS (n = 7 Respondents)

1	11	1.58	too time consuming
2	11	1.83	lack of experience
3	14	2.33	hassles with industry & interest groups
4	17	2.83	lack of role models
5	19	3.16	potential ethical issues
6	17	4.25	perceived secondary gain by patients
7	26	5.2	too much paper work
8	12	6.0	fear of legal repercussions
9	12	6.0	too many industries/health concerns
10	10	10.0	too much media attention
11	11	11.0	irrelevant for my patients
12	12	12.0	irrelevant for family medicine

RESSUM2.FLO

ENVIRONMENTAL & OCCUPATIONAL SURVEY of FAMILY MEDICINE RESIDENTS

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

2. Please rank order your perceived difficulties with environmental and occupational medicine with (1) being the worst problem:

GREENVILLE FP RESIDENTS (n = 24 Respondents)

1	62	2.81	lack of experience
2	47	2.86	perceived secondary gain by patients
3	69	3.45	too much paper work
4	63	3.93	hassles with industry & interest groups
5	85	4.72	lack of role models
6	65	5.0	fear of legal repercussions
7	70	5.38	potential ethical issues
8	89	5.56	too time consuming
9	73	6.63	too many industries/health concerns
10	76	7.60	too much media attention
11	96	8.72	irrelevant for my patients
12	92	11.5	irrelevant for family medicine

RESSUM2.GRV

ENVIRONMENTAL & OCCUPATIONAL SURVEY of FAMILY MEDICINE RESIDENTS

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

2. Please rank order your perceived difficulties with environmental and occupational medicine with (1) being the worst problem:

GREENWOOD FP RESIDENTS (n = 23 Respondents)

1	64	3.05	lack of experience
2	57	3.17	too much paper work
3	55	3.93	lack of role models
4	75	4.41	hassles with industry & interest groups
5	77	4.53	perceived secondary gain by patients
6	94	4.95	too time consuming
7	76	5.85	fear of legal repercussions
8	80	6.15	potential ethical issues
9	106	6.63	too many industries/health concerns
10	95	7.92	too much media attention
11	113	10.27	irrelevant for my patients
12	117	10.64	irrelevant for family medicine

RESSUM2.GRW

ENVIRONMENTAL & OCCUPATIONAL SURVEY of FAMILY MEDICINE RESIDENTS

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

FAMILY PRACTICE RESIDENTS' RANK ORDER OF PERCEIVED DIFFICULTIES WITH EOM: 1992 SURVEY BY DR. GODENICK & 1993 SFPRS/EMCC SURVEY

2	1	lack of experience
1	2	too much paper work
3	3	perceived secondary gain by patients
5	4	too time consuming
4	5	hassles with industry & interest groups
6	6	lack of role models
NA*	7	potential ethical issues
7	8	fear of legal repercussions
8	9	too many industries/health concerns
NA	10	too much media attention
9	11	irrelevant for my patients
	12	irrelevant for family medicine

*NA = question not asked

RESSUM2.COM

ENVIRONMENTAL & OCCUPATIONAL SURVEY of FAMILY MEDICINE RESIDENTS

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

3. What do you like most about environmental & occupational medicine?

ANDERSON FP

* contact and community resources
* working with patients who are employed (2)
* it is preventive, helps patients to avoid future medical problems (2)
* puts history in perspective and narrows down the diagnosis (2)
* I do not like it at all.
* It is interesting. (2)
* diversity (2)
* detective work
* Brings environmental concerns to the forefront.
* patient advocacy

CHARLESTON FP

* important to know about occupational/environmental hazards
* detective work
* prevention (2)
* ability to improve the health of large groups of people
* addresses patients' concerns about workplace
* satisfaction in making challenging diagnoses

COLUMBIA FP

* reasonable hours (2)
* interesting
* essential for FP
* patients usually healthy
* toxic exposures
* evaluation process /detective work(2)

FLORENCE FP

* prevention
* chemical exposure
* it's relevance
* helps to keep patients employed (2)

GREENVILLE FP

* involvement with the community and community concerns (2)
* patient advocacy (3)
* prevention (4)
* It is interesting/fulfilling. (2)
* diversity (2)
* hours (2)
* It pays good. (2)

GREENWOOD FP

* prevention
* challenge
* returning people back to work
* set hours
* improving the work environment (2)
* adds variety to the practice (3)
* pertinent to practice (4)

SPARTANBURG FP

* similarity of health problems seen in family medicine
* very relevant to daily family practice (2)
* work hours
* interesting and rewarding, good way to gain new patients (2)
* prevention (3)
* better understanding of patient stresses and environments
* growing field for the future (2)
* helpful to patients
* reimbursement is good

ENVIRONMENTAL & OCCUPATIONAL SURVEY of FAMILY MEDICINE RESIDENTS
EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

4. What do you like least about environmental & occupational medicine?

ANDERSON FP

* requires more focused reading/very broad subject (4)
* back pain without objective basis for pain
* paper work/hassles (4)
* too little patient contact
* lack of experience
* patient malingering
* perceived secondary gain by patients
* too routine
* patient advocacy

CHARLESTON FP

* time consuming
* special interest groups
* difficult for one physician to make a difference
* can't be well informed without specialized training

COLUMBIA FP

* no long-term patient follow up
* no kids
* too litigious (2)
* secondary gain by patients
* boring, drug seeking patients
* lack of industry cooperation with environmental mandates
* my lack of knowledge/experience (3)
* special interest groups

FLORENCE FP

* lack of knowledge (3)
* too much paperwork/hassles (2)
* lack of real-world solutions to problems
* helps to keep patients employed (2)
* the need to balance patient interests vs. company interests

GREENVILLE FP

* The problem with freedom of what can be done.
* employers not as knowledgeable/committed to intervention
* malingering patients/perceived secondary gain (5)
* lack of knowledge (2)
* workmen's compensation
* paper work/hassles (4)
* strict regulations of regulators (2)
* too broad (2)

GREENWOOD

* epidemiology/statistics
* paper work (5)
* chemical hazards
* malingering patients(5)
* resistance to cooperation by companies & employees
* variety of problems
* lack of knowledge (4)

SPARTANBURG FP

* lack of experience (7)
* not much emphasis on this topic (3)
* lack of patient contact (2)
* Workmen's Compensation Claims
* too much paper work (4)
* politics (3)
* toxicology & chemical exposure are not interesting

ENVIRONMENTAL & OCCUPATIONAL SURVEY of FAMILY MEDICINE RESIDENTS

EMCC / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM - November 1993

5. Would you consider spending elective time in environmental and occupational medicine?

Anderson (22)	14	8	· overview is enough · I do not like EOM. · I don't plan to spend a large amount of practice time with it. · already have required training · too many electives, little time
Charleston (11)	8	3	· I find it boring.
Columbia (13)	7	6	· already too many sub-specialties · too broad · no clear curriculum available · not enough elective time
Florence (7)	6	1	· no interest
Greenville (24)	22	2	· interested in other things
Greenwood (23)	18	5	· won't be seeing these patients · tedious work site analysis · low volume of patients · other things more important · boring
Spartanburg(29)	24	5	· not relevant for me · not interested
Total 129 (100%)	99/76	30/24	

RESSUM5.WPD

ENVIRONMENTAL & OCCUPATIONAL MEDICINE CURRICULUM

ENVIRONMENTAL MEDICINE CURRICULUM COMMITTEE / STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM

FORMAT	EOM ELECTIVE CURRICULUM - MODULES*								EOM ELECTIVES: CLINICAL / SITE VISITS / PROJECTS
	ERGO-NOMICS	NIHL	ACUTE & CHRONIC CHEMICAL EXPOSURE	EOM DERMA-TITIS	EOM LUNG DISEASE	IMPACT OF SUB-STANCE ABUSE	LOW DOSE RISKS	WORK. COMP. & OTHER LEGAL	
SELF-STUDY ELECTIVE 8 HOURS	1 HOUR	1 HOUR	1 HOUR	1 HOUR	1 HOUR	1 HOUR	1 HOUR	1 HOUR	NONE
ONE WEEK ELECTIVE 30 HOURS	"	"	"	"	"	"	"	"	1. THREE 1/2 DAYS WITH PRIVATE OCC. MED. PHYSICIAN. 2. INDUSTRY/FARM/HOSPITAL SITE VISIT ARRANGED BY THE RESIDENT. 3. VISIT WORK HARDENING, BACK SCHOOL PROGRAMS (PT GROUPS). 4. 1/2 DAY WITH AGROMEDICINE STAFF AND/OR AGMED MONOGRAPHS. 5. FOUR 1/2 DAYS FP PATIENT CARE.
ONE MONTH ELECTIVE 120 HOURS	"	"	"	"	"	"	"	"	1. ONE 1/2 DAY PER WEEK FOR CRITICAL REVIEW OF LITERATURE ON A TOPIC ASSIGNED BY THE ROLE MODEL FACULTY MEMBER. 2 ONE 1/2 DAY PER WEEK FOR CASE PRESENTATION AT NOON OR TOPIC CONFERENCE. 3. THREE 1/2 DAYS PER WEEK WITH PRIVATE OCC. MED. PHYSICIAN. 4. TWO 1/2 DAYS PER WEEK IN EMPLOYEE HEALTH SERVICES. 5. FOUR 1/2 DAYS PER WEEK FP PATIENT CARE.

EOM LONGITUDINAL CORE CURRICULUM		LONGITUDINAL CURRICULUM MODULES*					
		EOM HISTORY TAKING	COMMU-NICATING EOM RISKS TO PATIENTS	DATA BASES & CONSUL-TANTS	EOM SITE VISIT	EOM IN PRIVATE PRACTICE	
1ST YEAR	OBJECTIVE - TEACH THE USE OF "WHACS" WITH CHART AUDIT OF AT LEAST 50% COMPLIANCE; OSCE EXAM	1 HOUR					
2ND YEAR	OBJECTIVE - SITE VISIT WITH ROLE MODEL FACULTY - 1/2 OF RESIDENCY COHORT AT A TIME. PREPARE A SITE EVALUATION ASSESSMENT REPORT; OSCE EXAM		1 HOUR	1 HOUR	1 HOUR		
3RD YEAR	OBJECTIVE - INCORPORATING EOM AS AN INTEGRAL PART OF PRIVATE PRACTICE; OSCE EXAM					2 HOURS	

* Modules will be designed and edited by the EMCC and will consist of slide lectures, scripts,and interactive pc program.. Revised 3/11/94.

STATEWIDE FAMILY PRACTICE RESIDENCY PROGRAM

ENVIRONMENTAL MEDICINE CURRICULUM COMMITTEE

ENVIRONMENTAL and OCCUPATIONAL MEDICINE LONGITUDINAL CURRICULUM MODULES

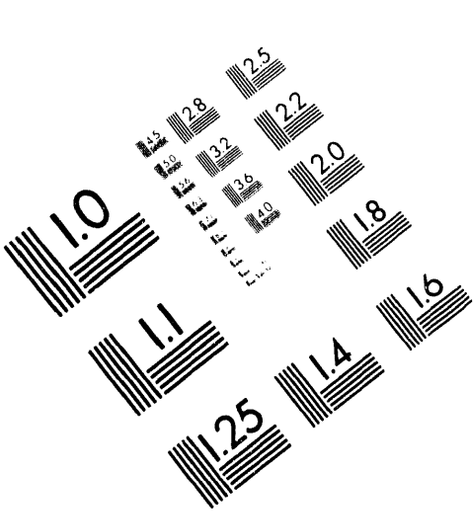
1 - Environmental and Occupational Medicine History for Family Physicians

2 - Communicating Environmental and Occupational Risks to Patients: A Guide for the Family Physician

3 - Environmental and Occupational Medicine Resources for the Family Physician

4 - Environmental and Occupational Medicine in Private Practice: Choices for the Family Physician

5 - Using Hospital Site Visits for Teaching Environmental and Occupational Medicine





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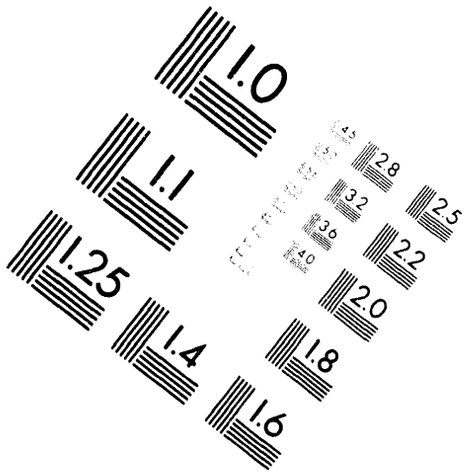

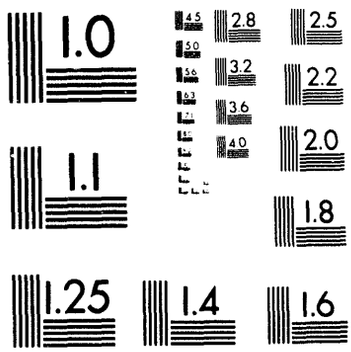

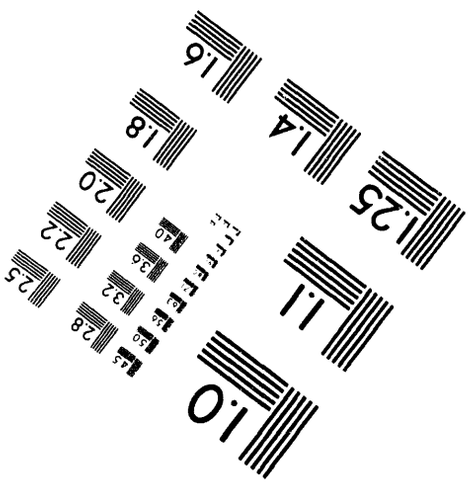

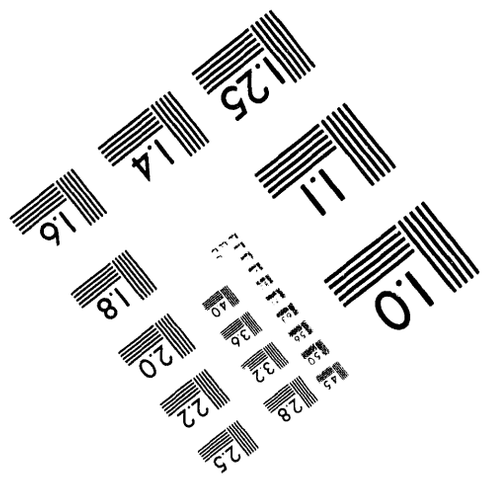

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7 of 8

Module 1

Environmental and Occupational Medicine History for Family Physicians

INDEX

Objective . . . . . Section 1

Teaching Slides . . . . . Section 2

Script for Teaching Slides . . . . . Section 3

Slide Lecture Evaluation Forms . . . . . Section 4

Interactive PC Program and Instructions . Section 5

PC Program Evaluation Forms . . . . . Section 6

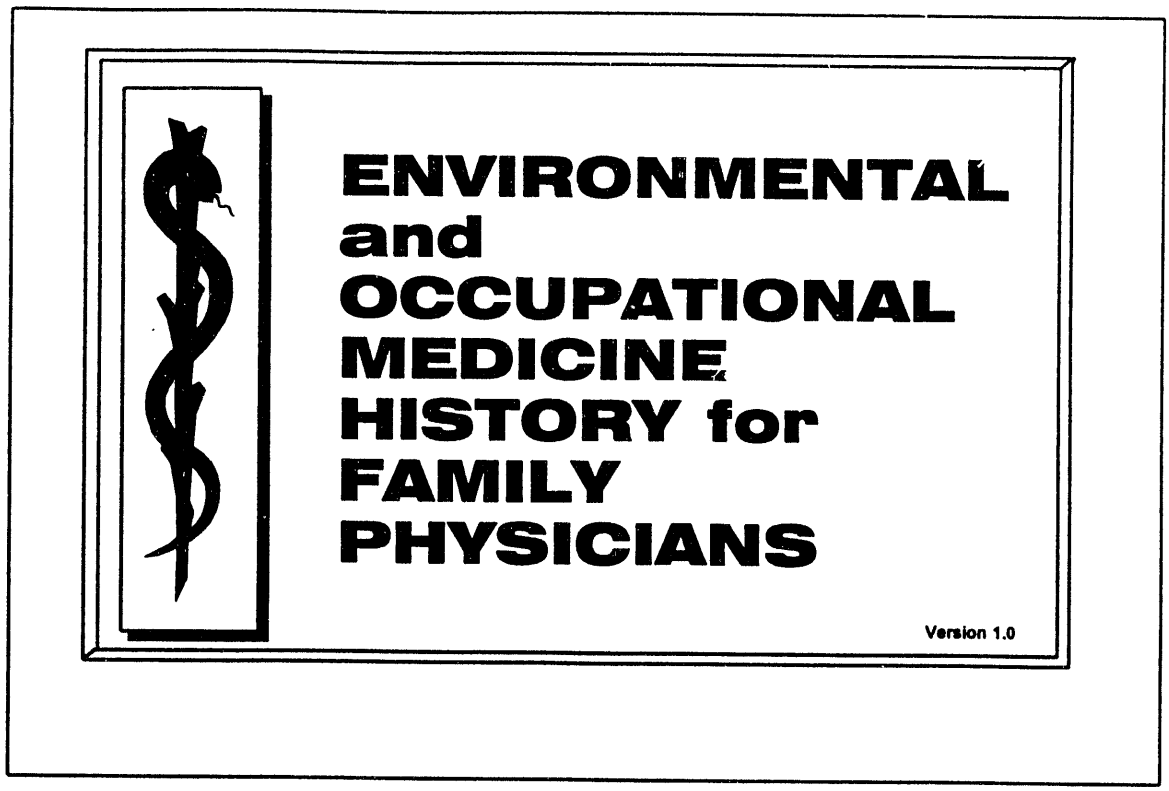
Case History Templates . . . . . Section 7

References . . . . . Section 8

Credits . . . . . Section 9

OBJECTIVE

The objective of this module is to give the family physician a tool, the mnemonic WHACS, for including basic environmental and occupational medicine (EOM) history in the patient's chart.



The objectives of this lecture are to : 1) discuss the role of environmental and occupational medicine (EOM) in family practice, and 2) give the practitioner the mnemonic, WHACS, for including essential EOM questions in the patient's chart.

WHY SHOULD ENVIRONMENTAL AND OCCUPATIONAL MEDICINE (EOM) BE A PART OF FAMILY PRACTICE?





- **Majority of EOM patients are treated by family physicians.**
- **An EOM history should be part of the chart.**
- **Patients trust you.**
- **Patients need their jobs.**
- **Prevention is better than cure.**

There are a number of reasons as to why EOM should be part of family practice. Perhaps the most important is the trust patients have in their family physicians.

[redacted]

1993 SURVEY OF PATIENT EOM CONCERNS

- 338 PATIENTS OF THE STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM RESPONDED TO THE SURVEY.
- ONE FINDING OF THIS STUDY WAS THAT *NINE OF TEN* PATIENTS WERE LIKELY OR SOMEWHAT LIKELY TO DISCUSS AN ENVIRONMENTAL HEALTH CONCERN WITH THEIR FAMILY PHYSICIAN.



AS A FAMILY PHYSICIAN, YOU ARE WELL TRAINED IN THE BASIC SKILLS REQUIRED FOR EOM.

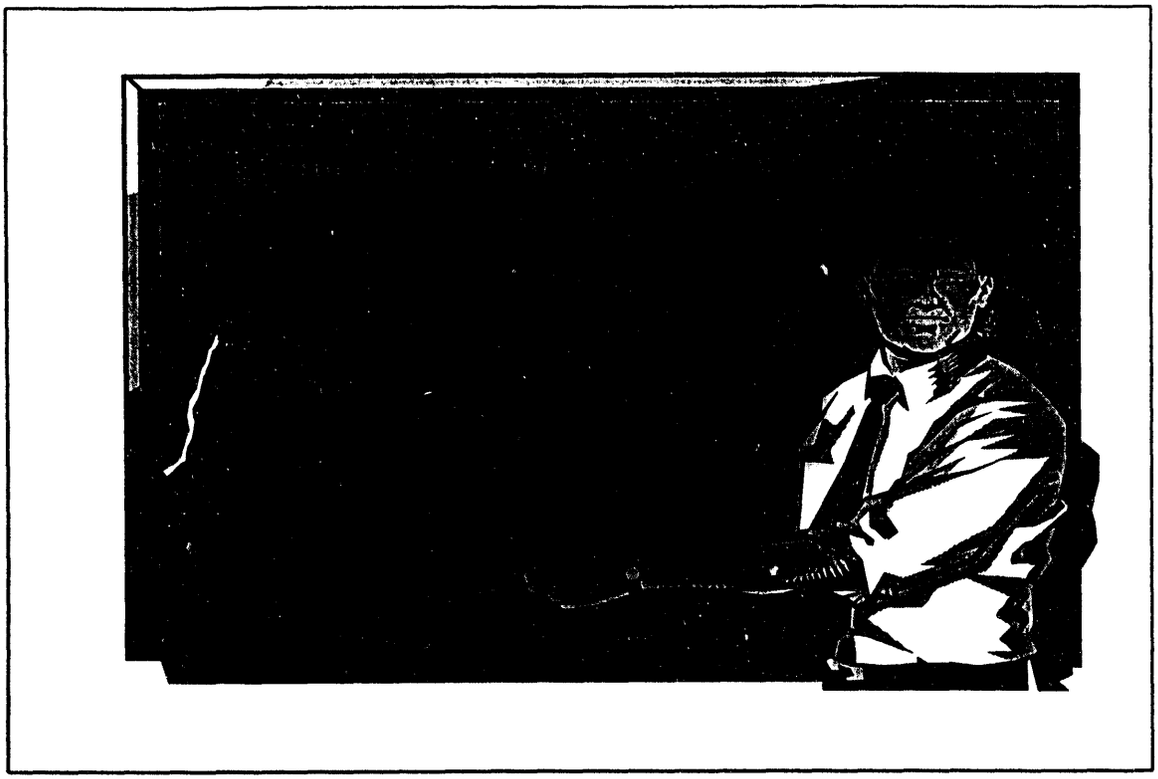
Family physicians possess the basic skills required for most EOM problems.

FAMILY PRACTICE STRENGTHS IN EOM

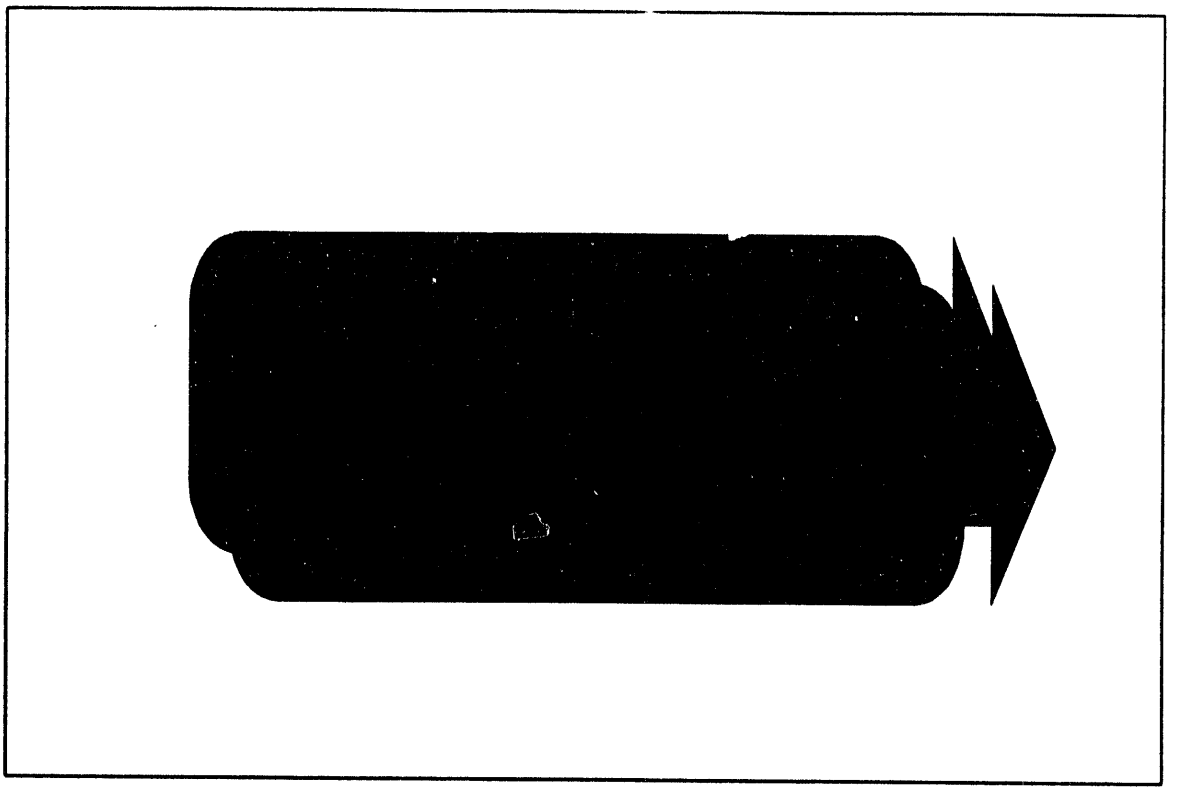


- BREADTH OF KNOWLEDGE
- COMMUNICATION SKILLS
- HISTORY TAKING
- PHYSICAL EXAMINATION
- ORDERING APPROPRIATE TESTS
- TREATMENT & OUTCOMES
- CONTINUITY OF CARE

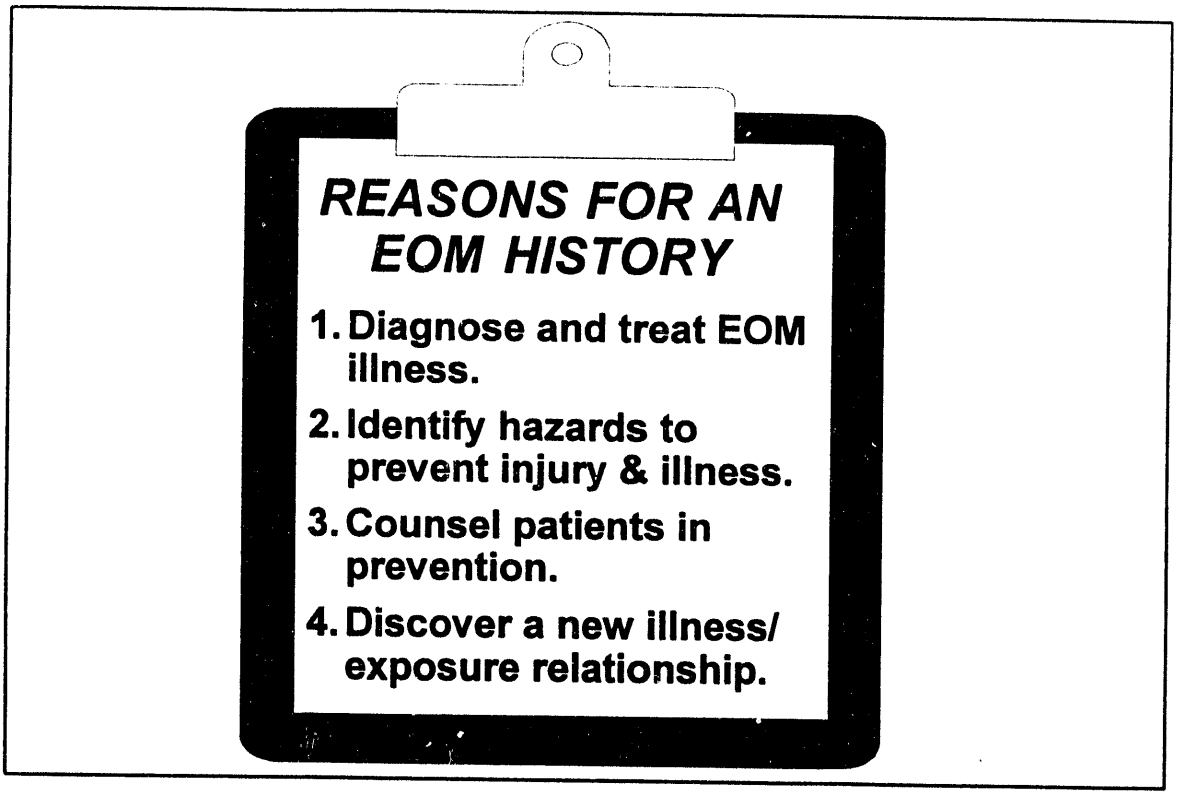
These are the strengths that family practitioners have that enable them to manage most EOM illness.



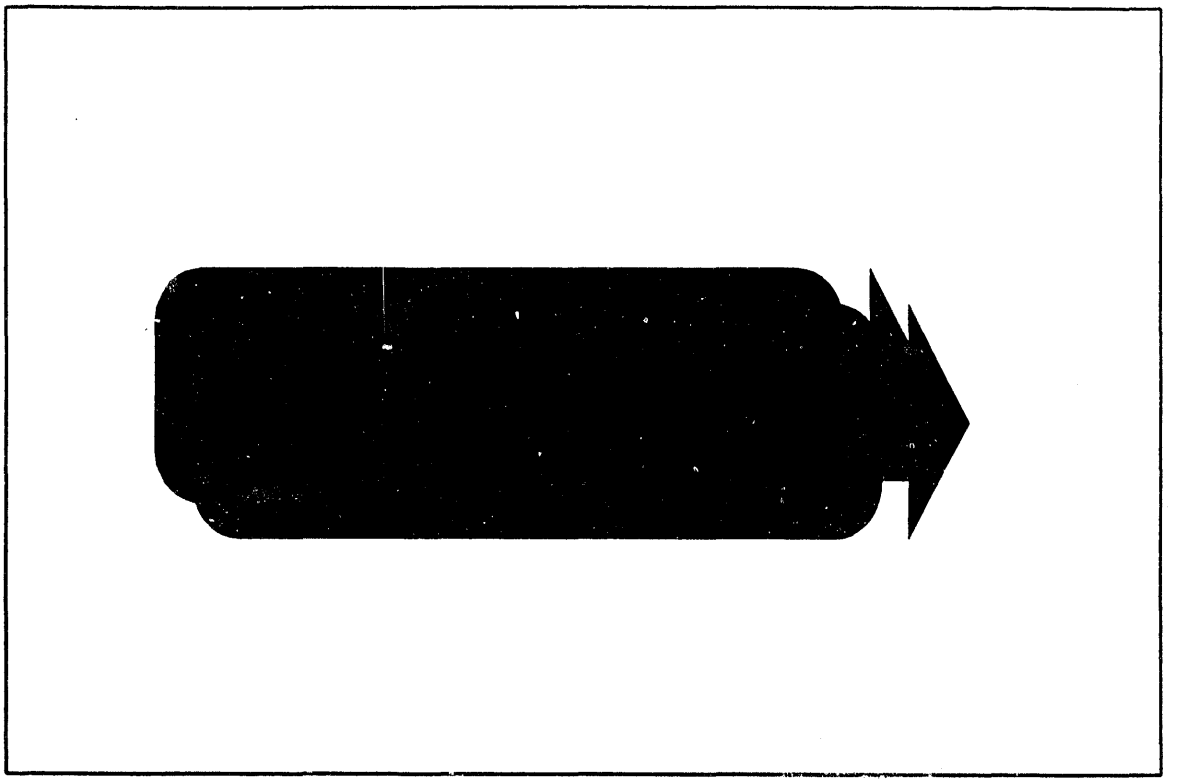
Family practice physicians are well trained to manage most EOM problems. Specialization in EOM is not required to include EOM contracts with industry in the practice.



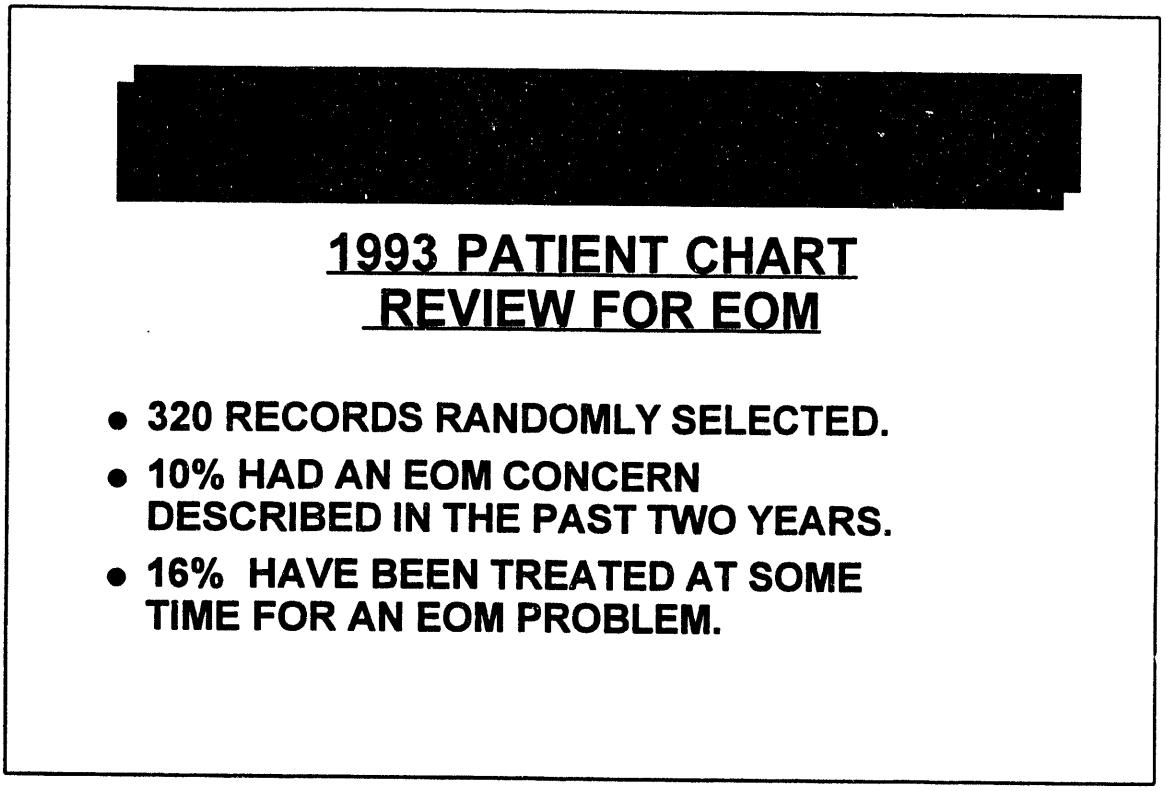
An EOM history should be part of a patient's chart.



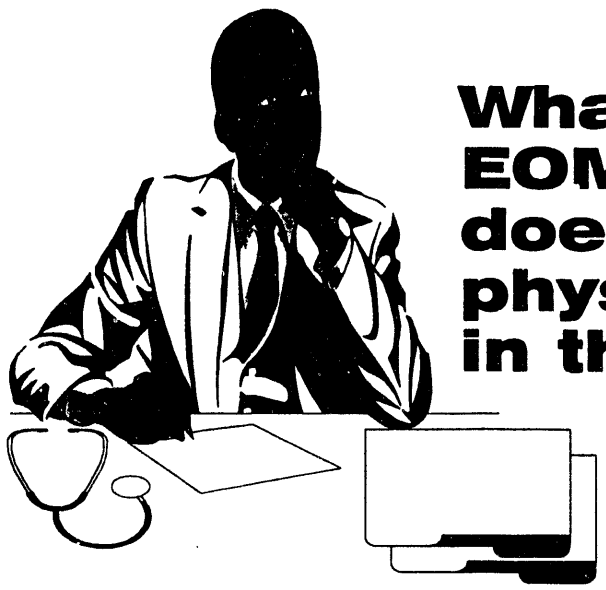
There are valid reasons for the family physician to inquire about a patient's EOM exposures. Early identification of risks and prevention of illness are most important.



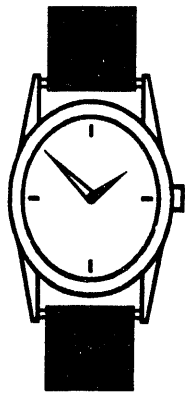
Reliable statistics on the number of EOM illnesses treated by family practice are rare. There is some recent data from the SC Statewide Family Practice Residency System.



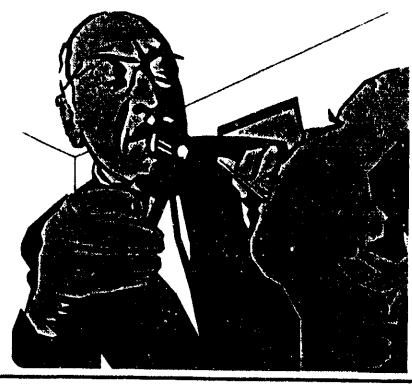
You can expect to see EOM concerns and illness in family practice.



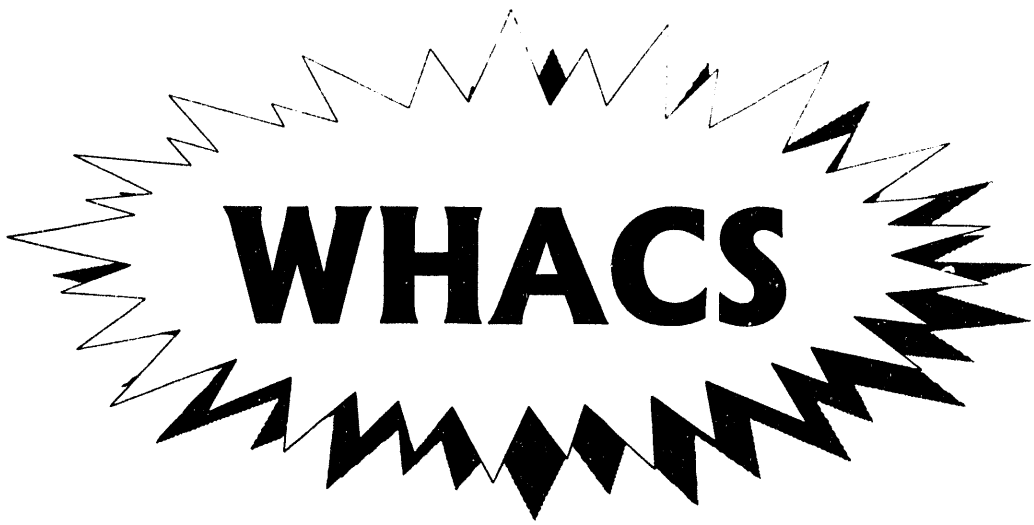
What basic EOM history does a family physician need in the chart?



What basic EOM information can be obtained during the 15 minute office visit?

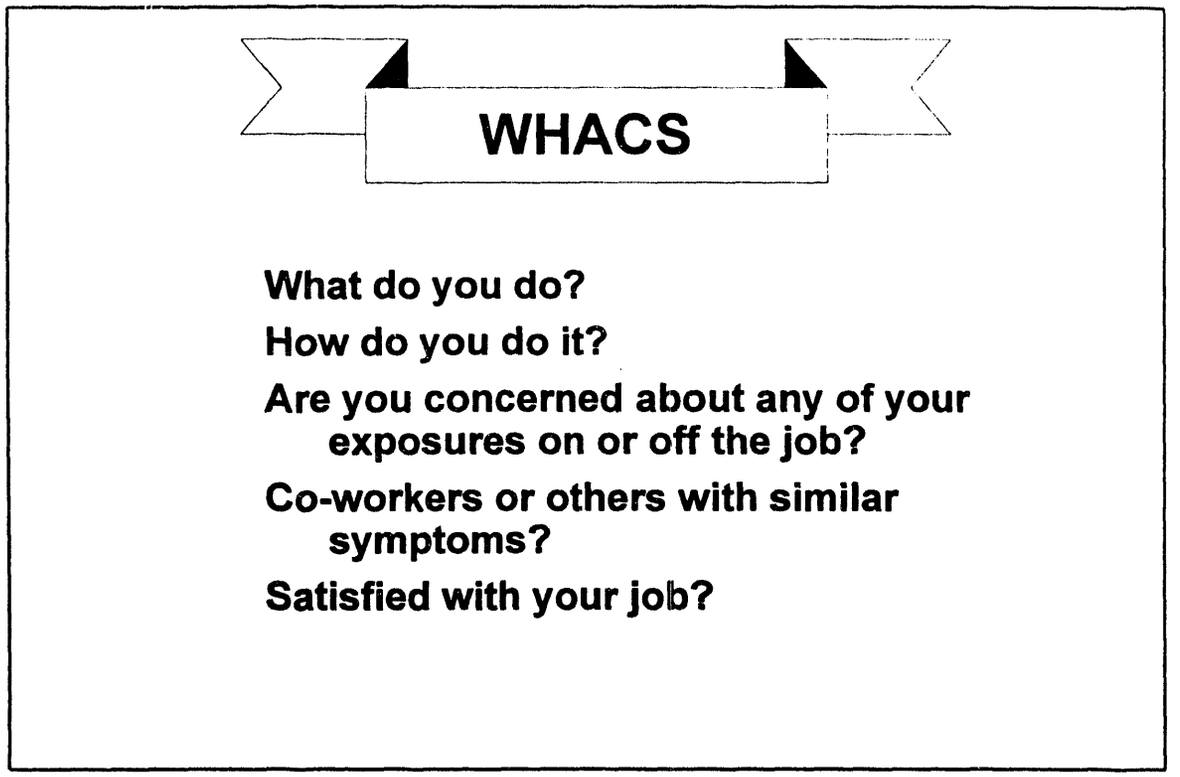


Busy practitioners do not need more things to do. There is a way to obtain basic EOM information during the routine office visit.



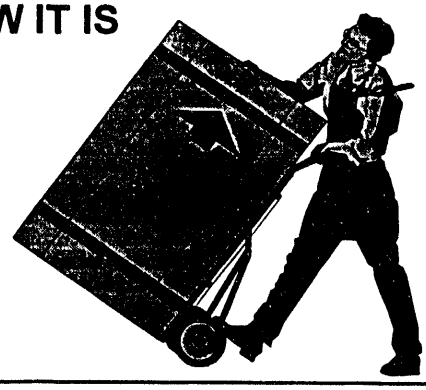
***WHACS* IS A MNEMONIC FOR FIVE ESSENTIAL EOM QUESTIONS.**

WHACS was developed by the faculty of the Environmental Medicine Curriculum Committee of the South Carolina Statewide Family Practice Residency System.


WHACS
What do you do?
How do you do it?
Are you concerned about any of your exposures on or off the job?
Co-workers or others with similar symptoms?
Satisfied with your job?

WHAT DO YOU DO?

DON'T JUST ASK FOR THE JOB TITLE; GET THE PATIENT TO DESCRIBE THE JOB AND HOW IT IS PERFORMED.



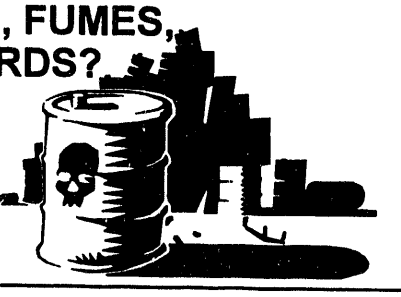
This question does not ask for a job title. A patient who replies, "I work at DuPont," could be an office worker, a chemist, a warehouseman or any of a number of other occupations that has job duties that may expose the patient to a variety of risks on the job. Get the patient to describe what he or she does on the job. Also remember the patient may have more than one job.

Remember the least articulate patient may have the most serious exposures.



HOW DO YOU DO IT?

DON'T ASSUME THE JOB PROCESS IS WITHOUT RISK. DOES THE PATIENT DO A LOT OF SITTING OR LIFTING? IS THE PATIENT EXPOSED TO DUSTS, FUMES, CHEMICALS OR OTHER HAZARDS?



Get the patient to explain how the job duties are performed. Does the job require prolonged standing, lifting, sitting or exposure to dusts, fumes, etc. Ask the patient about the use of protective clothing.

ARE YOU CONCERNED ABOUT ANY OF YOUR EXPOSURES ON AND OFF THE JOB?

- **DON'T FORGET ABOUT OFF THE JOB EXPOSURES.**
- **DON'T FORGET TO ASK ABOUT CONCERNS IN THE HOME OR THE COMMUNITY.**



The patient may express concern over a particular long-term or a new work exposure.

The patient may be concerned with an exposure in the community. Lawn pesticide applications, radon, high voltage power lines, and living in the vicinity of nuclear power plants or hazardous waste sites are examples of common concerns.

Also does the patient have e hobbies or engage in leisure activities which use materials that may place the patient at risk.



CO-WORKERS OR OTHERS WITH SIMILAR PROBLEMS?

DON'T FORGET TO ASK IF CO-WORKERS OR OTHERS HAVE SIMILAR COMPLAINTS. IF THE ALLEGED EXPOSURE WAS OFF THE JOB, WHAT ABOUT HOUSEHOLD MEMBERS, NEIGHBORS, OR OTHERS WITH SIMILAR PROBLEMS?



Always remember to ask, "Who else is exposed?"

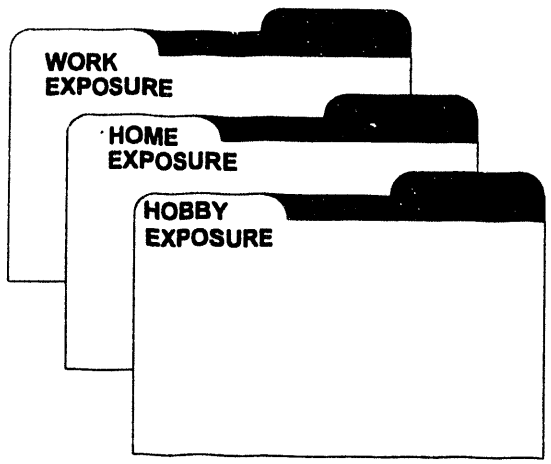
SATISFIED WITH YOUR JOB?

- **DON'T UNDERESTIMATE THE KEY ROLE OF JOB SATISFACTION.**
- **DISSATISFACTION CAN INFLUENCE THE HISTORY AND AN INDIVIDUAL'S RESPONSE TO ILLNESS OR INJURY.**

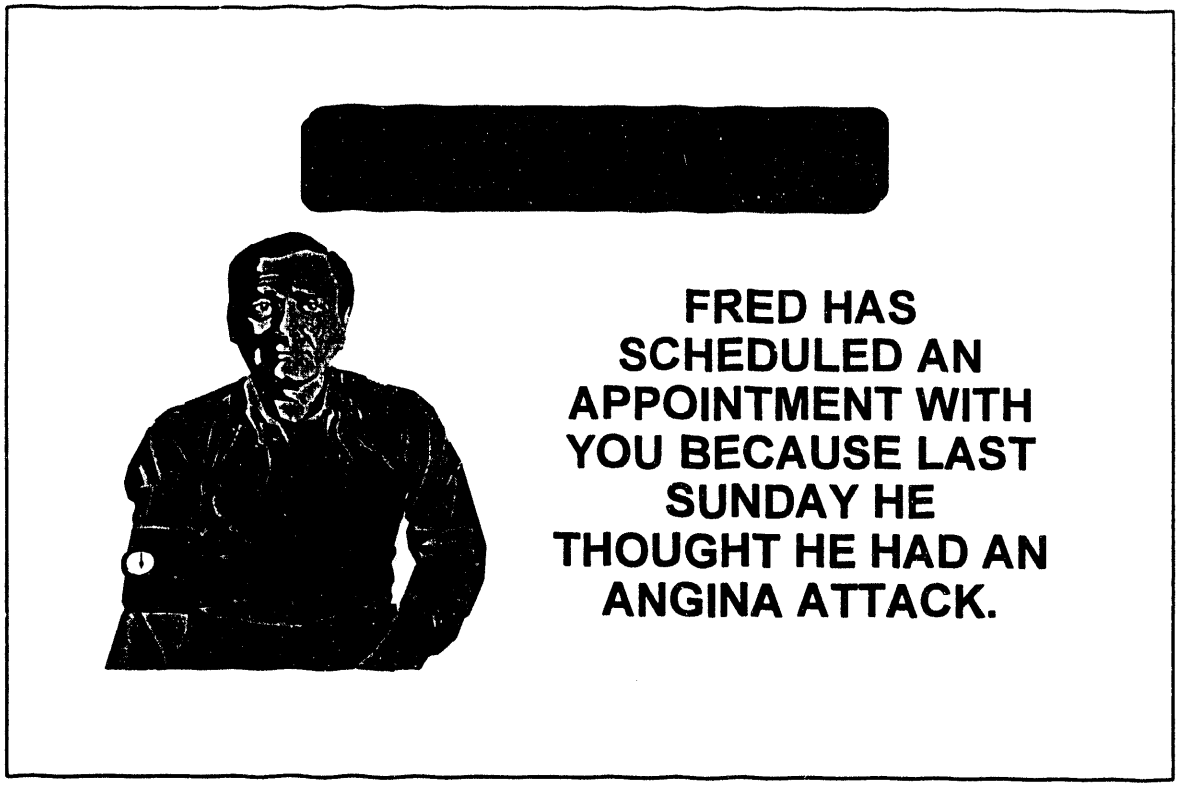


Don't forget the importance of this question. The patient's response may help explain the current or future patient encounters. It may also influence return to work after an illness.

The "Satisfaction" of WHACS can serve as a base-line for future patient visits, job stress or Workers' Comp claim.



Following are three different exposure scenarios involving Fred Smith. These will illustrate the importance of considering EOM in your differential diagnosis.



Fred has scheduled an appointment with you because last Sunday he had an episode which felt like an angina attack. He has not had any cardiac symptoms since then. His cardiac symptoms are relieved with just a couple of sublingual nitroglycerin tablets.

[redacted]

- AGE 52
- CORONARY BYPASS AT AGE 45
- NO ANGINA FOR PAST 2 1/2 YEARS
- PHYSICAL EXAM:
  - BP: 120/82, RESP: 18, PULSE: 72
  - HEENT: UNREMARKABLE
  - CHEST: NO RALES OR RHONCHI
  - HEART: RATE REGULAR , NO MURMUR
  - EKG: LEFT BUNDLE BRANCH BLOCK



- Fred also reported that he had a headache and nausea prior to the chest pain which lasted for about two hours after the pain subsided.
- As you talk with Fred, you realize that you do not know what he does for a living and what his occupational or environmental exposures might be. You decide to use *WHACS*.



- When asked the *WHACS* questions, Fred said he owned a dry cleaning business. He spends half of his time working with a variety of chemicals including tetrachloroethylene, carbon disulfide and ammonia. He has not noticed any temporal relationship between his symptoms and work activity.
- Co-workers and family members do not have similar complaints. Fred is not concerned with any exposures at home or in the community.

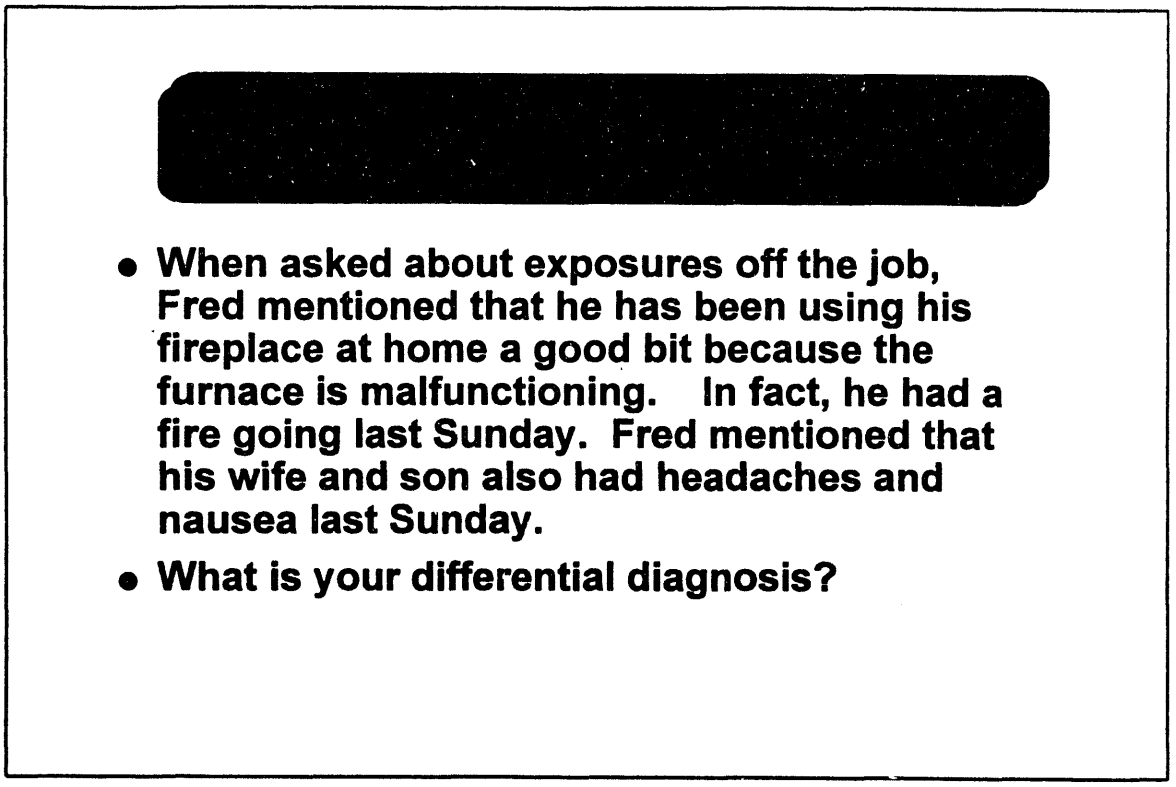


- **Fred said that two days prior to the chest pain he cleaned up a spill of carbon disulfide. This occurred in a small room where he stores his chemicals. He placed the broken bottle and clean-up rags in the trunk of his car for later disposal, but does not remember removing them.**
- **What is your differential diagnosis?**

Carbon disulfide poisoning is certainly possible. He cleaned the spill in a small room and carried the broken bottle and clean-up rags in the trunk of his car. He had been exposed to the fumes every time he was in the car. Symptoms of carbon disulfide poisoning include dizziness, nausea and headache.



Through *WHACS* you learned that Fred has worked as an accountant for 12 years. He spends most of his time at a PC. He is happy with his job, but admits to being stressed during tax time. He is not concerned with any exposures at work and no co-worker has similar symptoms. Fred said he has been having more headaches than usual.



- **When asked about exposures off the job, Fred mentioned that he has been using his fireplace at home a good bit because the furnace is malfunctioning. In fact, he had a fire going last Sunday. Fred mentioned that his wife and son also had headaches and nausea last Sunday.**
- **What is your differential diagnosis?**

The malfunctioning furnace caused Fred to use his fireplace more than usual. Remember his wife and son also had headache and nausea last Sunday. Carbon monoxide poisoning from the fireplace or perhaps the furnace or both is the probable diagnosis.



WHACS **revealed that Fred retired last year after working as an accountant for 30 years. He is enjoying his woodworking and furniture restoration hobbies. He says he is exposed to various paints, paint removers, solvents, stains and to wood dust in his basement workshop. He admits the work area is poorly ventilated.**



- **He is not concerned with any of his exposures, although he comments on how bad the paint remover smells. It contains methylene chloride. Sometimes after prolonged use, he develops a headache. When asked, Fred said he had used the paint remover for about three hours prior to his chest pain. No one else in the house had similar symptoms.**
- **What is your differential diagnosis?**

Overexposure to methylene chloride is the most likely diagnosis. This chemical is a CNS depressant and it is metabolized to CO which stresses the cardiovascular system.

CASE HISTORY
TEST QUESTIONS

The carbon disulfide work exposure scenario best illustrates which one of the following?

1. **The use of WHACS to establish an OSHA workplace violation.**
2. **That WHACS can establish the mode of exposure.**
3. **Failure of the patient to use protective clothing.**

The correct answer is 2.

The home CO exposure best illustrates which one of the following?

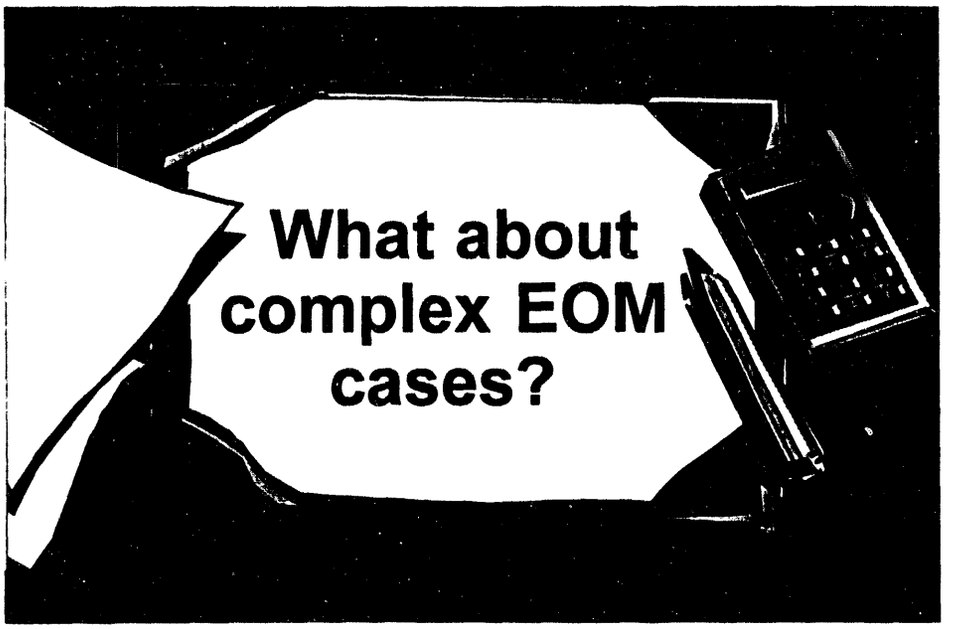
1. The futility of asking work exposure questions of patients who are office workers.
2. Failure of a patient to recognize an EOM hazard.
3. The importance of asking about off-the -job exposures and who else has similar symptoms.

The best answer is 3. Statement 2 is also true.

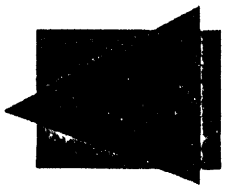
The hobby exposure to methylene chloride best illustrates which one of the following?

1. **Patients rarely have EOM exposures after retirement.**
2. **Inhalation of methylene chloride only affects patients with a history of cardiovascular disease.**
3. **The importance of hobby or recreational exposures in WHACS.**

3 is correct.



WHACS is sufficient for most patient encounters. The difficult case may require more detailed questioning, extensive diagnostic tests, or referral to a specialist. There are four levels of EOM history taking.



LEVELS OF EOM HISTORY TAKING

1 - BASIC

2 - DIAGNOSTIC

3 - SCREENING

4 - COMPREHENSIVE

The four levels are basic, diagnostic, screening and comprehensive.



BASIC

- **WHACS**
- **Appropriate for most primary care EOM problems.**

WHACS is all a family physician needs for most patients.



DIAGNOSTIC

- **Focused questions identify an environmental or occupational association.**
- **History suggests the diagnosis.**
- **Signs & symptoms usually not specific.**

The second level is diagnostic. Signs and symptoms are present and more detailed questions will identify the cause.

Lab confirmation may be useful.

Unfortunately, there are relatively few specific diagnostic signs of EOM illness. Examples include lead lines in the gum, chloracne from dioxin, chrome ulcers of the nasal septum, and skin lesion characteristic of fire-ant venom.

CASE HISTORY - CARPET CLEANER

- **Your 47 year old patient has scheduled an appointment because of fever, indigestion and dark urine. The *WHACS* history recorded during a previous visit says the patient works as a carpet cleaner for a janitorial service. His main task is to use carbon tetrachloride to clean stains. Co-workers have no illness.**
- **His previous medical history includes binge drinking.**
- **At this point, do you think his occupation has anything to do with his symptoms?**

This case demonstrates that lifestyle can have an effect on an occupational exposure. The potentiating effect of ethanol on carbon tetrachloride toxicity in experimental animals is well known. Case histories reporting carbon tetrachloride poisoning in alcoholic workers have been published. The differentiating evidence in these cases has been the fact that co-workers, who did not abuse alcohol, but had the same exposure, did not become ill.



SCREENING

- **Pre- and post-employment**
- **Specialized screening for those at risk**
- **Periodic screening**
- **Prevention**

The third level is screening for pre- and post -employment physicals and periodic evaluation at the request of an employer or the patient. Specific questions about the known exposures of the job should be asked.

Laboratory tests may be critical. Examples include blood lead levels, pulmonary function and hearing.

With current emphasis on cutting costs of patient-initiated visits, periodic screening could become more important to pick up early illness.

HOSPITAL EMPLOYEES



- Hospital employees who work in jobs (central supply, surgical suites, respiratory therapy, etc.) that expose them to ethylene oxide are an example of workers who require periodic screening.
- Ethylene oxide is a suspected human carcinogen and it may cause spontaneous abortions. OSHA requires exposure monitoring and medical surveillance for workers exposed to air levels >0.5 ppm.



COMPREHENSIVE

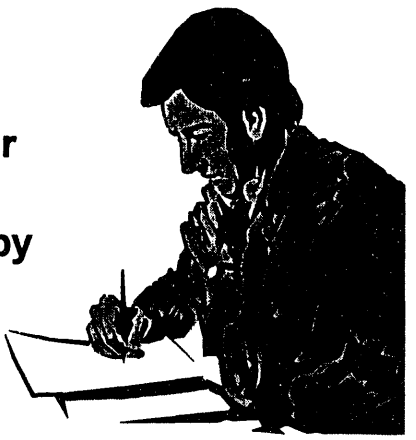
- **Detailed history**
- **Consult with experts**
- **May need to refer to specialist(s)**
- **Extensive tests**
- **Medical / legal implications**

The fourth level is comprehensive which requires a detailed history. An exposure and effect relationship is possible or probable. Consultation with experts, extensive testing and referral to specialists may be required.

Please see the curriculum module "Data Bases and Consultants" for listings of agencies and specialists.

A MORE DETAILED EOM HISTORY CAN BE . . .

- **Self-administered by the patient in the waiting room or mailed to the patient in advance of the visit.**
- **Administered by the office staff (RN, PA, pharmacist, or receptionist).**
- **Histories should be verified by the physician for completeness and reliability.**



A detailed EOM questionnaire can be self administered or administered by a member of the office staff .



HAVE YOU CONSIDERED EOM ILLNESS IN YOUR TIRED PATIENTS?

CAN YOU LIST 8 EOM SENTINEL EVENTS IN OLDER PATIENTS?



Some exposure have delayed, intermittent, cumulative or chronic health effects. Examples - carcinogensis, neuropathies, central nervous system changes, hearing loss, cross-sensitization, etc.

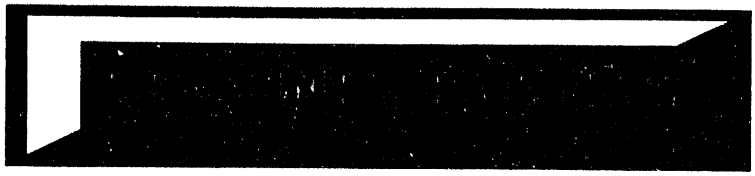
An EOM history should not be limited to those patients who are employed. For example, retirees may have been exposed to hazards on the job that manifest in later illness.

The following are examples.



- ***Lung cancer*** **(asbestos)**
- ***Leukemia*** **(benzene, petroleum refining)**
- ***Bladder cancer*** **(aniline dye)**
- ***Bronchitis / asthma*** **(wood and grain dusts)**

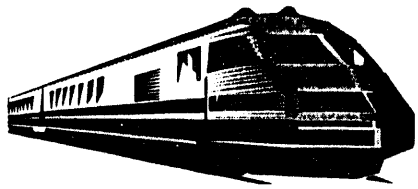
Asbestos is well known. What about patients who worked in the textile industry and were exposed to anailine dyes ? Or patients who were carpenters or farmers?



- ***Neuropathy / encephalopathy***
  (solvents)
- ***End-stage renal failure***
  (lead workers)
- ***Arteriosclerotic heart disease***
  (long term exposure to CO, CO_2)
- ***Musculoskeletal system***
  (repetitive trauma)

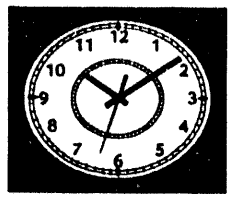
Most EOM problems seen by family physicians involve injury to the musculoskeletal system.

CASE HISTORY RETIRED RAILROAD WORKER



- **Your 70 year old patient has scheduled an office visit because he has occasional chest pain when he walks. He also reports tingling in his lower extremities. He has been retired for 10 years and has been in good health.**
- **The *WHACS* history in his chart recorded during a previous visit says the patient was often bothered by the diesel fumes from the engine.**
- **At this point, do you think his occupation has anything to do with his symptoms?**

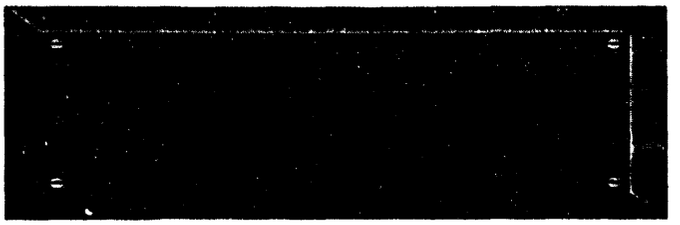
The patient had worked as a conductor, thus he probably had minimum exposure to the diesel fumes. His previous work history and concern over the diesel fumes should have a low priority in your differential diagnosis.





***WHACS* CAN BE PART OF THE 15 MINUTE OFFICE VISIT!**

WHACS takes no more than a couple of minutes and is appropriate for most of your patients.



- ***WHACS***
- **Family physicians possess the skills required for most EOM problems.**
- **Refer to specialists as needed.**
- **Continuity of care**

Don't forget WHACS:

What do you do? How do you do it? Are you concerned about any of your exposures on and off the job? Co-workers or others having similar problems. Satisfied with your job?

Remember continuity of care. The patient's history of multiple exposures may not come out during the first visit.

Refer to EOM specialists when necessary, you are not expected to be an EOM expert.

CREDITS

This lecture was developed under the auspices of the Environmental Medicine Curriculum Committee of the SC Statewide Family Practice Residency System.

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- **Charleston - Drs. C. Brock, W. Simpson, & S. Schuman**
- **Columbia - Drs. E.P. McCutcheon & P.W.Stone**
- **Florence - Dr. H.E. Terrell**
- **Greenville - Dr. D.S. Grubbs**
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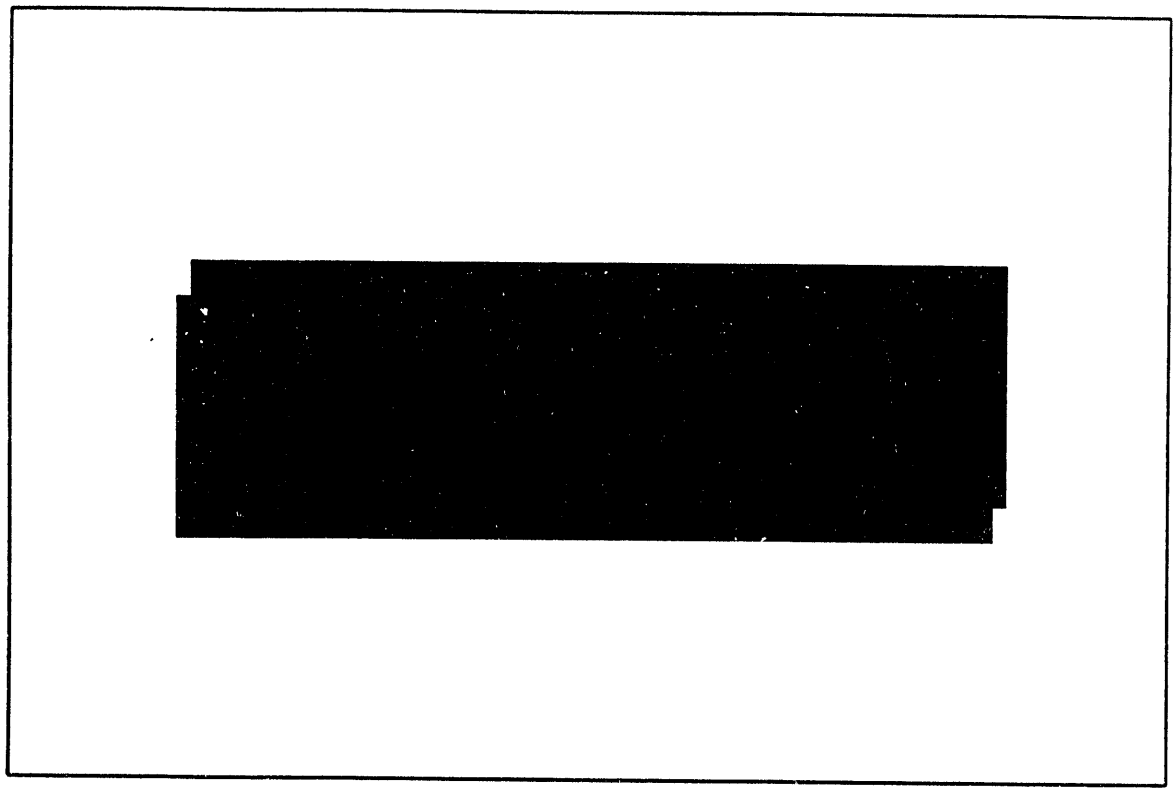

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STATEWIDE FAMILY PRACTICE RESIDENCY PROGRAM

ENVIRONMENTAL MEDICINE CURRICULUM COMMITTEE

ENVIRONMENTAL and OCCUPATIONAL MEDICINE LONGITUDINAL CURRICULUM MODULES

1 - Environmental and Occupational Medicine History for Family Physicians

2 - Communicating Environmental and Occupational Risks to Patients: A Guide for the Family Physician

3 - Environmental and Occupational Medicine Resources for the Family Physician

4 - Environmental and Occupational Medicine in Private Practice: Choices for the Family Physician

5 - Using Hospital Site Visits for Teaching Environmental and Occupational Medicine

Module 2

COMMUNICATING ENVIRONMENTAL AND OCCUPATIONAL RISKS TO PATIENTS: A GUIDE FOR THE FAMILY PHYSICIAN

INDEX

Objective . . . . . Section 1

Teaching Slides . . . . . Section 2

Script for Teaching Slides. . . . . Section 3

Slide Lecture Evaluation Forms . . . . . Section 4

Interactive PC Program and Instructions . Section 5

PC Program Evaluation Forms . . . . . Section 6

Case History Templates . . . . . Section 7

References . . . . . Section 8

Credits . . . . . Section 9

OBJECTIVE

The objectives of this module are to give the family physician an introduction to the basics of EOM risk communication and to offer a seven step protocol for use during EOM patient encounters.

COMMUNICATING ENVIRONMENTAL AND OCCUPATIONAL RISKS TO PATIENTS:

A GUIDE FOR THE FAMILY PHYSICIAN

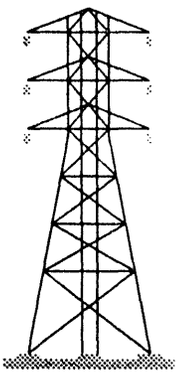


Version 1.0

- The objectives of this presentation are to:
  - 1. Give the family physician an introduction to the basics of EOM risk communication.
  - 2. Offer a seven step protocol for use during EOM patient encounters.
  - 3. Use case histories to illustrate specific points.
- A summary and test questions are also included.

CASE HISTORY: POWER LINES

One of your patients with treated testicular cancer has been in remission for five years. He asks:

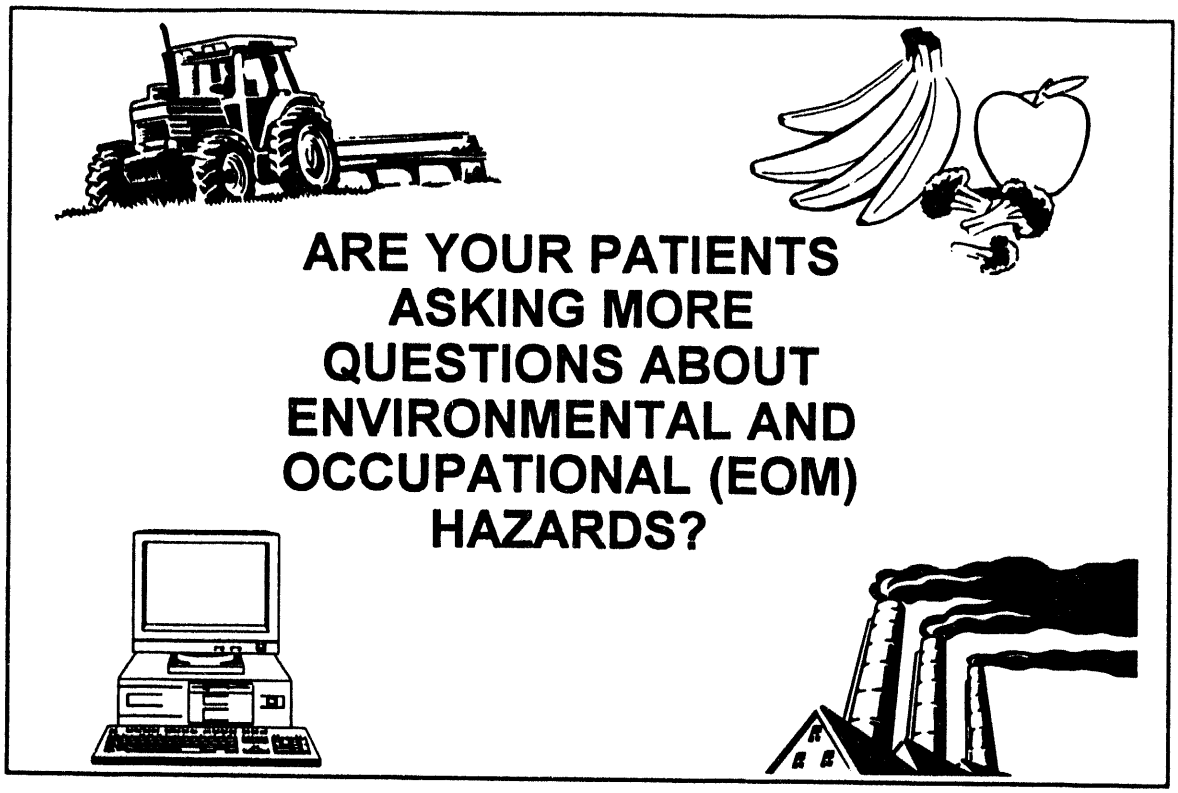


Q **Will living near power lines cause a recurrence of his cancer?**

A **You tell your patient, "You're not the first to ask this question." You explain that the oncologist you consulted could find no evidence to link testicular cancer with exposure to power lines.**

•This patient is concerned because, having had cancer once, he is now afraid that it will recur or that he will get another kind of cancer. Even though the TV program may not have linked testicular cancer to powerlines, he wants you to reassure him that there is no connection.

•Concerns about proximity to hazards is also common - remember that your patient's concern goes beyond the issue of health (can he find a buyer for his house, will it affect the resale value, will the neighborhood get a bad reputation?)



•Alerts about potential environmental or occupational hazards (eg. worksite injuries, pesticides in food, radiation from computer screens, factory emissions) are becoming commonplace in the newspapers and on TV and the radio.

WHY DOES YOUR PATIENT COME TO YOU FOR EOM RISK INFORMATION?

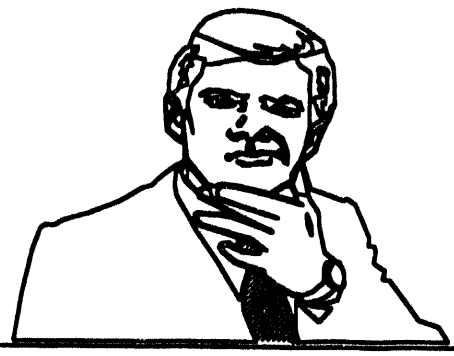
BECAUSE YOUR PATIENT . . .

- **TRUSTS YOU**
- **EXPECTS YOU TO BE KNOWLEDGEABLE ABOUT A BROAD RANGE OF HAZARDS, INCLUDING ENVIRONMENTAL ONES**

•A patient expects the same level of expertise from the MD with EOM as with infectious disease, pregnancy, trauma, etc.

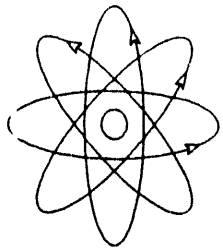
•The patient may be confused by many sources of risk information(TV, radio, newspaper, magazines, friends, family, activists groups, etc.)

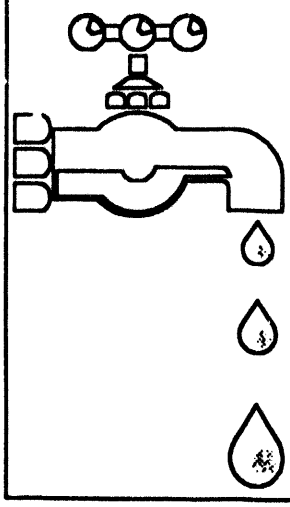
YOUR PATIENT OFTEN CAN'T EVALUATE FOR HIMSELF THE NUMEROUS MEDIA WARNINGS ABOUT EOM HAZARDS



- Hazards are news.
- Risk factors are news.
- The news media serves its own needs first and usually does not try to educate.
- Media information on EOM risks emphasizes the sensational, the controversial, and especially the political agenda.
- Media tends to emphasize the "victim" story, the "small" individual opposed to the "big", impersonal company or burearacracy.
- Media tends to cast itself as the investigator, defender and reformer on behalf of the victim.

EXAMPLES of ENVIRONMENTAL HAZARDS PERCEIVED BY PATIENTS





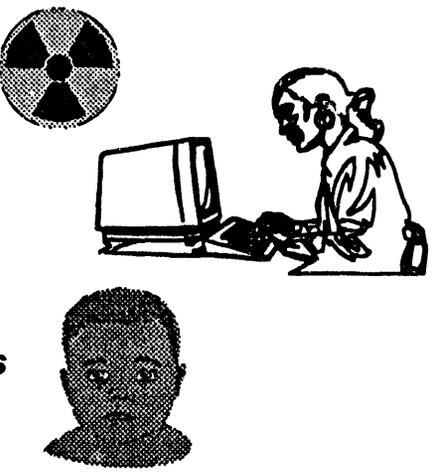
- NUCLEAR POWER
- PESTICIDE RESIDUES IN FOOD
- RADON
- WATER CONTAMINATION
- HAZARDOUS WASTE
- NOXIOUS ODORS
- ANY INVOLUNTARY EXPOSURE



- The basis of concern is involuntary exposures.
- Invisible forces are especially feared: radon, electromagnetic energy, etc.
- Parts per billion of a toxin are beyond comprehension, but not beyond fear and distrust.
- Delayed effects suggest an inevitable train of negative events following the exposure.

EXAMPLES OF OCCUPATIONAL FEARS PERCEIVED BY PATIENTS

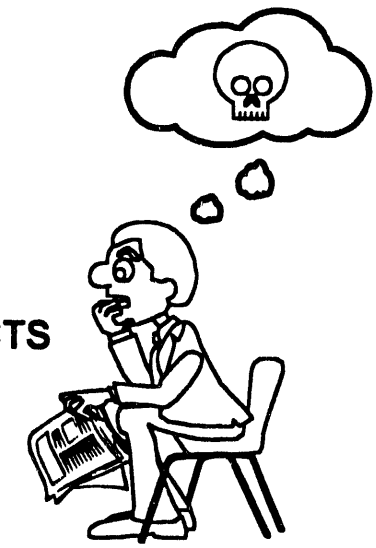
- **ACUTE/CHRONIC EXPOSURE**
  chemical, radiation, noise
- **MUSCULOSKELETAL INJURY**
  back strain, CTS, tendonitis
- **LONG-TERM RISK EFFECTS**
  cancer, neurological, birth defects



- Your patients' fear of his occupational exposure risks and hazards are offset by his need to work and make money.
- Patients' occupational risk concerns cover the past, present, and future.

PATIENT FEARS OF ENVIRONMENTAL HAZARDS

- CANCER
- BIRTH DEFECTS
- LEARNING DISABILITIES
- TOXIC OVERLOAD
- UNEXPLAINED HEALTH EFFECTS



•At the top of the list of EOM concerns are syndromes with mixed or unknown etiologies.

•Example: 1% of human births worldwide result in major birth defects. Two-thirds of such defects are completely unexplained (neither chromosomal, metabolic, viral, radiation, nutritional, nor heredity etiologies.)

•Problem: How to explain this to a distressed parent? Opportunity for presumptive causes: preventable exposure; someone, something must be blamed.

PATIENT'S PERCEPTION: SYMPTOMS IN SEARCH OF AN EOM CAUSE

? SEXUAL DYSFUNCTION
? IMPAIRED MEMORY
? FATIGUE
? ALLERGIES
? STRESS
? NEUROPATHIES



•When a patient has unexplained signs and symptoms, he wants:

- a diagnosis (give it a name),
- an evaluation (learning and wisdom),
- a prediction (prophecy),
- your advice (how to stop the damage),
- your reassurance (tell me it is not so)
- your perspective (it could be worse).

WHO SHOULD BE CONCERNED ABOUT EOM ILLNESS?

EVERYONE!

- EMPLOYED----------moonlighting
- RETIREES----------prior jobs
- UNEMPLOYED----------prior jobs
- HOMEMAKERS----------home / environment
- CHILDREN----------home / school / part-time jobs
- HOBBYISTS----------solvents, glues, paints
- OUTDOOR RECREATION-------insect-borne diseases

•No one is exempt from the possibility of an environmentally or occupationally induced illness since all people, young and old, are exposed to a work or home environment.

•And, as mentioned before, workplace hazards can often be found in, be brought to, or have parallels within the home.

•Even the transportation (bus, train, plane, car) which takes you from one environment to another is part of your "environmental exposure."

IF THE NEXT PATIENT YOU SEE:

- HAS AN EOM EXPOSURE
  YOU SHOULD LOOK FOR RELEVANT SIGNS AND SYMPTOMS



•If your patient says that he has had an EOM exposure, you should look for the signs and symptoms which would support his claim.

IF THE NEXT PATIENT YOU SEE:

- **HAS UNEXPLAINED SIGNS OR SYMPTOMS**

  YOU SHOULD CONSIDER EOM IN YOUR DIFFERENTIAL DIAGNOSIS



•If your patient has signs and symptoms which have no immediate explanation, remember that they could have an EOM cause.

CASE HISTORY:
UNEXPLAINED BLOOD LEAD LEVELS

- **HISTORY: A 46 year old microwave technician has an elevated blood lead level (BLL), 50 u/dl. This is revealed during his annual employment exam.**
- **WHACS: Work history is negative for soldering and welding; he has no hobbies that expose him to lead; household members' BLLs are normal; he lives in a house less than a year old. Co-workers' BLLs are normal.**
- **PHYSICAL EXAM: Questionable numbness of extremities & minor memory impairment.**
- **LABORATORY CONFIRMATION: A repeat BLL is 51 u/dl.**

•REFERRAL: One month ago, you referred the patient to a specialist who initiated chelation for 19 days with oral DMSA. The BLL declined to 13 u/ dl.

•CURRENT HISTORY: Two months after chelation, you repeat the BLL; surprisingly it is now 56 u/dl.

• FOLLOW-UP: BLLs are scheduled every month for the next six months; results remain the same. In the interim, you interview coworkers and management for possible sources of exposure. None are elicited. You repeat the coworkers' BLLs which again are normal. You have consulted with experts and no one has any clues as to the source of the lead exposure.

• SIX MONTHS LATER: As you draw the patient's blood, he asks, "While I work, sometimes I chew on wire that has colored plastic insulation, is this of importance?"

WHAT IS AN APPROPRIATE LEVEL OF RESPONSE FOR YOU TO USE WITH YOUR EOM PATIENT?

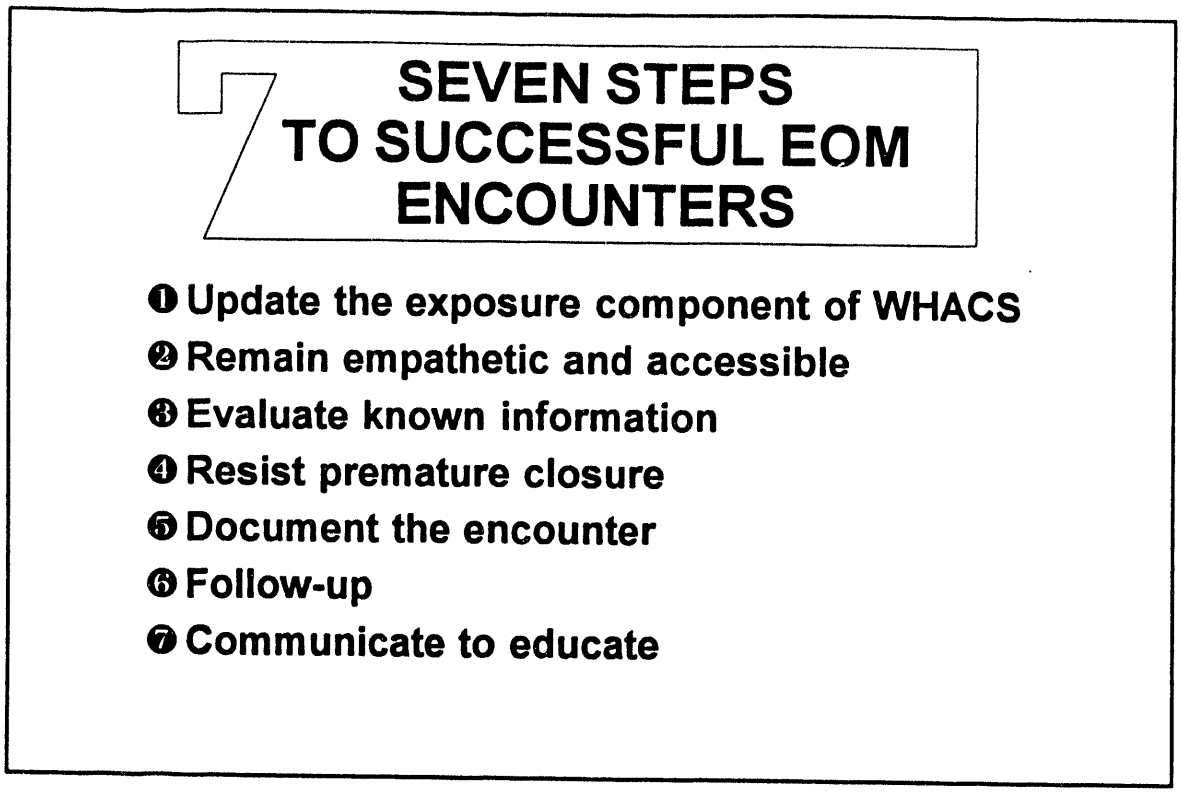


•Since you are not an EOM specialist it may be difficult to decide what level of response you should make to a suspected or alleged EOM illness.

•EOM concerns, like many other concerns of patients, may not be revealed clearly in the chief complaint, or history of present illness. Sooner or later, the astute clinician perceives the underlying fear or reason for maximum concern, and helps the patient "organize" and "sort out" the relevant signs and symptoms. He can help the patient keep the concern in perspective.

•After all, what does the "chief complaint" represent? With few exceptions, the chief complaint is the best and most concise expression of a patient's need to understand what he feels or fears.*

*Balint groups have re-discovered the art and skill required of the MD to fully appreciate the impact of the so-called "simple" chief complaint (Brock C and Johnson A, et al.



•These seven points will help you with your EOM patients.

ONE: UPDATE THE EXPOSURE COMPONENT OF WHACS

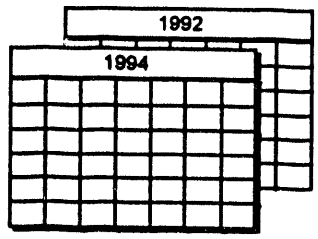
What do you do?

How do you do it?

Are you concerned with any of your exposures on or off the job?

Co-workers or others having similar problems?

Satisfied with your job?



•WHACS is a simple, mnemonic way for you to remember five key questions which should be included in every patient history.

•These five questions are the foundation of basic EOM as well as good family medicine.

THROUGH WHACS YOU MAY...

- ESTABLISH A BASELINE HISTORY
- IDENTIFY POSSIBLE EOM RISKS
- DECIDE TO MANAGE THE PATIENT YOURSELF OR MAKE THE APPROPRIATE REFERRAL FOR EVALUATION

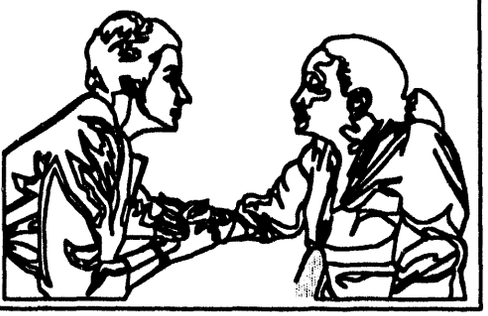
•Through WHACS, a baseline environmental and occupational history is established for each patient against which future health complaints can be compared.

•By using WHACS you will be able to

- •educate patients about potential EOM risks and thus avoid disease
- •recognize early EOM illness and arrest disease
- •refer patients with more complicated (or elusive) EOM illnesses to specialists

TWO: REMAIN EMPATHETIC

- **REGARDLESS OF A CAUSE AND EFFECT RELATIONSHIP**
- **BECAUSE IT CAN HELP THE PATIENT WHEN TESTS ARE INCONCLUSIVE**
- **BECAUSE IT ENCOURAGES PATIENT COOPERATION**



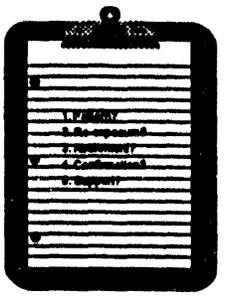
•As in other Family Practice situations, being available to listen may be the best thing you can do for some of your patients.

•Patients often appreciate the listening function as a special benefit from you (someone in authority, worthy of trust).

3 THREE: EVALUATE KNOWN INFORMATION

USE EOM DIAGNOSTIC CRITERIA

- ✓ PATTERN OF EXPOSURE?
- ✓ RE-EXPOSURE EXACERBATES?
- ✓ ABATEMENT PROVIDES RELIEF?
- ✓ CONFIRMED BY LAB?
- ✓ SUPPORTED BY HUMAN CASE STUDIES?



•EOM illnesses are often diagnosed by noting that a patient has a PATTERN of exposure in that RE-EXPOSURE EXACERBATES the condition and ABATEMENT PROVIDES RELIEF.

• For example, a patient who has an allergy to a work-related product would have signs and symptoms during the week, but on the weekends when he was away from the allergen, his signs and symptoms would diminish.

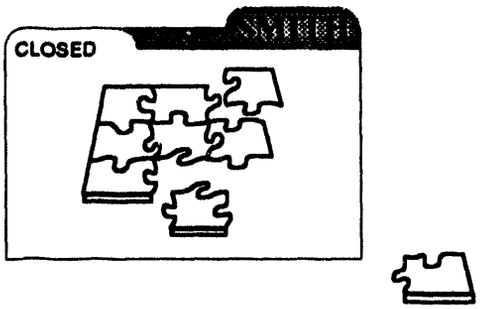
•Of course, laboratory tests (such as allergy tests) can help to confirm a suspected diagnosis

•Reference libraries, EOM resource services, and on-line computer databases can provide you with current information about relevant literature.

•ANIMAL STUDIES ARE SUGGESTIVE BUT ARE NOT CONCLUSIVE FOR HUMAN HEALTH EFFECTS.

FOUR: RESIST PREMATURE CLOSURE

PREMATURE CLOSURE IS THE UNSUBSTANTIATED AGREEMENT OR DISAGREEMENT WITH YOUR PATIENT'S PERCEPTION OF EOM ILLNESS.



- You should avoid either agreeing or disagreeing with the patient's assessment of his problem until you are able to determine if there is a cause and effect relationship between his illness and his exposure.
- You may find yourself agreeing with a patient who is extremely knowledgeable about a disease he thinks he has.
- Once you have crossed "the line" from investigator, to empathizer, to advocate, it may be difficult or impossible to retract your original comment or opinion.

FIVE: PLAN THE FOLLOW-UP
IT IS THE KEY TO:

DIAGNOSIS 

TREATMENT 

PREVENTION 

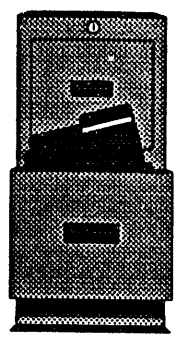
WORKSITE MODIFICATION 

•Follow-up is also critical since it is the foundation of accurate diagnosis (were you correct?) and treatment (is it working?), as well as learning for the physician, patient, and employer (is the patient avoiding the exposure or has the worksite been modified to prevent the exposure hazard?).

SIX: DOCUMENT THE ENCOUNTER

DOES YOUR EOM PATIENT HAVE A HIDDEN AGENDA?

- LAWSUIT
- WORKERS' COMPENSATION
- DISABILITY

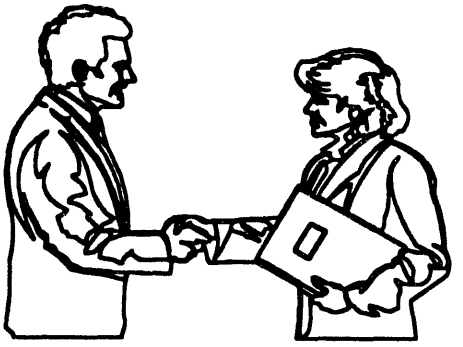


•Your patient may consider that he has an EOM illness if he suddenly develops signs and symptoms that he relates to an environmental or occupational exposure.

•Although many patients are only interested in obtaining treatment for their illness, or desire suggestions on how to avoid an illness, other patients have "hidden" agendas such as filing a lawsuit or obtaining workers' compensation or disability claims.

SEVEN: COMMUNICATE TO EDUCATE

EFFECTIVE EOM DEPENDS UPON OPEN COMMUNICATION BETWEEN YOU AND YOUR PATIENT



•For your EOM patient, open communication includes

1. Information on how to recognize potential signs and symptoms of EOM exposures.
2. Information on how to avoid or minimize EOM risks.

CASE HISTORY:
UNEXPLAINED BLOOD LEAD LEVELS

<u>OUTCOME:</u> After several cycles of treatment, improvement, and relapse, a further discussion with your patient led to his question, "Could chewing the plastic insulation from lengths of wire contribute to my condition?"

➟Laboratory tests of the plastic insulation revealed a high lead content.

Your patient is likely to have the clue to the diagnosis of an EOM illness!

WHACS can lead you to that information.

•TESTS: Laboratory testing of the plastic revealed a high lead content.

•Patients often "know" what is causing their symptoms without knowing it. WHACS will help you AND them think about possible exposure hazards.

WHAT ARE FAMILY PRACTICE STRENGTHS IN EFFECTIVE EOM RISK COMMUNICATION?

❶ CONTINUITY OF CARE

❷ DIFFERENTIAL DIAGNOSIS

❸ EOM HAZARD EVALUATED RELATIVE TO THE PATIENT'S OVERALL HEALTH AND MEDICAL HISTORY

•Good differential diagnosis will include family members and others exposed. Differential diagnosis is the use of logic to consider the most likely as well as the less likely causes of illness or disability.

•Continuity of care includes: (a) a trusting patient/doctor relationship based upon success with minor and major concerns, and (b) a longitudinal perspective of time/place/exposure influences on the natural history of the illness.

•An example of maintaining perspective is the role of the primary care provider versus the specialist in the optimal management of results of sero-indicators of prostate cancer in elderly men who need to evaluate their own options and choices among the risks and benefits of treatment.

WHAT ARE YOUR TOOLS FOR EFFECTIVE EOM HAZARDS COMMUNICATION?

- ✓ ACCESS TO AND USE OF DATA BASES
- ✓ CONSULTATION WITH EXPERTS
- ✓ FOLLOW-UP FOR OUTCOMES
- ✓ CASE-BY-CASE EXPERIENCE
- ✓ EARLY DOCUMENTATION OF COMPLAINT AS DESCRIBED BY THE PATIENT
- ✓ SETTING GOALS AND LIMITS

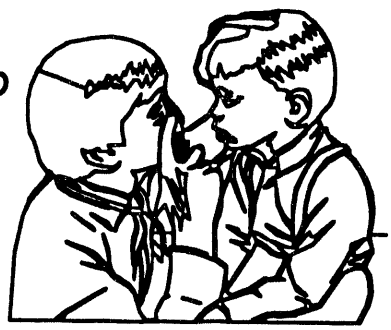


•Your Family Physician tools and skills are also appropriate and valuable for your EOM patients.

•Successful house officers become successful practitioners by skill in time management, choosing what can be done for the patient and what cannot be done, and helping patients recognize their own capacities and limits for recovery or prevention.

THREE C's FOR EFFECTIVE EOM HAZARDS COMMUNICATION

- ✓ **COMPETENCE**
  EFFICIENT, QUALIFIED MD
- ✓ **CARING**
  EMPATHETIC MD
- ✓ **COMMITMENT**
  DEDICATED MD



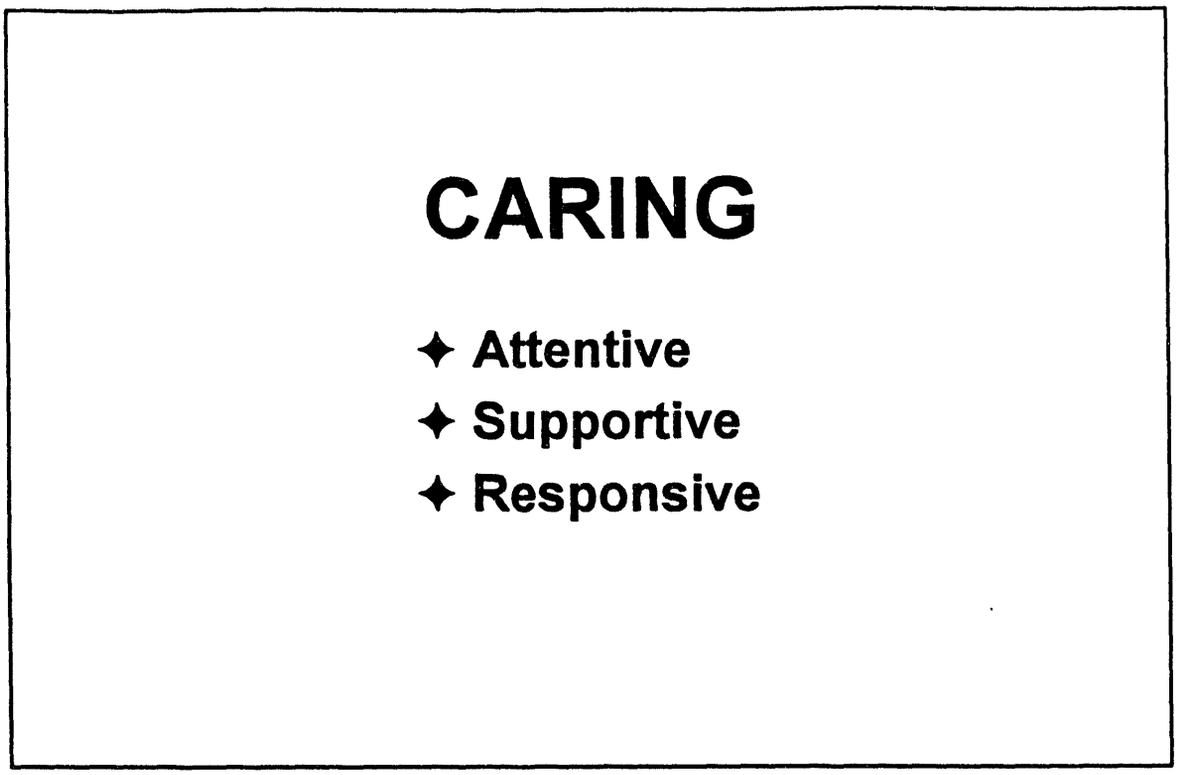
•Together the three C's are a winning combination.

COMPETENCE

- ✦ Does the physician's facility inspire confidence?
- ✦ Do the physician and staff inspire trust?

•An example is the seasoned physician treating a patient with neuropathy of the lower legs. The patient claims this developed after using a new solvent in his work at the local fiberglass boat manufacturing plant. Does the physician admit in front of the patient his ignorance of this specific solvent and its health effects?

•Because fear and concern over long term disability are so dominant in the patient, how does this MD respond. Does he "pretend" that he has seen similar cases and that he expects a successful outcome? Only he knows how hard he will have to work to find medical literature on the solvent and to find knowledgeable consultants.



•A given in family practice . . . .

COMMITMENT

- ✦ Dedication
- ✦ Reminders
- ✦ Follow-up
- ✦ Referral

•Commitment is continuity of care. Follow -up does not necessarily require the patient to come into the office. You or a staff member can telephone the patient or you can have the patient call you.

•Follow-up includes accessibility of yourself or your staff to receive good news, bad news or irrelevant news on the subsequent course of the illness.

PATIENTS EXPECT ALL THREE C's:
TWO OF THREE
ARE NOT ENOUGH

✓ COMPETENCE

✓ CARING

✓ COMMITMENT

•The three C's are the classical approach to risk communication. Family physicians are well experienced in the first two C's, but may need some additional practice with the third C, commitment, when caring for the EOM patient.

•Physicians vary in the overall 3 C's impression they convey to a patient.

TRAPS IN EOM HAZARDS RISK COMMUNICATION

❶ UNDERREACTION TO AN ALLEGED TRUE HAZARD

(Type I Alpha Error)

❷ OVERREACTION TO AN ALLEGED FALSE HAZARD

(Type II Beta Error)

❸ PREMATURE REACTION TO INSUFFICIENT EVIDENCE

•Three examples include:

•Underreaction to a true hazard - noise induced hearing loss on the job and during recreation.

•Overreaction to noxious odors - some people believe malodor is equivalent to toxicity. Odors from some industries, such as paper mills and chemical plants, or commercial lawn pest control for example, provide opportunities for some people to allege adverse health effects from odor alone.

•Unexplained clusters of disease will be "explained" by special interest groups or the media. There are temporal clusters, place clusters, exposure clusters and etiologic agent clusters. Only the later explains cause and effect. Most clusters (99% +) are chance events.

COMMUNICATION FACTS

☞ THE MOST EFFECTIVE MESSAGES CONTAIN A MAXIMUM OF SEVEN WORDS.*

☞ ONLY THREE POINTS CAN BE EFFECTIVELY COMMUNICATED IN THE AVERAGE CONVERSATION.*

*Covello VT: Environmental Risk Communication Workshop - Charleston, SC 5/93.

- This has been tested in a wide variety of groups; passing an 8 or 9 word message will not work from person to person; an average of seven words is the maximum.
- A limited number of points can be made in the average conversation. Pick the two or three most important and stress them.

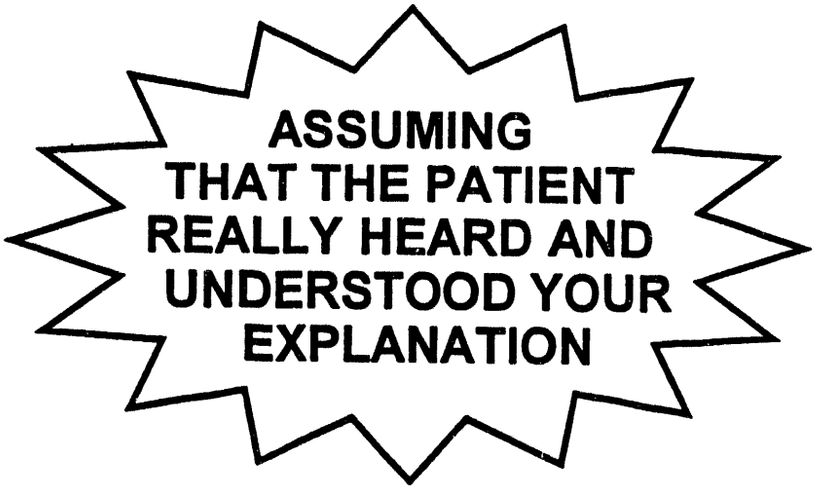
LEARNING FACT

LEARNING VARIES AMONG PATIENTS

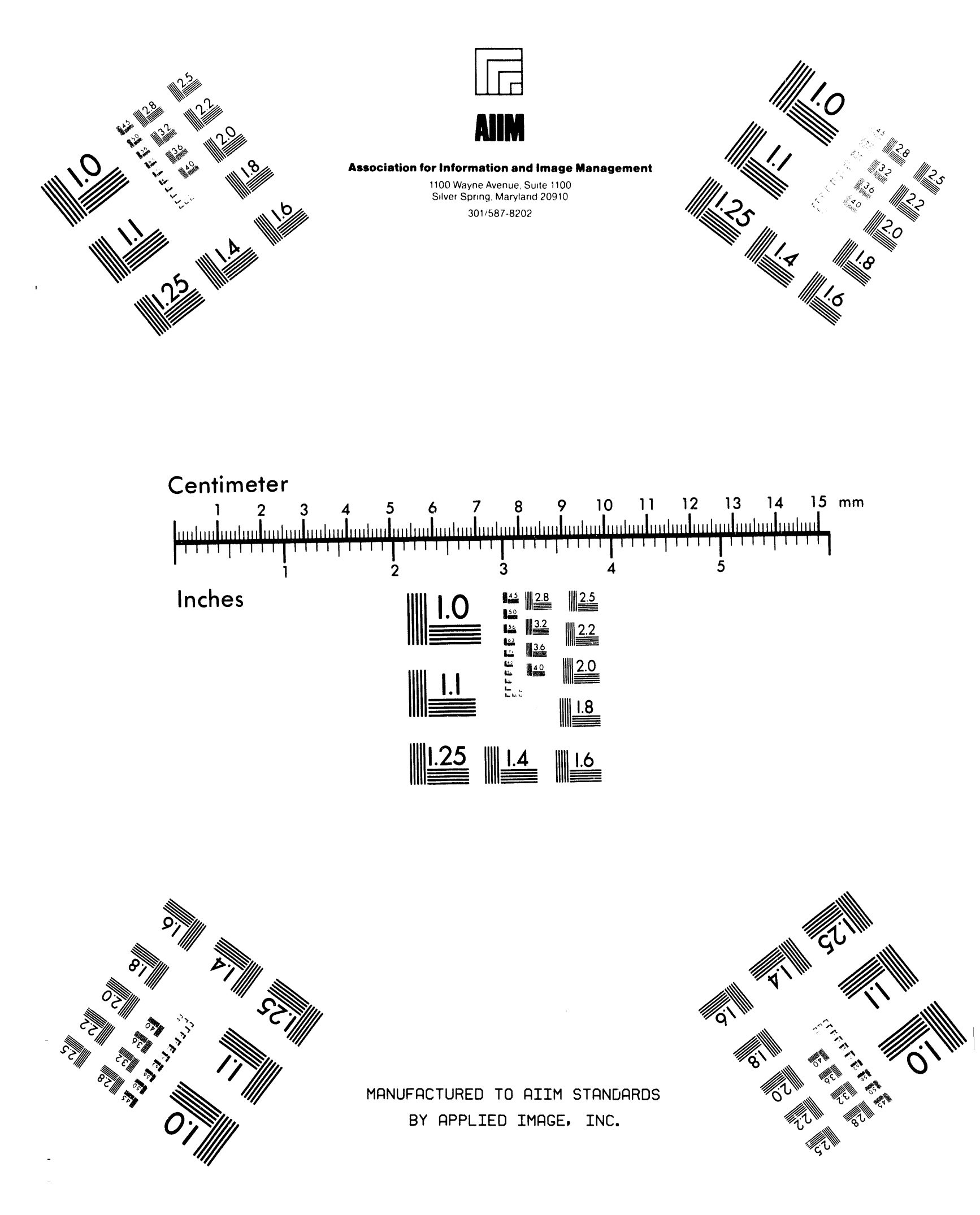
VISUAL LEARNING
AUDITORY LEARNING
KINESTHETIC LEARNING

•Each person learns by all three modalities but each is predisposed to excel in one area.

A PITFALL OF EOM HAZARDS COMMUNICATION



- When you were talking, did the patient hear and understand what you meant?
- When the patient was talking, did you hear and understand what was meant? While the physician listens, is he only hearing and waiting for his turn to speak?
- Patients who present with true or alleged EOM illness are fearful and apprehensive. They can be so distracted, that not a word is heard after the word "cancer," "birth defect," etc. is spoken.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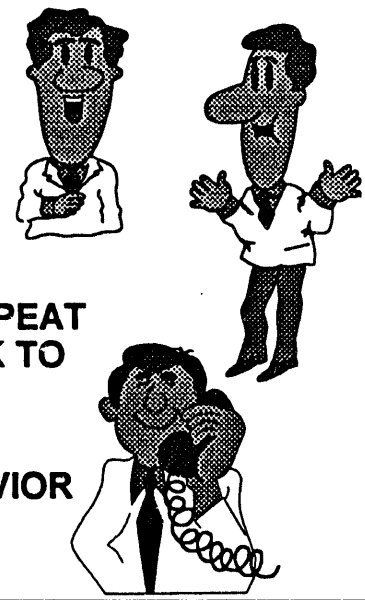
8 of 8

CASE HISTORY:
A PREVENTABLE DEATH?

- **A 43 year old patient, who worked in a laboratory, was exposed to toluene di-isocyanate and developed increasingly severe asthma. Avoidance to toluene was advised as well as a job change. The patient followed this advice and improved steadily.**
- **Six years later, he had a severe asthma attack while helping a friend paint his car. His physician advised him to discontinue the hobby because there was toluene in the paint.**
- **Subsequently, and against advice, he again helped paint a car. He had another asthma attack and died one hour later.**

•When you advise your patient to avoid a health hazard, you must be sure to impress upon him the adverse effects of non-compliance. However, many people are "risk-takers" and feel that the worst-case scenario "can't happen to them."

VALIDATING YOUR COMMUNICATION WITH A PATIENT



❶ GIVE THE MESSAGE

❷ REPEAT THE MESSAGE



CAN YOUR PATIENT REPEAT THE MESSAGE BACK TO YOU?

❸ FOLLOW-UP IN TERMS OF BEHAVIOR

- When you give your patient a message (may need to be sent in 1, 2 or 3 of the modalities: auditory, visual, kinesthetic) you should see if your patient can tell you in his own words what you said.
- Another communication check is to follow-up the patient to see if his behavior has changed. Knowing that you're going to check up on him can increase his compliance.

SUMMARY :
TRUST IS YOUR GOAL

***T**ake time to listen, to explain.*

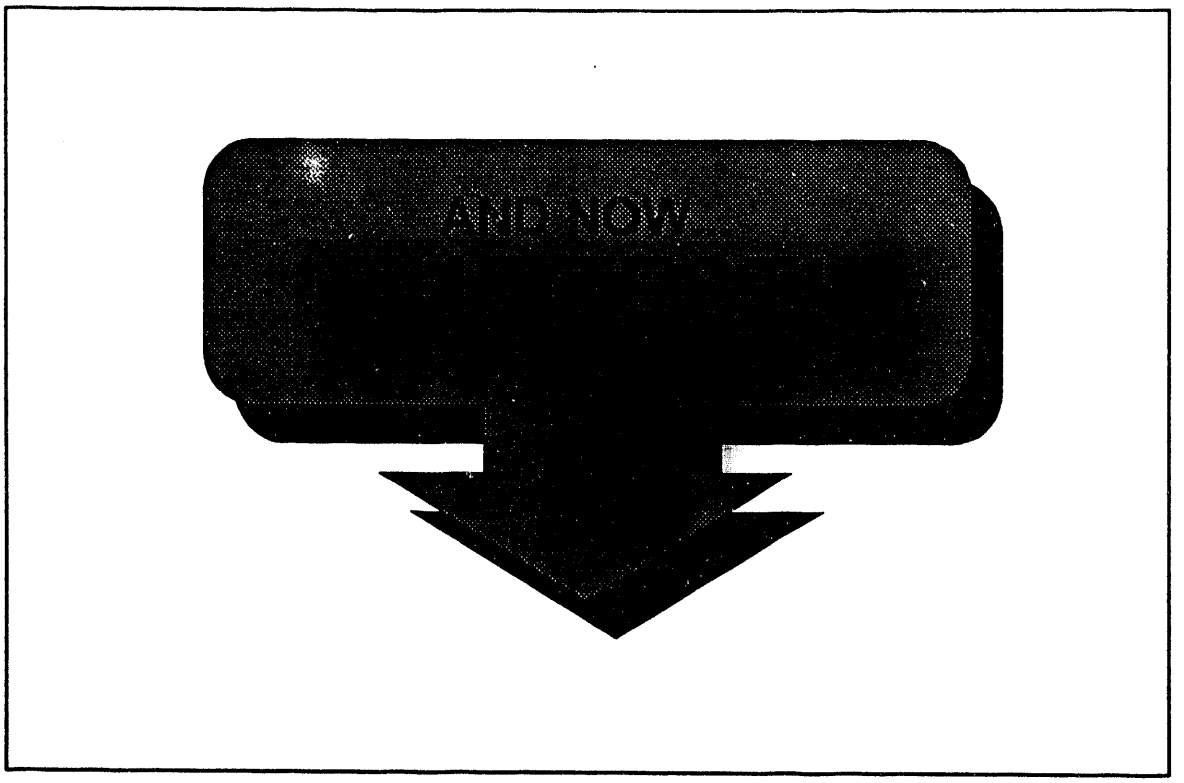
***R**espond appropriately; do no harm.*

***U**nknowns in science are inevitable.*

***S**cience and skill will prevail.*

***T**ime to follow-up and reassure.*

•Think of those you have trusted for your personal care or for your loved ones. Trust is a gift worth sharing.



- What points were illustrated in the three case histories?

CASE HISTORY: POWER LINES

Q When is it appropriate to give your patient information about EOM risks or hazards?

- Obviously, if you are familiar with the exposure hazard that the patient is concerned about, you can - at that time - tell your patient what is known, and what is not known, about the hazard and how that information relates to his particular situation.
- You may have to delay giving your patient EOM information until you have consulted other resources.

CASE HISTORY: UNEXPLAINED BLOOD LEAD LEVELS

- How did the physician learn the source of his patient's lead exposure?

•The patient "knew" all along what the source of his lead exposure was; however, he obviously didn't make the connection. Also, even if a patient suspects that something he is doing may be causing him problems, he may be embarrassed to admit to the activity.

CASE HISTORY:
A PREVENTABLE DEATH?

- Who was responsible for the patient dying of an asthma attack after his exposure to toluene? The doctor? The patient? Both?

•It is difficult to determine, after the fact, who was at fault in this case. Just because the patient was warned about the exposure doesn't mean the danger was stressed enough. Or, the patient might not have believed it was that serious. Or, was a risk-taker and predisposed to ignore danger.

CREDITS

This lecture was developed under the auspices of the Environmental Medicine Curriculum Committee of the SC Statewide Family Practice Residency System.

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STATEWIDE FAMILY PRACTICE RESIDENCY PROGRAM

ENVIRONMENTAL MEDICINE CURRICULUM COMMITTEE

ENVIRONMENTAL and OCCUPATIONAL MEDICINE LONGITUDINAL CURRICULUM MODULES

1 - Environmental and Occupational Medicine History for Family Physicians

2 - Communicating Environmental and Occupational Risks to Patients: A Guide for the Family Physician

3 - Environmental and Occupational Medicine Resources for the Family Physician

4 - Environmental and Occupational Medicine in Private Practice: Choices for the Family Physician

5 - Using Hospital Site Visits for Teaching Environmental and Occupational Medicine

Module 3

ENVIRONMENTAL AND OCCUPATIONAL MEDICINE RESOURCES FOR THE FAMILY PRACTICE PHYSICIAN

INDEX

Objective . . . . . Section 1

Teaching Slides . . . . . Section 2

Script for Teaching Slides. . . . . Section 3

Slide Lecture Evaluation Forms . . . . . Section 4

Interactive PC Program and Instructions . Section 5

PC Program Evaluation Forms . . . . . Section 6

Case History Templates . . . . . Section 7

References . . . . . Section 8

Credits . . . . . Section 9

OBJECTIVE

The objective of this module is to develop a practice based EOM directory. This will assist the family physician with a variety of EOM cases. Included in the directory will be state and federal agencies, faculty and private practitioners

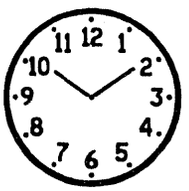


ENVIRONMENTAL & OCCUPATIONAL MEDICINE RESOURCES FOR THE FAMILY PHYSICIAN

VERSION 1.0

The objective of this lecture is to present some of the environmental and occupational resources available to the family physician.

INFORMATION RETRIEVAL QUESTIONS for the BUSY PHYSICIAN



- **What are the equipment requirements?**
- **What will it cost?**
- **How long will it take?**
- **How accurate is the data?**
- **Can I get a hardcopy record?**
- **Can I talk to a real person?**



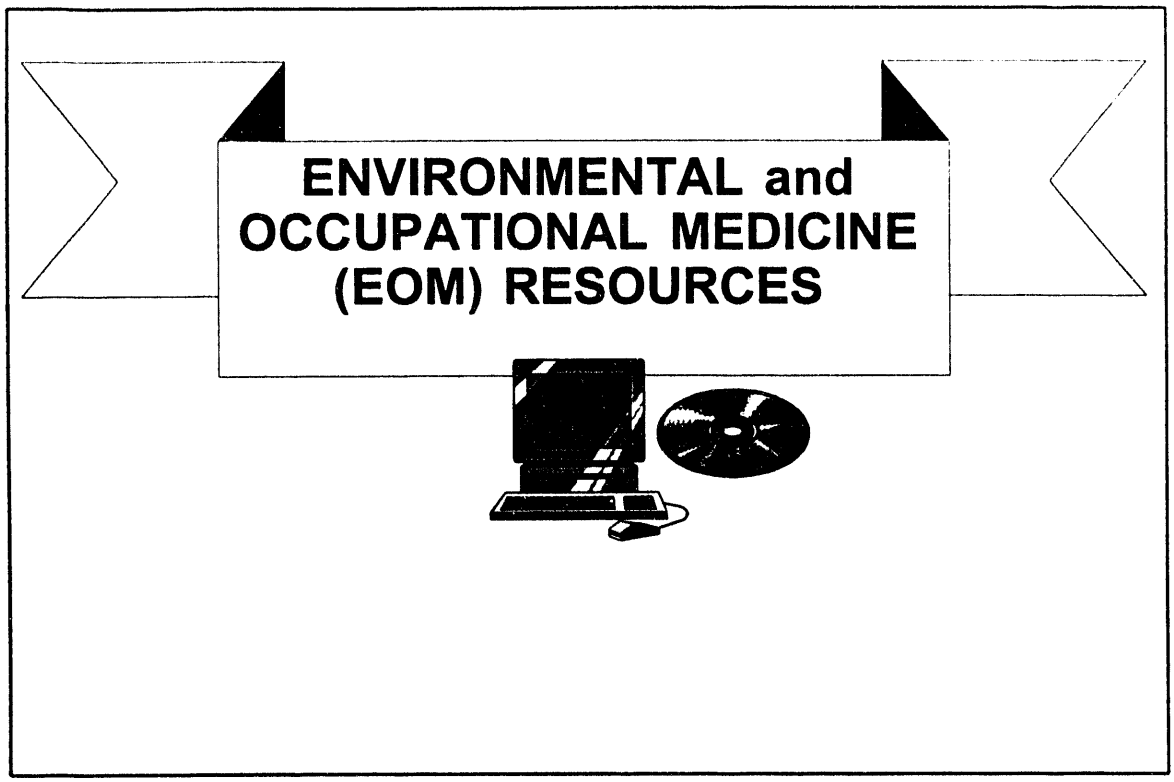
Available electronic information is already vast and expanding rapidly. The physician should be able to access this information without compromising his busy schedule. There are many advantages for the physician who conducts his own computerized information search. The obvious disadvantage is that time spent at the computer takes away from the time available for direct patient care.

The physician who conducts his own computer search has more control of the search process, can change the direction of the search based on information gained in the middle of the retrieval process, learns of new developments before they are printed, and enhances patient confidence that the physician is up to date.

Computerized information searches conducted by someone other than the physician may be a better use of time for the busy physician. Some control of the process is lost, but with guidelines provided by the physician, a search conducted by an information specialist may provide more information in a shorter period of time.

Which approach is best? Only you can decide.

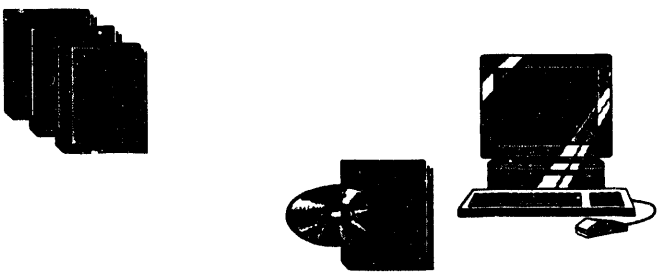
Whichever approach is taken, knowledge of available resources is a valuable tool for today's physician.



Environmental and occupational medicine (EOM) information is available in a variety of formats from many sources.

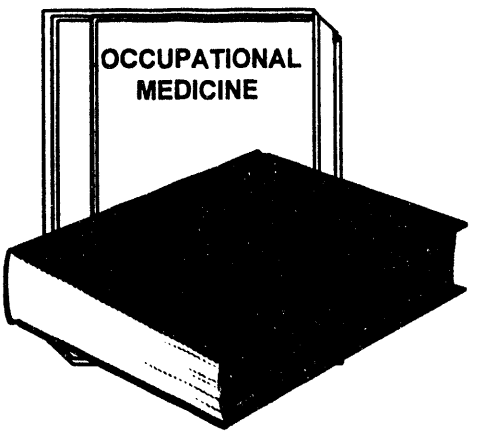
EOM RESOURCES

WHAT RESOURCES CAN THE BUSY PHYSICIAN ACCESS FROM THE OFFICE?



What resources can the busy physician access from the office?

EOM RESOURCES
REFERENCE TEXTS and JOURNALS



The family physician usually has a collection of reference material at the office. Addition of selected EOM reference texts can provide a quick reference source for many of the environmental and occupational medicine questions encountered in family practice.

Recommended EOM texts:

Occupational Medicine, Zenz C. MD, DrS, Mosby-Year Book 1994.

Environmental Medicine, Tarcher AB, Plenum Publishing 1992.

COMPUTER RESOURCES



The personal computer is well established in the family practice setting as an aid to office operations (patient medical record information, patient billing, etc.).

The personal computer can also be used to organize office reference information into databases for rapid retrieval. Entry of information into the computer requires time and some knowledge of computer operation.

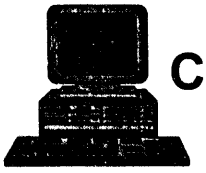
Note - One example of a commercial database program that is designed for use on the personal computer is Reference Manager by Research Information Systems. Reference Manager provides template screens for entry of bibliographic information. This information can be quickly searched by keywords, author, journal, etc. and the appropriate bibliographic information retrieved.

COMPUTER RESOURCES

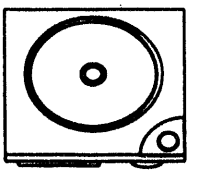


The compact disk in read only memory format (CD-ROM) is an efficient and convenient storage device. Compared to floppy disks, which hold less than 1.5 megabytes of digital information, CDs hold more than 600 megabytes of information. A computer with CD reader can access volumes of information. CD technology has made possible multimedia presentation on personal computer. Another advantage of CD storage of information is that CDs are easily transported from one computer to another and many CDs can be stored in very little space.

Database information on CD is available from many commercial suppliers and government agencies. One of the most economical sources of occupational database information is the Canadian Centre for Occupational Health and Safety (905)572-2981.

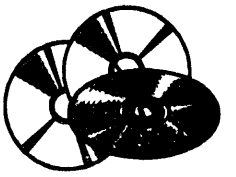


COMPUTER RESOURCES



CD ROM Database Systems

- **Compact Disk Reader**
- **CD Software (Titles)**
- **Unlimited Access**
- **No On - Line Service Charges**



Minimal requirements for CD use are:

personal computer

CD-ROM reader (player)

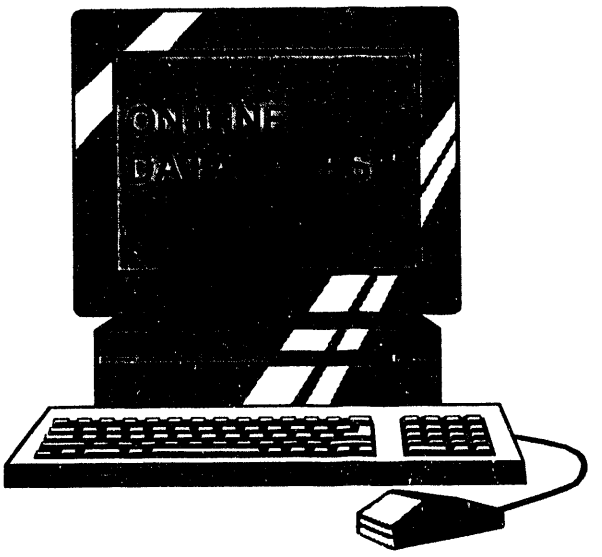
CD Software (Titles)

Advantages of the CD ROM database include:

Unlimited access to the information - there is no communication service fee for access to the database as it is completely contained in the CD and personal computer.

Many different database CDs can be stored and easily changed on the personal computer.

COMPUTER RESOURCES



On-line databases are databases that can be reached through telecommunication.

Minimal requirements for on-line communication:

Personal computer with modem (Most computers include a modem as part of the system or as an optional accessory.)

Telephone connection (phone number) to communication service. This is now commonplace in most locations in the developed world.

Database source - this is the supplier of the database information. The supplier may be the originator of the database information or a commercial vendor that purchases the database information and provides access for the end-user. The commercial vendor charges a fee for access to the service.

Examples of database sources

National Library of Medicine (NLM) is an originator of NLM databases and supplier to individuals of the NLM on-line databases.

Compuserve and America Online are commercial vendors that provide access to many databases including NLM databases.



COMPUTER RESOURCES

ON-LINE COMPUTER SEARCH REQUIRES:

- **ELECTRONIC CONNECTION**
- **ACCOUNT, ID, PASSWORD**
- **TRAINING**
- **TELECOMMUNICATION FEES, SERVICE FEES**

To conduct an on-line computer search from a personal computer you must have:

1. an electronic connection (example - modem plus telephone connection)
2. an account with the database supplier for billing (To verify identity and for account security, an ID and password are supplied by the vendor.)
3. training (may be self paced but will require time depending on the difficulty of the individual database program).

Fees for access to individual databases as well as on-line connect time and license to use the service may be accessed. There is considerable variation in the method and amount of service fees accessed by different suppliers.

Note- One advantage of subscribing to a commercial vendor such as Compuserve is that access to different database services is standardized (to some extent) and menu driven screens make the process more user friendly. A single account and password simplifies the process compared to many accounts, IDs and passwords required for separate access to each database supplier.

COMPUTER RESOURCES

EXAMPLES of ON-LINE DATABASES

NATIONAL LIBRARY OF MEDICINE DATABASE

MEDLARS - NLM database on computer

- **MEDLINE**
- **TOXLINE**
- **RTECS**
- **HSDB**

MEDLARS (Medical Literature Analysis and Retrieval System) is the computerized files of the National Library of Medicine. MEDLARS contains over 30 biomedical databases.

One of the most recognized on-line databases is the National Library of Medicine's **MEDLINE** database. MEDLINE is a bibliographic database listing over 6,500,000 references from 1966 to the present. MEDLINE lists every reference in *Index Medicus* plus references from 600 additional journals. Abstracts are included in the listing for MEDLINE but not *Index Medicus.* The database can be searched by combinations of keywords, author, journal etc. which can only be searched one at a time from *Index Medicus.*

Other MEDLARS databases:

TOXLINE (Toxicology Information Online) is a bibliographic database of toxicological information.

RTECS (Registry of Toxic Effects of Chemical Substances)is a database of the National Institute of Occupational Health and Safety. It contains toxic effects data for thousands of chemicals.

HSDB (Hazardous Substances Database) is a full text database of over 4000 chemicals. The information in the database includes peer reviewed toxicology data from human studies.

COMPUTER RESOURCES

NLM DATABASES

- **PRINTED FORMAT - Index Medicus**
- **COMPUTER FORMAT ? MEDLINE, etc**

ON-LINE ACCESS REQUIRES:



- ☎**PC, MODEM, ACCOUNT, ID, etc**
- ☎**SOFTWARE**
  - ▲**GRATEFUL MED or**
  - ▲**COMMERCIAL VENDOR or**
  - ▲**INTERNET ACCESS?**

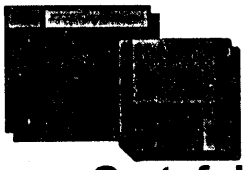
Direct access to the NLM databases such as MEDLINE requires knowledge of the search protocol or language. This can be complicated or at least time consuming.

User-friendly software programs for searching the NLM databases are available and definitely make the search and retrieval process more manageable.

GRATEFUL MED is a menu driven program developed by NLM. The program is available from NLM.

Paperchase is a menu driven program developed by Beth Israel Hospital in Boston. Paperchase makes it possible to search MEDLINE and 3 additional NLM databases without having to deal with the complicated search language directly.

Both Grateful Med and Paperchase are also available through commercial vendors on-line services.



USER FRIENDLY SOFTWARE TO ACCESS MEDLINE

- **Grateful Med**
  - **NLM account required**
  - **Training?**
- **Commercial Vendors**
  - **Compuserve**
    - **Paperchase**
    - **Knowledge Index**
  - **America Online**

ACCESSIBLE BY MODEM FROM YOUR P.C.

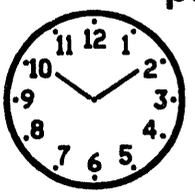
The number and variety of access paths to on-line medical databases is difficult to determine. The number of available databases is growing as the number of connections between databases and potential users increases.

You will need at least one account to access the major databases. The simplest method of accessing many different database suppliers is to subscribe to one of the larger on-line services. The amount you spend on computer searches depends on the time required to connect to the database and to extract the necessary information.

Literature supplied with the Grateful Med program from NLM lists the average cost of a simple search at $3 to $5. Connect fee rates for NLM databases are $18 per hour.

COMPUTER RESOURCES

ASSISTED Computer Searches performed by



Your Medical Library Staff or

MUSC OEMO Staff or

Contract Service

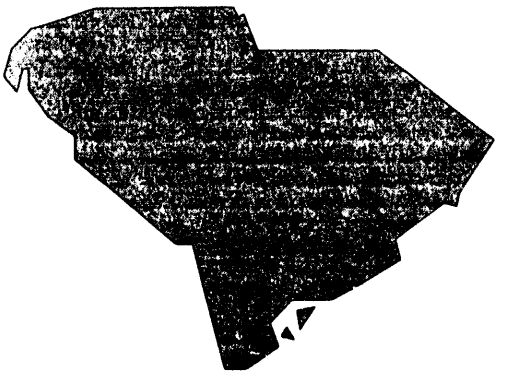
Easy Access to Information Requires less of the physician's time.

Assisted computer searches may be conducted by hospital or medical library staff. Where these services are available, they are often free to faculty and staff.

EXPERTS / CONSULTANTS



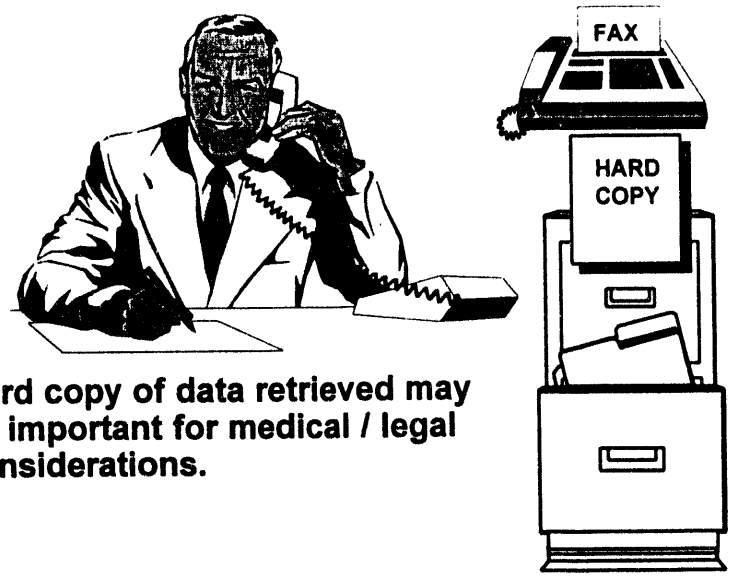
S.C. AGENCIES



FEDERAL AGENCIES



NETWORK INFORMATION



Hard copy of data retrieved may be important for medical / legal considerations.

A hardcopy of data retrieved by computer search or by consultation with a specialist may be important for medical/legal considerations. Don't forget to request a copy of referenced material for your files.



Don't forget that the Occupational and Environmental Medicine Office is available to assist you in tracking down information related to environmental medicine, occupational medicine, or any health and environment related questions.

OEMO RESOURCES

- KNOWLEDGEABLE STAFF
- OEMO REFERENCE LIBRARY
- DATABASE FILE OF EOM PUBLICATIONS
- CD-ROM DATABASE INFORMATION
- ACCESS TO ON-LINE COMPUTER DATABASES
- NETWORK OF SPECIALISTS PROVIDING INFORMATION ON EOM TOPICS

Specific resources of the OEMO include a knowledgeable staff, selected reference works dealing with environmental and occupational medicine, a database of EOM publications, CD-ROM and on-line computer database information, and a network of specialists to consult on EOM topics.

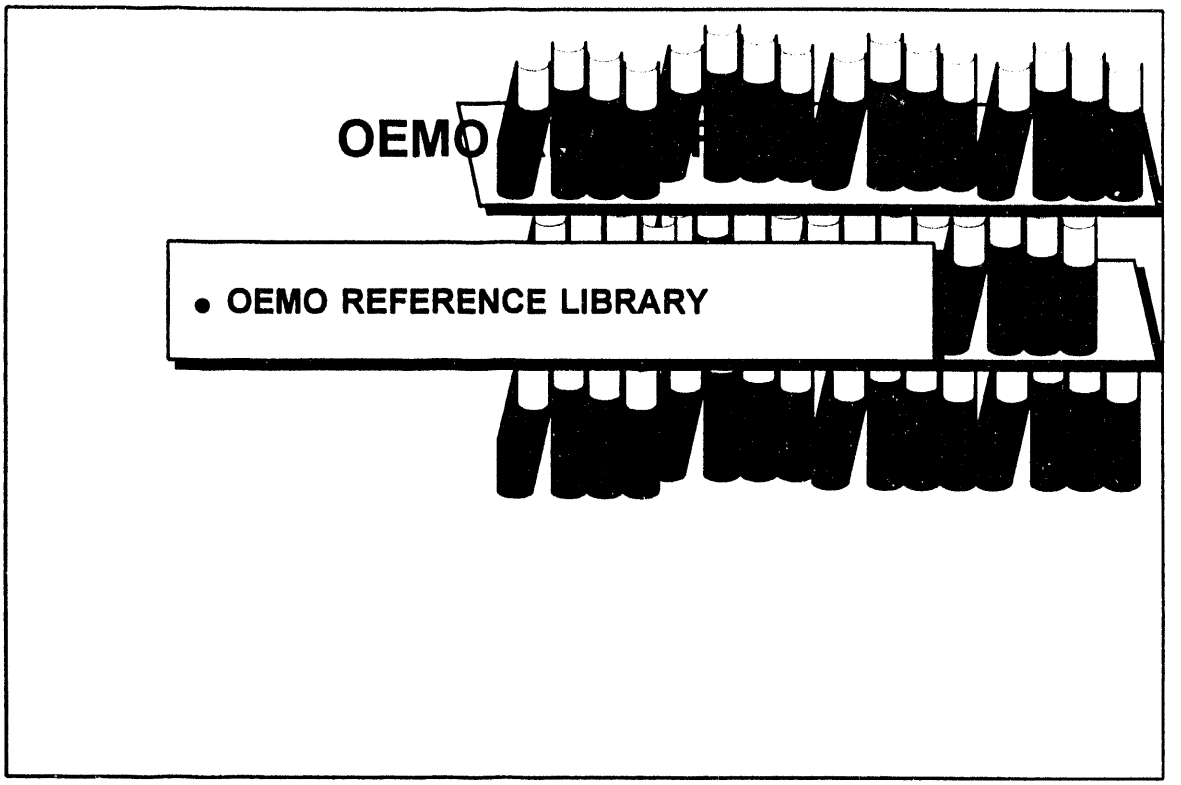
OEMO RESOURCES

- **OFFICE STAFF TO LINK RESOURCES**
- **FREE SERVICE for FACULTY, RESIDENTS and STAFF OF SC STATEWIDE FAMILY PRACTICE RESIDENCY SYSTEM**
  - ▲ **Consultations**
  - ▲ **Case Research**



The consultation and research services of the OEMO are available,free of charge, to faculty and staff of the SC Statewide Family Practice Residency System.

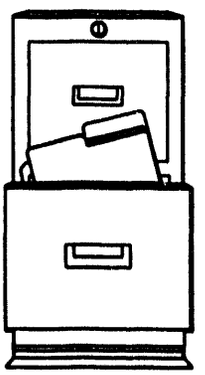
792-2281



Reference texts are selected for the OEMO Library based on projected usefulness for family practice physicians. Trends in diagnosis, therapy, new diseases and new outbreaks of old diseases are monitored and new publications are evaluated for usefulness. The office library is cross-referenced for rapid retrieval of information.

OEMO RESOURCES

- DATABASE FILES OF EOM PUBLICATIONS
- HARD COPIES OF EOM ARTICLES FROM JOURNALS, NEWSLETTERS, NEWSPAPERS



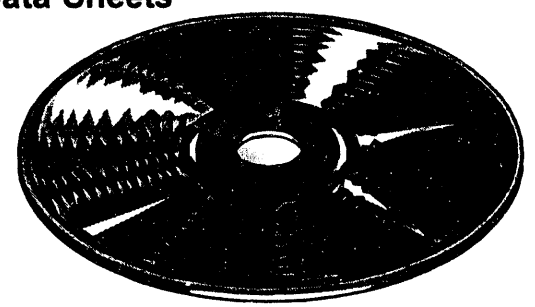
OEMO maintains files of newspaper articles, journal articles, monographs and slide presentations collected over ten years of information support to SC physicians.

OEMO RESOURCES

CD-ROM DATABASE INFORMATION

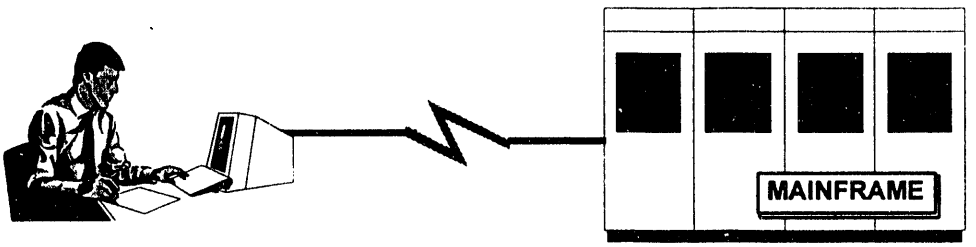
EXAMPLES

- **Material Safety Data Sheets**
- **CCINFO**

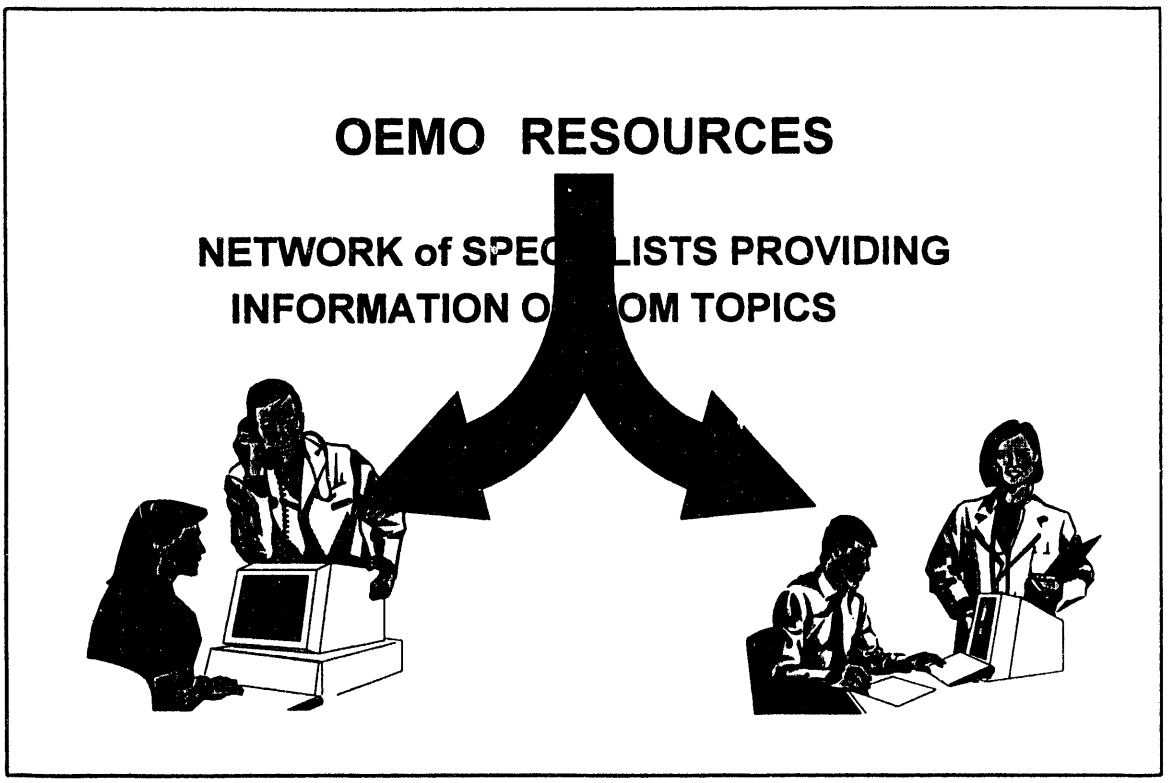


OEMO subscribes to information services providing database information on CD. CD titles include Material Safety Data Sheets and CCINFO. This information is also available to the family practice faculty and residents by contacting the OEMO. 792-2281

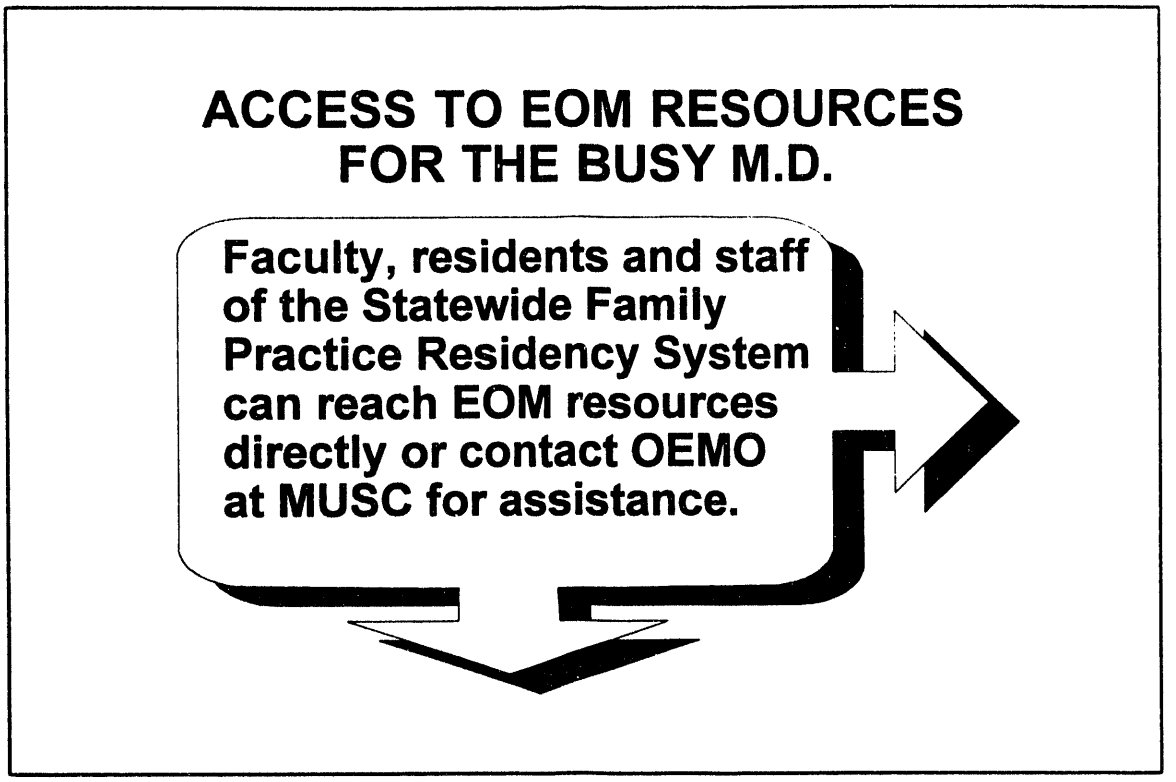
OEMO OFFICE RESOURCES



- **ACCESS TO ON-LINE COMPUTER DATABASES**
  - ▲ MEDLINE, TOXLINE, etc.
  - ▲ INTERNET DATABASES



More than 20 years of consultation and research in environmental and occupation medicine has generated many individual contacts offering a diverse range of knowledge and experience.


ACCESS TO EOM RESOURCES
FOR THE BUSY M.D.
Faculty, residents and staff of the Statewide Family Practice Residency System can reach EOM resources directly or contact OEMO at MUSC for assistance.

FOR THE BUSY PHYSICIAN

ACCESS TO EOM RESOURCES:



EOM REFERENCE LIBRARY



CD-ROM DATABASES



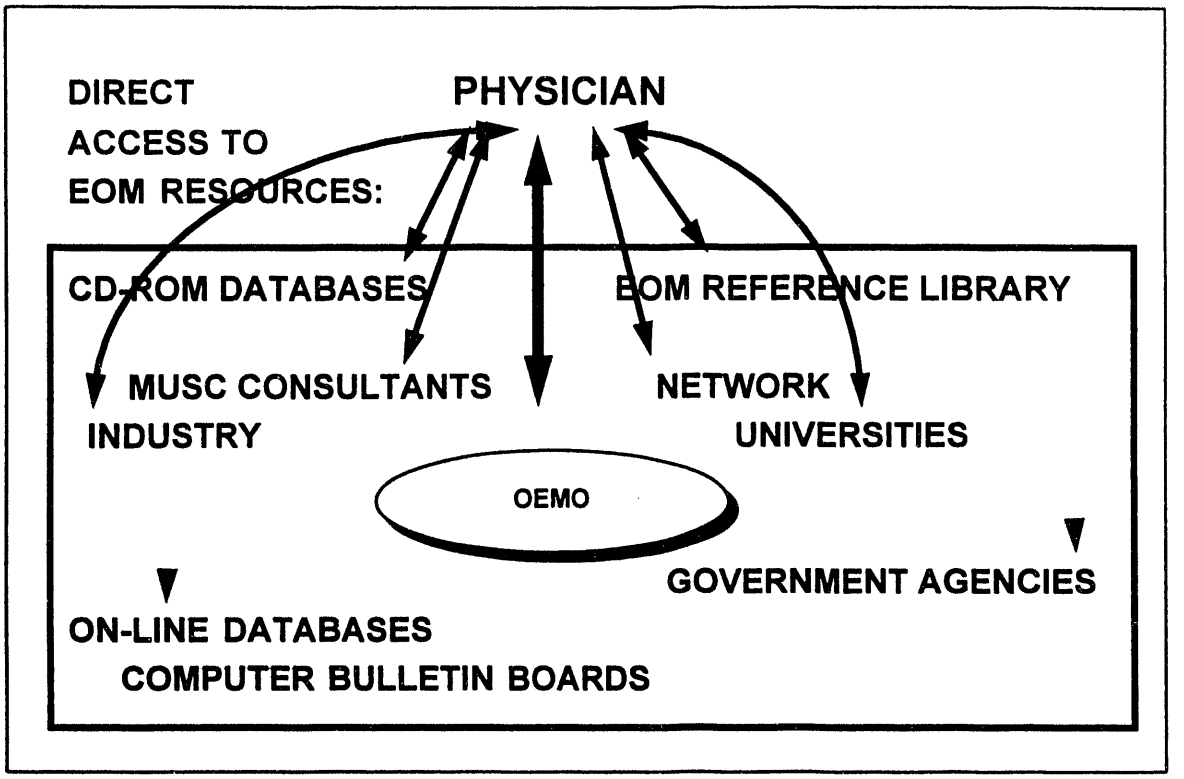
ON-LINE DATABASES



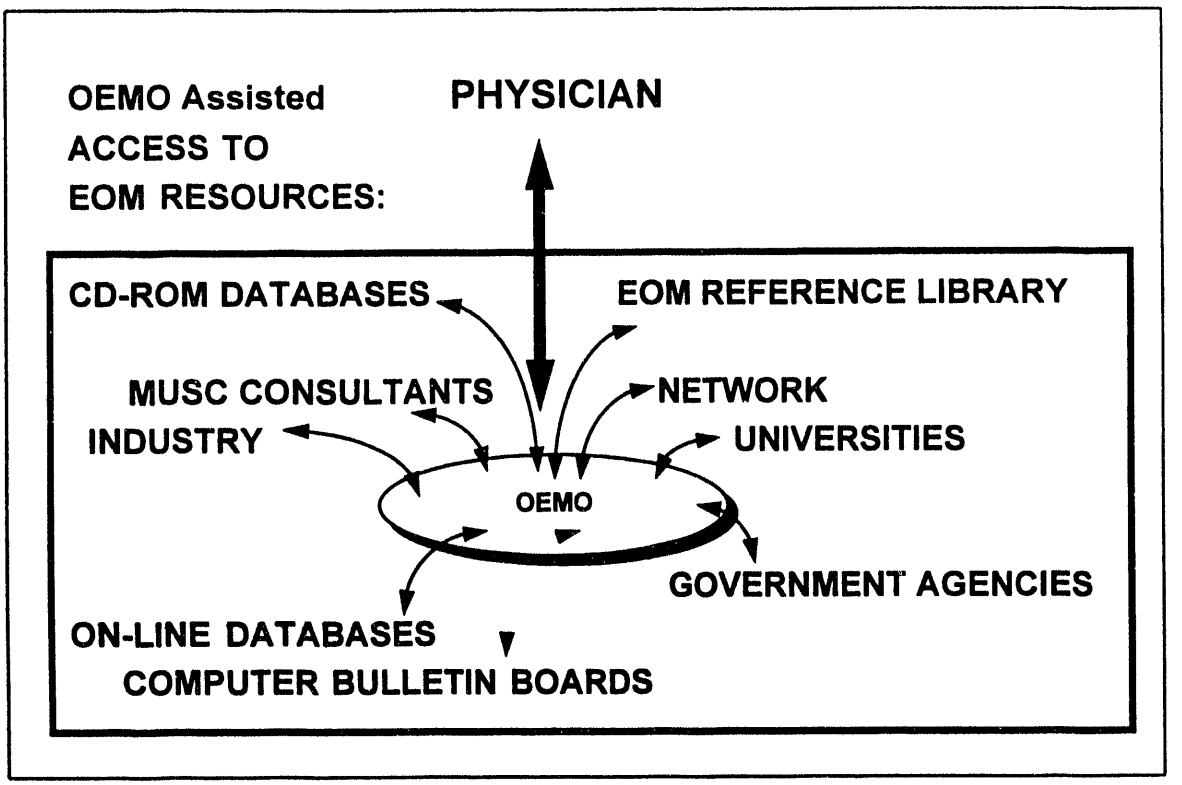
COMPUTER BULLETIN BOARDS

NETWORK OF EOM CONSULTANTS





The SC physician can access all of these EOM resources directly providing the physician has the necessary equipment and time.



Or the SC physician can call the OEMO and request the free services of that office. The OEMO will conduct or assist the MD in conducting the computer search, PC database search and phone calls to consulting specialists.



CASE STUDY - WEST COAST HIGH PERFORMANCE PILL

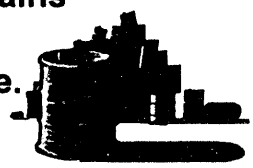


- A 15 year old high school athlete comes for routine physical examination.
- After the exam, he asks you for the latest scientific information on the new "sports vitamin" which his coach brought back from the West Coast.
- The active ingredient in the capsule is a salt of vanadium; recommended dosage is one daily.
- Your pharmacist has no current information.

WHAT OTHER SOURCES OF INFORMATION CAN YOU FIND?

CASE STUDY
35 YEAR OLD LONGSHOREMAN

- ☹ Presents with anxiety, brownish purple stains on hands, forearms and ankles.
- ☹ Patient examination and lab tests negative.
- ☹ 3 days prior, pt was exposed to spill of potassium dichromate.
- ☹ Pt immediately showered, rushed to ER. Reassured and sent home for 48 hrs.
- ☹ Pt returned to work and found spill site restricted and decontamination team at work in full protective suits.
- ☹ Pt rushed to Family Physician.





WHAT ARE THE SOURCES OF INFORMATION?

POTASSIUM DICHROMATE

Request for information received from Family Practice Physician. Patient was exposed to a chemical and was concerned about possible health effects.

- **MSDS database service**
- **OEMO reference library**



DIOXIN



Request for information on health effects of DIOXIN through INCINERATION

- OEMO Reference Library
- RefMan database of EOM Journal articles
- MSDS database service
- Phone calls to experts
- MINIMEDLINE search
- MUSC LIBRARY assisted computer search

ALL SEARCHES NEGATIVE!

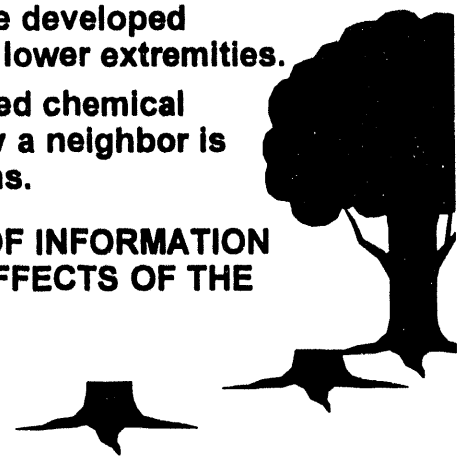


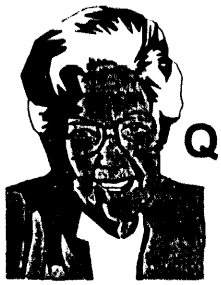
CASE STUDY

An 82 year old gardener complains of low grade morning fever for the past month. Her health has been excellent until she developed strange sensations in both lower extremities.

She is concerned that repeated chemical treatment of tree stumps by a neighbor is causing her health problems.

WHAT ARE THE SOURCES OF INFORMATION FOR THE TOXICOLOGIC EFFECTS OF THE PRODUCT?





CASE STUDY
82 YEAR OLD GARDENER



Q. Could the chemicals (two different o
counter products) cause:

a. low grade fever?

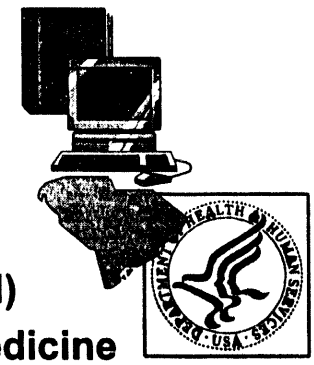
b. paresthesias?

c. other long term health effects?

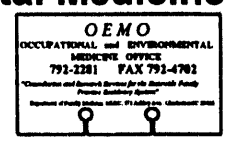
Both labels claim that the products are designed specifically for tree stump remova but no ingredients are listed on the label.

WHAT ARE THE SOURCES OF INFORMATION FOR THE TOXICOLOGIC EFFECTS OF THE TWO PRODUCTS?

ENVIRONMENTAL and OCCUPATIONAL MEDICINE (EOM) RESOURCES



- Reference Texts And Journals
- Computer Resources
- Experts / Consultants
  - ▲ Agencies (State and Federal)
  - ▲ Specialists (State and Federal)
- Occupational Environmental Medicine Office (OEMO) at MUSC



CREDITS

This lecture was developed under the auspices of the Environmental Medicine Curriculum Committee of the SC Statewide Family Practice Residency System.

- **Anderson - Dr. H.E. Woodall**
- **Charleston - Drs. C. Brock, W. Simpson, & S. Schuman**
- **Columbia - Drs. E.P. McCutcheon & P.W.Stone**
- **Florence - Dr. H.E. Terrell**
- **Greenville - Dr. D.S. Grubbs**
- **Greenwood - Dr. D.E. Ruiz**
- **Spartanburg - Dr. M.T. Godenick**

CREDITS

This lecture is part of a curriculum module produced by the:

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Tarcher AB. Appendix D Information resources in the field of environmental and occupational medicine. In Tarcher AB (ed): Principles and practices of environmental medicine. New York: Plenum Medical Book Co.; 1992:601-608.

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