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# DRAFT AIR PATHWAY REPORT

Phase I of the Hanford Environmental
Dose Reconstruction Project

July 20, 1990

Pacific Northwest Laboratory
Richland, Washington 99352

Draft

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This report was prepared by staff at the Pacific Northwest Laboratory, which is operated by Battelle Memorial Institute, under the direction of an independent TSP. The work described here was directed and monitored by the TSP; however, this report has not yet been reviewed and approved by the TSP. At the TSP's direction, the report is being made available to the public at the same time it is provided to the TSP. The information contained herein is considered preliminary until it undergoes review by the TSP.

## PREFACE

This is one of three draft reports that summarize the first phase of a four-phase historical radiation dose assessment effort titled the Hanford Environmental Dose Reconstruction (HEDR) Project. This, the Draft Air Pathway Report, is directed to technical audiences, as is the Draft Columbia River Pathway Report. The Draft Summary Report, which presents both the air and river pathways, is intended for a general audience. Detailed descriptions of all aspects of the HEDR Project and the dose reconstruction process are available in more than 20 supporting documents (Appendix A).

The air pathway portion of Phase I has several objectives. Foremost among these is to determine that sufficient historical information exists or can be reconstructed from incomplete records to enable a dose reconstruction study to proceed and to demonstrate that this is the case. A second objective is to design conceptual and computational models to specifically deal with uncertainties in the dozens of variables needed to estimate historical doses to offsite populations. The final objective is to determine whether the data and models are sufficient to enable credible doses to be calculated. In summary, Phase I is a pilot or demonstration phase. The Phase I preliminary dose estimates, which were calculated to demonstrate the feasibility of reconstructing doses, will definitely change as input and model structures are refined in later phases.

The reader must recognize the preliminary nature of the dose estimates that are presented and discussed in this and the two companion reports. As the HEDR Project continues, the averages, ranges, and distributions of dose estimates will change, for at least three reasons. First, the input to models will be refined. Second, the models will be refined. Third, the extent of the study area will change. In general, a larger study area yields lower average doses, a greater range of doses, and a greater proportion of lower doses.

It is also important to note that the objectives of the HEDR Project do not include estimating risk or extrapolating to health effects that might have resulted from radiation exposures. A related epidemiological study, the

Hanford Thyroid Disease Study, is being conducted for the Centers for Disease Control by the Fred Hutchinson Cancer Research Center. This study will seek to determine whether there is a correlation between thyroid disease and estimated thyroid doses for residents near the Hanford Site.

The HEDR Project is directed by an independent Technical Steering Panel (TSP) of scientists and representatives of the states of Oregon and Washington, of regional Native American Tribes, and of the public. The TSP's charter is to direct, review, evaluate, and approve all HEDR Project work. Funding for the project is provided by the U.S. Department of Energy, but the agency is not in the review or approval cycle.

The work described here was conducted by Battelle staff at the Pacific Northwest Laboratory and was directed by the Technical Steering Panel (TSP). The U.S. Department of Energy funds the project, but provides no technical direction or oversight.

## ABSTRACT

This report summarizes the air pathway portion of the first phase of the Hanford Environmental Dose Reconstruction (HEDR) Project, conducted by Battelle staff at the Pacific Northwest Laboratory under the direction of an independent Technical Steering Panel. The HEDR Project is estimating historical radiation doses that could have been received by populations near the Department of Energy's Hanford Site, in southeastern Washington State.

Phase I of the air-pathway dose reconstruction sought to determine whether dose estimates could be calculated for populations in the 10 counties nearest the Hanford Site from atmospheric releases of iodine-131 from the site from 1944-1947. Phase I demonstrated the following:

- HEDR-calculated source-term estimates of iodine-131 releases to the atmosphere were within 20% of previously published estimates.
- Calculated vegetation concentrations of iodine-131 agree well with previously published measurements.
- The highest of the Phase I preliminary dose estimates to the thyroid are consistent with independent, previously published estimates of doses to maximally exposed individuals.
- Relatively crude, previously published measurements of thyroid burdens for Hanford workers are in the range of average burdens that the HEDR model estimated for similar "reference individuals" for the period 1944-1947.

Preliminary median dose estimates summed over the years 1945-1947 for the primary pathway, air-pasture-cow-milk-thyroid, ranged from low median values of 0.006 rad (0.00006 Gy) for upwind adults (4.5% of the Phase I population) who obtained milk from backyard cows not on pasture to high median values of 68.0 rad (0.68 Gy) for downwind infants who drank milk from pasture-fed cows (0.5% of the Phase I population).

About 0.004% of the Phase I population was estimated to have received thyroid doses exceeding a previously published estimate (Washington State Department of Social and Health Services 1986) of 2,530 rem to a maximally exposed infant in Pasco, 1945-1947. Future work will expand the time, area, and radionuclides considered.

## EXECUTIVE SUMMARY

This is one of three draft reports that summarize Phase I of a four-phase historical radiation dose assessment effort titled the Hanford Environmental Dose Reconstruction (HEDR) Project. Preliminary dose estimates were calculated to demonstrate the feasibility of reconstructing doses. These estimates will definitely change as input and model structures are refined in later phases.

### BACKGROUND

The HEDR Project was prompted by mounting concern about possible health effects to the public from more than 40 years of nuclear operations at the Hanford Site. The Site was selected in 1943 (Figure 1) as the location for the plutonium-production facilities for producing atomic bombs used in World War II. The first three nuclear reactors began operating in 1944 and 1945. Chemical separation plants T and B were started up in December 1944 and April 1945. The greatest releases of radionuclides to the atmosphere from Hanford operations came from these separations facilities.

Releases of radioactive materials from Hanford were controlled through several steps, beginning with process controls and ending with feedback from personnel monitoring. Each of these control measures and their relative contribution in controlling emissions changed as experience was gained in control and monitoring technology and as knowledge was gained about the potential for health effects from radiation exposure.

Effluent monitoring, which began with the startup of Hanford facilities in 1944, consisted of measuring the amounts of radioactive materials vented to the atmosphere and released to soils and to the Columbia River. Efforts to develop technology to accurately measure atmospheric releases continued for several years before measurements became reliable. In the interim, atmospheric releases were estimated from process information and from estimated filter efficiencies, when effluent filters were installed beginning in 1948 (Ballinger and Hall 1989).

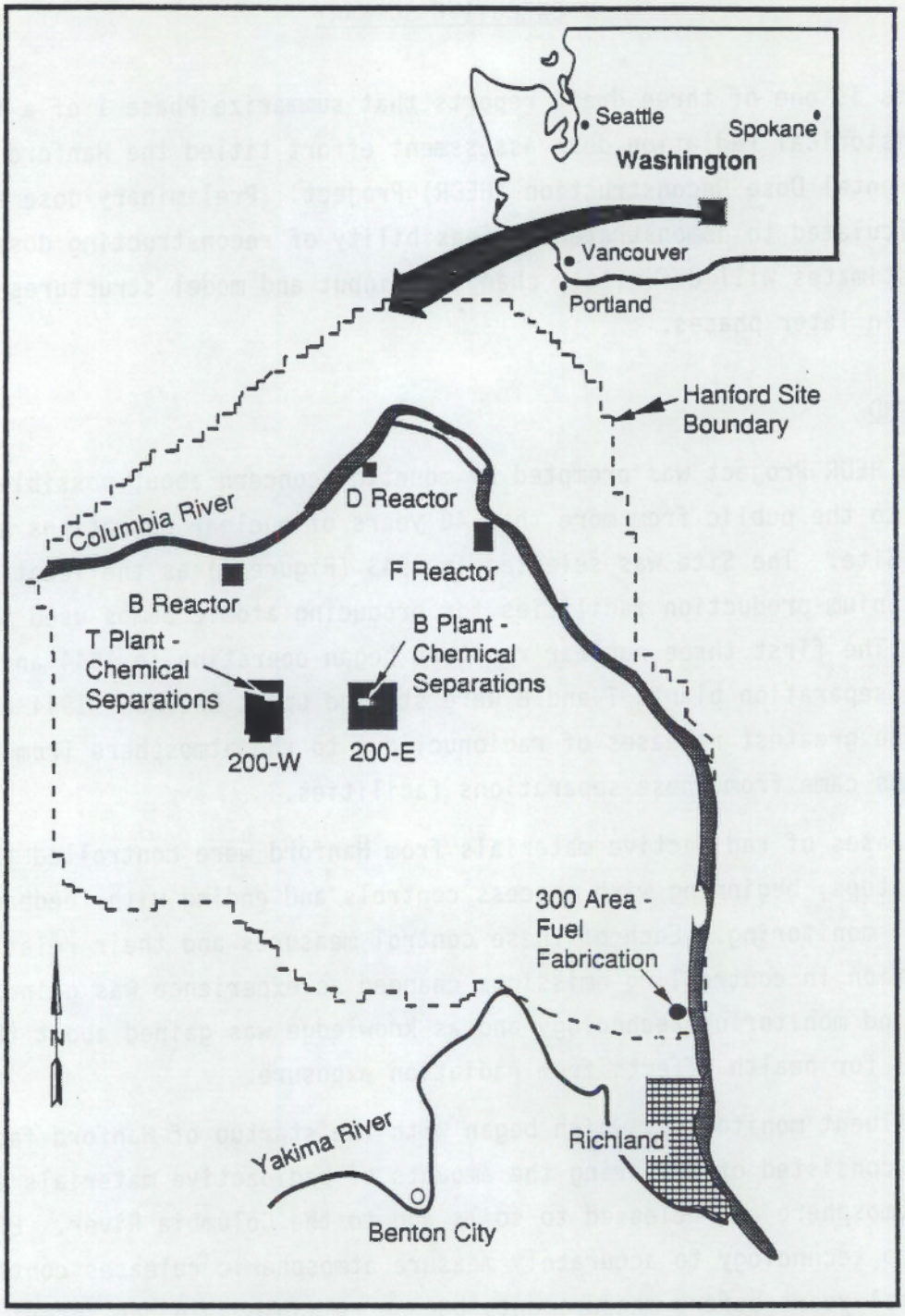


FIGURE 1. Hanford Site and Key Operating Facilities, 1944-1947

Meteorological measurements and observations of plume behavior began in 1943 in efforts to predict the path and concentrations of atmospheric releases of radioactive materials. Not until the mid-1950s, however, did researchers discover the possibility of milk as an important pathway for radioactive iodine (Parker 1956, Comar et al. 1957). Consequently, milk, the major pathway for iodine-131, a pathway that resulted in exposures from 10 to more than 100 times as high as the pathway via inhalation, was not monitored during the period of highest releases of iodine-131, from 1944 through 1947.

Onsite personnel monitoring of radiation exposure began when Hanford employees first began working at the site (Wilson 1987). In addition to measuring external exposure using pencil dosimeters, hand and foot counters, and scans of clothing and extremities with Geiger counters, a bioassay program and limited scans of the thyroid glands of specific workers were also begun. The thyroid measurements provided an important check on exposures of offsite populations estimated by the HEDR Project.

## PHASES

The HEDR Project consists of four distinct phases. The first phase of the air pathway portion of HEDR, a pilot or demonstration phase, was purposely limited to geographic coverage of 10 counties nearest Hanford (Figure 2), to the period from December 1944 through December 1947, and to one radionuclide, iodine-131. The unit of months was selected as the level of temporal resolution for Phase I. These factors influenced the selection of models and parameters and resulted in some conservatism in the designation of the ranges and forms of distributions.

Phase II is designated a review and testing phase, during which sensitivity analyses will be used to identify key parameters and the effects of model structure on dose estimates. Phases III and IV will be used to refine parameters, modify models, expand areas, extend time periods, and ensure that all key emissions of radioactive materials from Hanford will have been addressed.

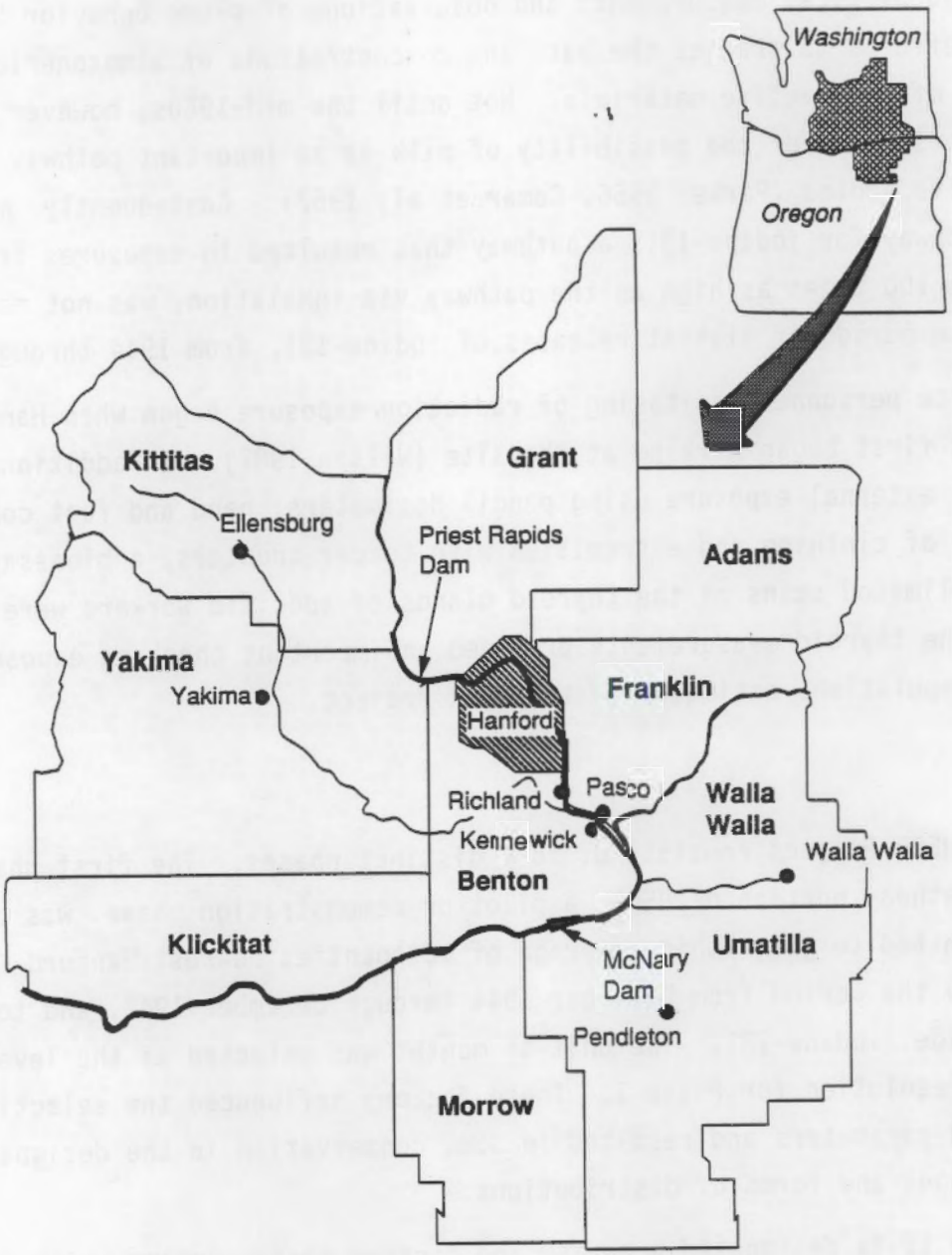


FIGURE 2. Phase I Study Area (Counties) for the Air Exposure Pathway

## APPROACH

A simplified project conceptual-logic diagram for calculating doses from atmospheric releases is shown in Figure 3. Generic pathways are submersion in contaminated air, inhalation of contaminated air, exposure to surfaces contaminated from atmospheric deposition, consumption of contaminated food crops, and consumption of contaminated animal products. Input to the HEDR model consists of distributions for most of the parameters, rather than point estimates, an approach that results in distributions of dose estimates.

This approach incorporates estimates of uncertainties resulting from spatial and temporal variability, incomplete historical information, sampling errors, and unavoidable biases in individuals' recall of lifestyle and food-habit information from the 1940s. This approach also provides a basis for focusing project resources on reducing uncertainties of key parameters and refining the model structure through the application of sensitivity and uncertainty analyses. Distributions of doses were calculated for "reference" individuals, individuals who shared combinations of characteristics such as age, sex, lifestyle, food habits, geographic locations, etc. These distributions were also combined into distributions representing selected populations.

### Source Term

In the early years of Hanford Site operations, technology did not permit monitoring for specific radionuclide emissions. Therefore, modeling of emissions was required for Phase I calculations. Estimates of amounts of irradiated fuel processed were based on records, reports, and a calculation of iodine-131 content in the spent fuel. The important input parameters of fuel irradiation history and cooling time were estimated from the previously published accounts. The calculations were within 20% of estimates made using other techniques (Anderson 1974).

### Atmospheric Transport

An interim atmospheric transport and dispersion model was developed for Phase I by modifying an existing version of the MESOI code (Ramsdell, Athey,

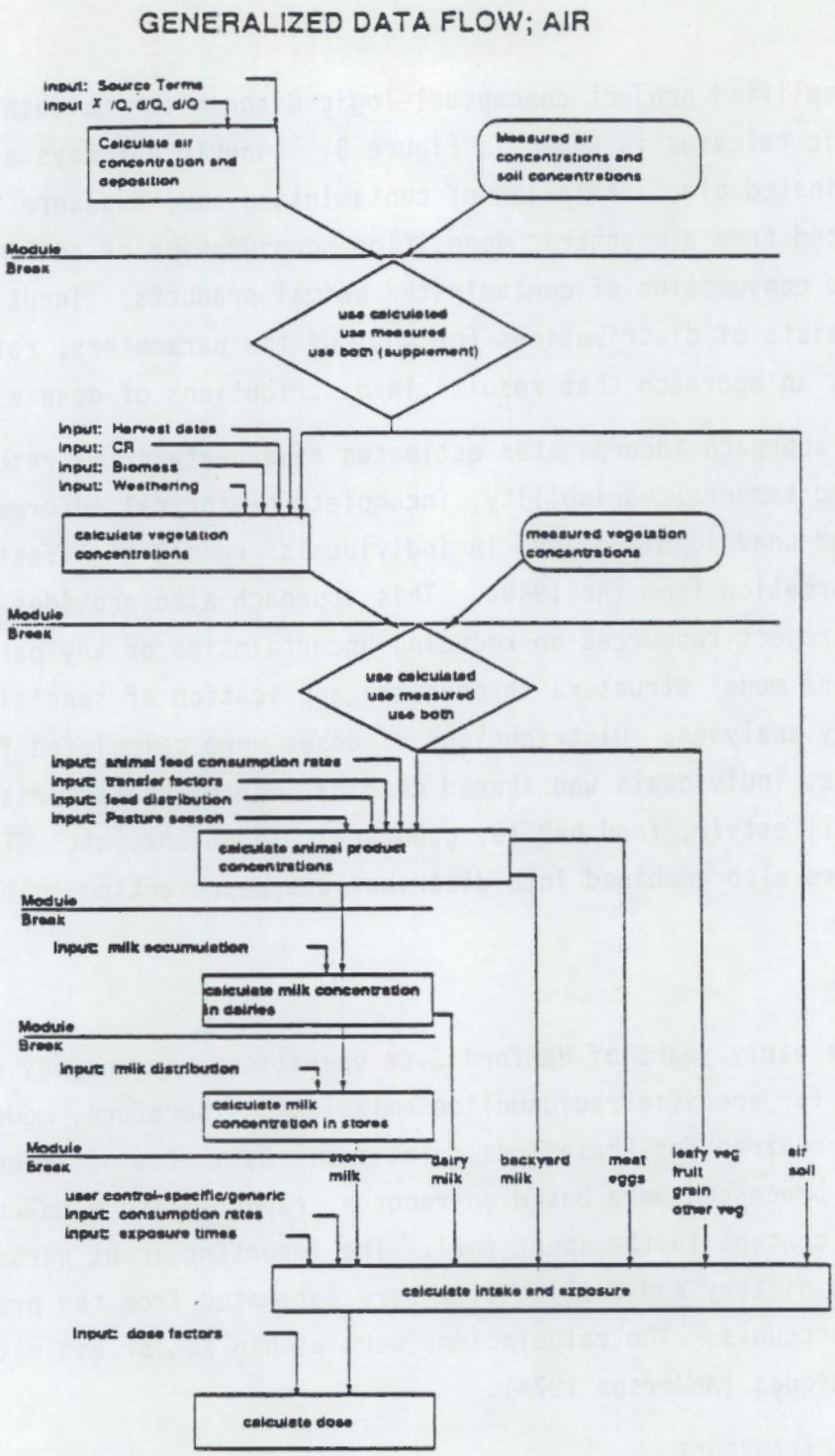


FIGURE 3. Conceptual-Logic Diagram for Calculating Doses from Atmospheric Releases

and Glantz 1983). The HEDR-modified version, called MESOILT2 (Ramsdell 1990), simulates the transport and diffusion of continuous plumes by dividing the plumes into discrete increments, referred to as "puffs." The code generates puffs every 15 minutes at the source; the puffs are transported by the wind until they leave the model domain. As the puffs move, they expand (i.e., diffuse) in response to turbulence, and airborne material is deposited as it comes in contact with the ground surface or is washed out by precipitation (washout was not considered in Phase I). The code also simulates radioactive decay. The wind fields and atmospheric stability data used by the model are updated each hour by interpolation from meteorological observations made at 3-h intervals.

A square model domain was selected for atmospheric transport modeling in Phase I. Physically, the domain extends east from the Cascade Mountains to approximately the Washington-Idaho border and south from Spokane to just below Pendleton.

MESOILT2 was used to compute monthly average radionuclide concentrations in the atmosphere, monthly average rates of radionuclide deposition, and month-end surface contamination at nodes within the model domain for a constant monthly release of iodine-131 from a stack between the 200-W and 200-E Areas. Atmospheric-transport calculations were based on meteorological conditions for January 1983 through December 1987, because the meteorological data for 1944 through 1947 were not available in time to be used in the Phase I atmospheric-transport calculations. Meteorological data for 1944-1947 became available after the Phase I atmospheric transport and diffusion calculations were completed. Estimates made with the 1983-1987 meteorological data do not differ greatly from those made with the 1944-1947 data. Thus, it is reasonable to conclude that using the 1983-1987 meteorological data in Phase I does not invalidate the results of the calculations or prevent the achievement of Phase I objectives.

Deposition/Interception

Most simulations of dry-deposition phenomena have attempted to lump many parameters into a "deposition velocity." This approach has been used in Phase I as a preliminary estimator. The project will eventually incorporate

a model that accounts for atmospheric conditions and radionuclide properties to provide the net wet and dry flux out of the plume. The current Hanford model (Napier 1988) uses a variable interception fraction that is a function of vegetation biomass. The interception fraction is based on the model of Chamberlain (1970). It generally results in a higher value of interception than the older constant-fraction characterization.

Concentrations in Foods

The concentration of radionuclides in animal products depends on the concentration in the animal's feed and on how much of the feed the animal consumes. In Phase I, which considered only dairy cattle, up to four types of feed (pasture, silage, hay, and grain) were considered. The location of feed production areas adds another dimension to the factors that influence milk concentrations.

Food products such as milk may be consumed directly by members of the producing farm family, or they may be sold. Most products that were sold were purchased for redistribution by distributors (such as milk purchases by creameries). These distributors tended to blend or average their inventory over a number of producers.

Demographic/Dosimetric Variables

The Phase I area was divided into 98 areas. With minor adjustments, these are county census divisions. The demographics of each census division are accounted for by providing estimates for individuals differentiated by age, sex, diet, and general lifestyle.

Eventually, seven age groups, based on the resolution provided by available data (with the inclusion of fetal thyroid), will be considered. For Phase I, only the adult and infant categories were investigated.

For each "reference individual" category (as defined earlier), distributions were prepared on monthly consumption rates of the following foods:

- leafy vegetables
- other (protected) vegetables and root vegetables
- grains (generally dried and stored)
- orchard fruits, berries, melons
- milk.

Because the aquatic pathway was not included for the 1944-1947 period, fish were not considered. Phase I assumed that all vegetables and fruits were produced locally. Most of the Phase I effort was focused on reconstructing the production and distribution of milk, because of the importance of the pasture-cow-milk-thyroid pathway for iodine-131.

Calculational Framework

The logic diagram of Figure 3 indicates "module breaks" for individual portions of the dose calculation. These module breaks define individual portions of the computer code that can be run in a stochastic simulation (Monte Carlo analysis). Because of the interconnected nature of the cow/feed/milk distribution model, no doses can be calculated for individuals in a particular census subdivision without knowing the environmental conditions in many other locations. The dose calculation has been structured into modules so that repetitive calculations are minimized, and information on the potential distributions of environmental parameters such as air concentration, vegetation concentration, or milk concentration can be saved and examined for each period. This approach results in the loss of some correlation information, but the losses do not detectably alter the dose distributions. This issue will be examined further in Phase II.

## PRELIMINARY RESULTS

Phase I results demonstrate that the key objectives were attained. First, sufficient historical information was retrieved and reconstructed. Second, preliminary conceptual and computational models were constructed to deal with uncertainties and to establish the foundation for extensive sensitivity analyses to be conducted in Phase II. Finally, the data and modeling approach produced credible, although clearly preliminary, dose distributions. These objectives were attained by demonstrating that

- the source-term estimates agree well with previsouly published estimates
- calculated vegetation concentrations are consistent with previous measurements in several locations
- the range of preliminary dose estimates encloses independent estimates of doses to maximally exposed individuals, and

- relatively crude, previously published measurements of thyroid burdens of workers are in the range of average burdens that the HEDR model estimated for similar "reference individuals."

Dose Estimates

Preliminary doses estimated for 1945, 1946, and 1947 and summed over 1945-1947 for the entire Phase I study population from the consumption of milk contaminated with iodine-131 are illustrated by complementary cumulative distribution functions in Figure 4. Doses, clearly greatest in 1945, ranged over several orders of magnitude. About 10% of the population in the Phase I study area was likely to have received more than 15 rad to the thyroid (0.15 Gy) for the period January 1945 through December 1947 from the milk pathway. Distributions of dose estimates for other pathways are shown in Figure 5.

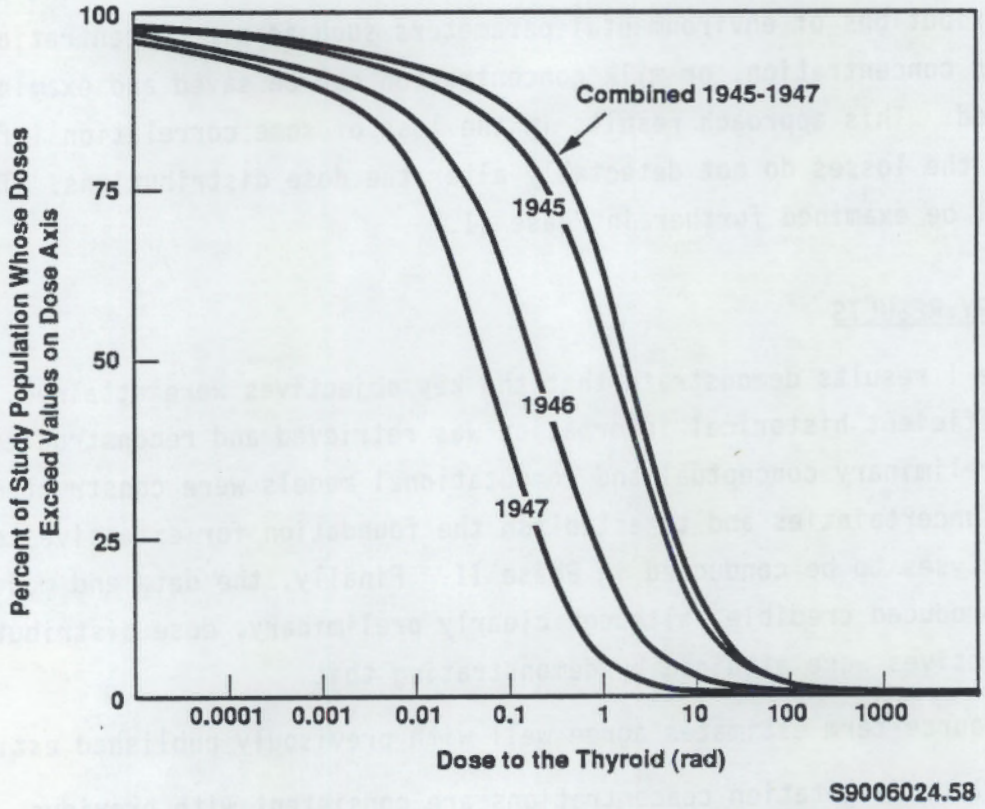


FIGURE 4. Preliminary Dose Estimates from the Milk Exposure Pathway, 1945, 1946, and 1947 and Total

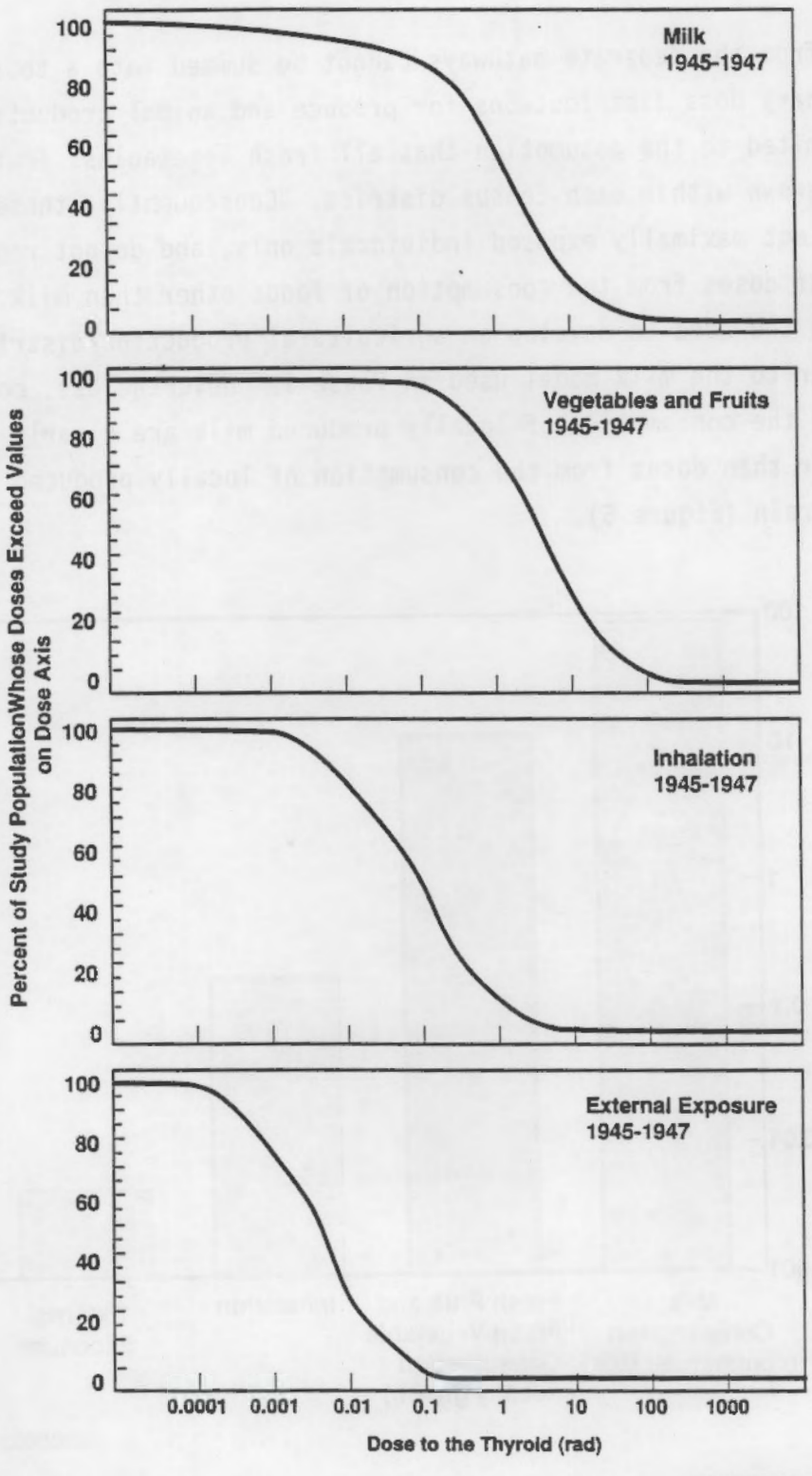


FIGURE 5. Distributions of Doses for All Pathways, for Phase I Area Population, 1945-1947

Doses from the separate pathways cannot be summed into a total dose. The preliminary dose distributions for produce and animal products other than milk are limited to the assumption that all fresh vegetables, fruits, and grain were grown within each census district. Consequently, these distributions reflect maximally exposed individuals only, and do not represent the true range of doses from the consumption of foods other than milk. Phase II will address the need to develop an agricultural production/distribution model similar to the milk model used in Phase I. Nevertheless, doses to infants from the consumption of locally produced milk are clearly several times greater than doses from the consumption of locally produced vegetables, fruit, and grain (Figure 6).

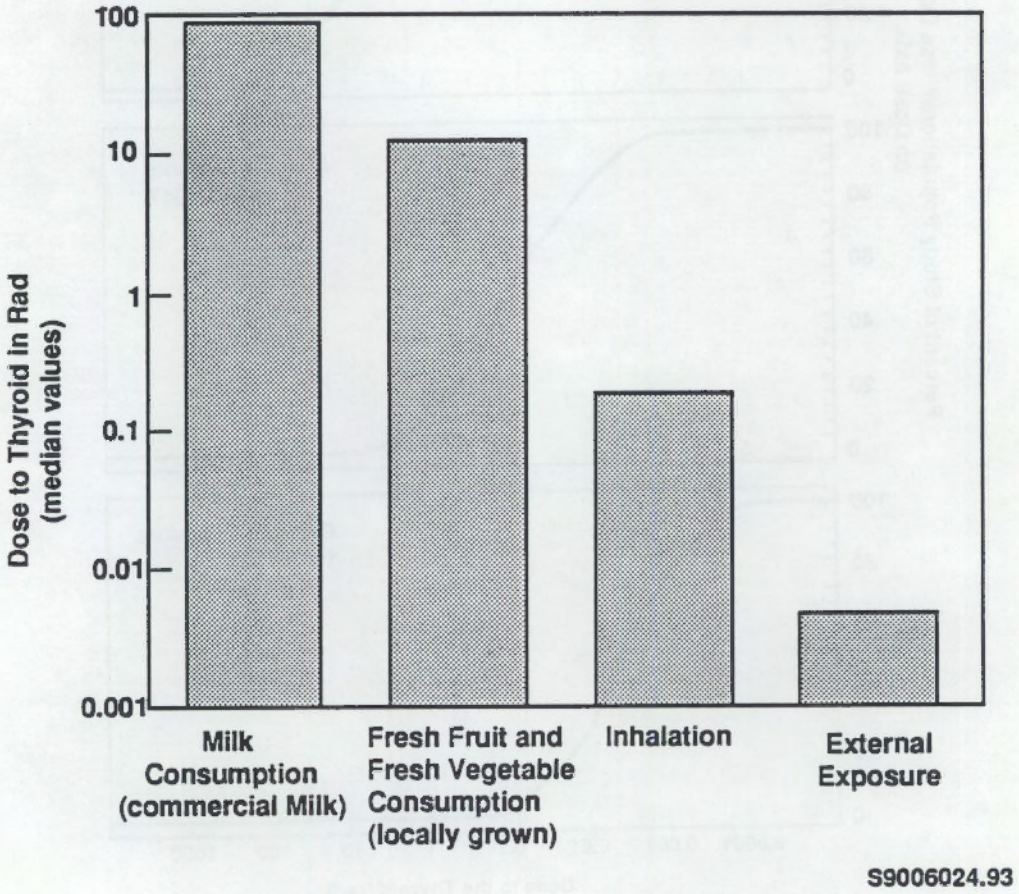


FIGURE 6. Relative Importance of Various Pathways, Based on Median Values (downwind Walla Walla infant, milk from dairy cows on pasture, locally grown vegetables and fruit, 1945-1947)

Comparison of Dose Estimates with Independent Information

In 1986, the Washington State Department of Social and Health Services (DSHS) (Washington State Office of Radiation Protection 1986) issued preliminary dose estimates for infants in Pasco. These preliminary estimates were based on previously published measurements of iodine-131 on sagebrush. The DSHS used a slightly modified model for a maximally exposed individual as provided in U.S. Nuclear Regulatory Commission (USNRC) Regulatory Guide 1.109 (USNRC 1977). About 0.004% of the Phase I population was estimated to have received thyroid doses exceeding the DSHS estimate of 2,530 rem to a maximally exposed infant in Pasco, 1945-1947.

From the time Hanford operations began, workers in areas likely to experience relatively higher air concentrations of iodine-131 had their thyroids checked with a portable radiation detector. The thyroid checks were used not to obtain highly accurate measurements but as a screening tool to detect potential exposures exceeding 10% of the then "tolerance" dose of about 1 rad/24 h. The median dose estimate based on the thyroid counts is somewhat greater than the median thyroid dose from inhalation calculated by the HEDR Project for adults in Richland during the non-grazing season of 1945-1946.

Comparison of Dose Estimates with Background Radiation

One way of placing the preliminary Phase I doses in perspective is to compare the doses with background radiation. Such a comparison requires the use of risk and weighting factors developed by the International Commission on Radiological Protection (ICRP). These factors were developed for radiation protection and therefore are purposely conservative. In particular, the ICRP factors are based on effects of high-dose, high-dose-rate external radiation, whereas major contributors both to background exposures and exposures from Hanford are relatively low-dose, low-dose-rate internally deposited radionuclides. With these caveats, the preliminary Phase I dose estimates for the air pathway are compared with cumulative doses from background radiation.

Approximately 5% of the Phase I study area population, or about 13,000 people, might have received cumulative doses [Effective Dose

Equivalent (rem)] from the milk pathway that were higher than the national, average background added over 3 years (0.36 rem annually, which includes radiation from natural and medical sources) (Figure 7). About 1% of the study population, or about 3,000 people, might have had doses from the milk pathway greater than the national average lifetime dose from background radiation.

Sources of Uncertainty and Future Work

Uncertainties in the preliminary Phase I dose estimates result from parameter uncertainties, model uncertainties, and variability (Finkel 1990; IAEA 1989). The extent of these uncertainties and their contributions to the uncertainty in dose estimates will be assessed during Phase II of the project.

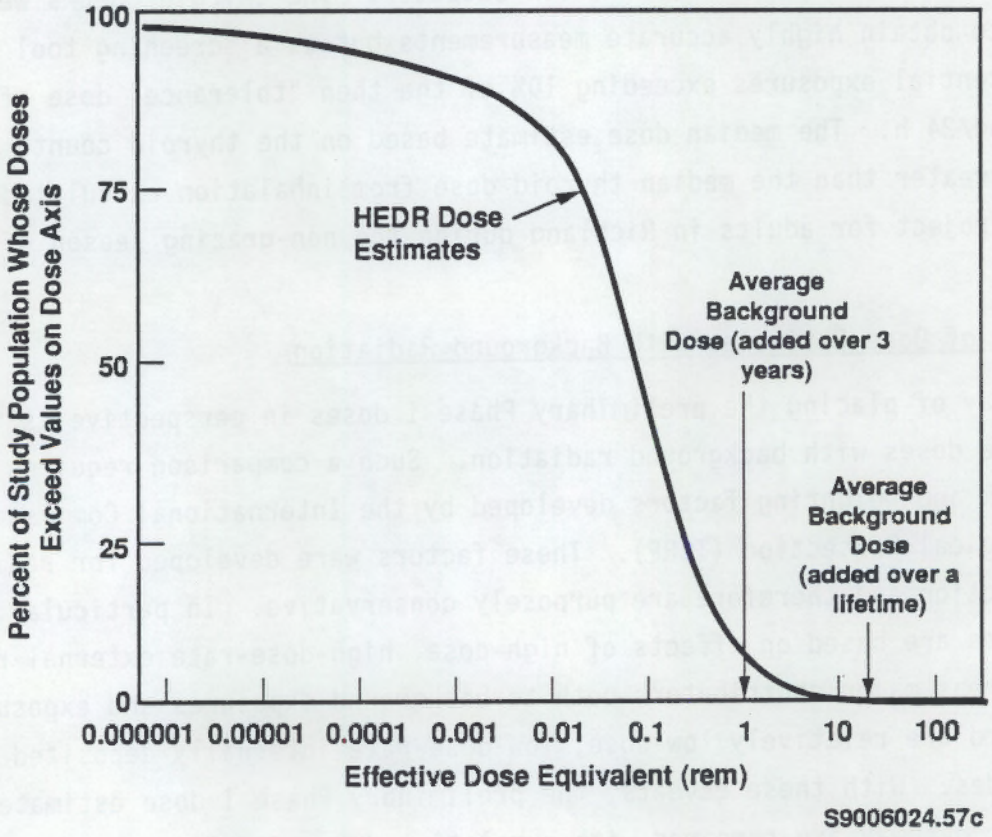


FIGURE 7. HEDR Preliminary Dose Estimates (milk exposure pathway) Compared with Background Radiation

Future dose estimates will change as efforts are made to reduce uncertainties in key variables and as the model structure is modified. These changes will include reductions in uncertainty and changes in mean and median values. Of the contributors to uncertainty/variability in dose estimates that were listed above, reductions in uncertainty in the atmospheric transport/deposition parameters and submodels are the most likely to result in the greatest reductions in uncertainties in the dose estimates.

In future HEDR work, doses will be estimated for an expanded time, a larger geographic area, a greater number of radionuclides, and additional pathways. In the interim, it is likely that iodine-131 releases accounted for more than 80% of cumulative doses to individuals in downwind areas from the atmospheric pathway from 1944 to the present. This is because most of the iodine-131 released from the Hanford Site from 1944 to the present was released during 1944-1947 and because iodine-131 accounted for more than 90% of the doses during 1944-1947.

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## FIGURES

## TABLES

# 1.0 INTRODUCTION

## 1.1 PROJECT OBJECTIVES

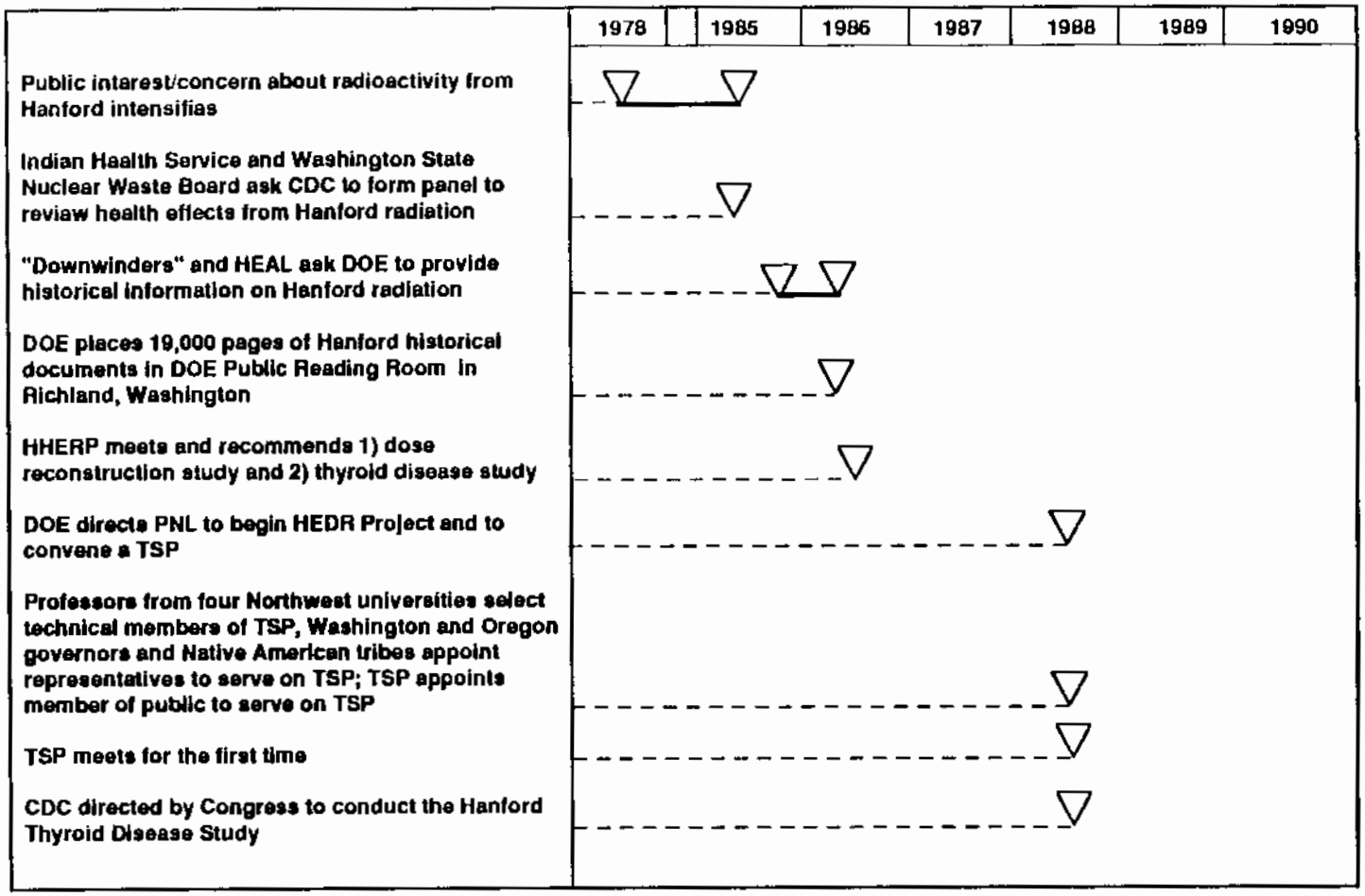
The primary objective of the HEDR Project is to estimate the radiation doses that people could have received from nuclear operations at the Hanford Site. The secondary objective is to make project records available to the public. Copies of project records are maintained in the Department of Energy - Richland Operations (DOE-RL) Public Reading Room in the Federal Building, Richland, Washington.

## 1.2 PROJECT HISTORY

The HEDR Project was prompted by mounting concern about possible health effects to the public resulting from more than 40 years of nuclear operations at the Hanford Site (Figure 1.1). In 1986, the Hanford Health Effects Review Panel--convened by the Centers for Disease Control at the request of the Washington State Nuclear Waste Board and the Indian Health Service--recommended as a top priority that potential doses from radioactive releases at the Hanford Site be reconstructed. The Panel also recommended that a thyroid disease study be initiated.

Representatives from the states of Washington and Oregon, from three regional Native American tribes, and from the U.S. DOE agreed that a dose reconstruction study should be funded by the DOE, be conducted by Battelle staff at the Pacific Northwest Laboratory, and be directed by an independent panel of scientists and state and Native American representatives. A TSP was deemed necessary to provide credible, independent scientific direction and to provide a forum for participation by the states, Native American tribes, and the public.

Representatives from four Northwest universities selected the technical members of the independent TSP, which directs the dose reconstruction work. The TSP includes members with technical expertise in environmental pathways, epidemiology, surface-water transport, ground-water transport, statistics, demography, agriculture, meteorology, nuclear engineering, radiation dosimetry, and cultural anthropology. The TSP also includes individuals




CDC = Centers for Disease Control
DOE = U.S. Department of Energy, Richland Operations
HEAL = Hanford Education Action League
HHERP = Hanford Health Effects Review Panel
PNL = Pacific Northwest Laboratory
TSP = Technical Steering Panel
HEDR = Hanford Environmental Dose Reconstruction (Project)

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FIGURE 1.1. Timeline of Events Leading to Establishment of HEDR Project

representing the states of Washington and Oregon, cultural and technical experts nominated by the Native American tribes in the region, and an individual representing the public. The TSP reviews, evaluates, and approves all technical decisions and reports.

A separate thyroid-disease study is being conducted in the Hanford area by the Fred Hutchinson Cancer Research Center for the Centers for Disease Control.

## 1.3 HANFORD SITE

The Hanford Site in southeastern Washington State (Figure 1.2) was selected in 1943 as the location for the facilities used to produce plutonium for atomic bombs used in World War II. The fuel cycle is illustrated in Figure 1.3. Of the three primary processes, fuel fabrication, irradiation, and separation, separation resulted in the greatest releases of radionuclides to the atmosphere. The separation process is the focus of the Air Pathway Report.

The first three nuclear reactors--B, D, and F--began operating in 1944 and 1945. Chemical separation plants T and B were started up in December 1944 and April 1945, respectively. After World War II ended in 1945, the reactors continued to irradiate uranium fuel and to produce plutonium. From 1949 through 1963, six new reactors--H, DR, C, KW, KE, and N--and four new separations plants--C, REDOX, U, and PUREX--began operating.

From 1964-1988, as the government needed less plutonium, it eventually closed all of its production reactors and separations plants, except the PUREX Plant. The PUREX Plant, which was shut down from 1972 to 1984, continues to be available to process plutonium from a backlog of irradiated fuel.

## 1.4 MONITORING OF RADIOACTIVE MATERIALS FROM HANFORD

The release of radioactive materials from Hanford was controlled through several steps (Figure 1.4). Operations were adjusted to meet guidelines of the time. Several types of guidelines were used (personnel exposure, environmental concentrations, emissions). Processes were controlled by adjusting

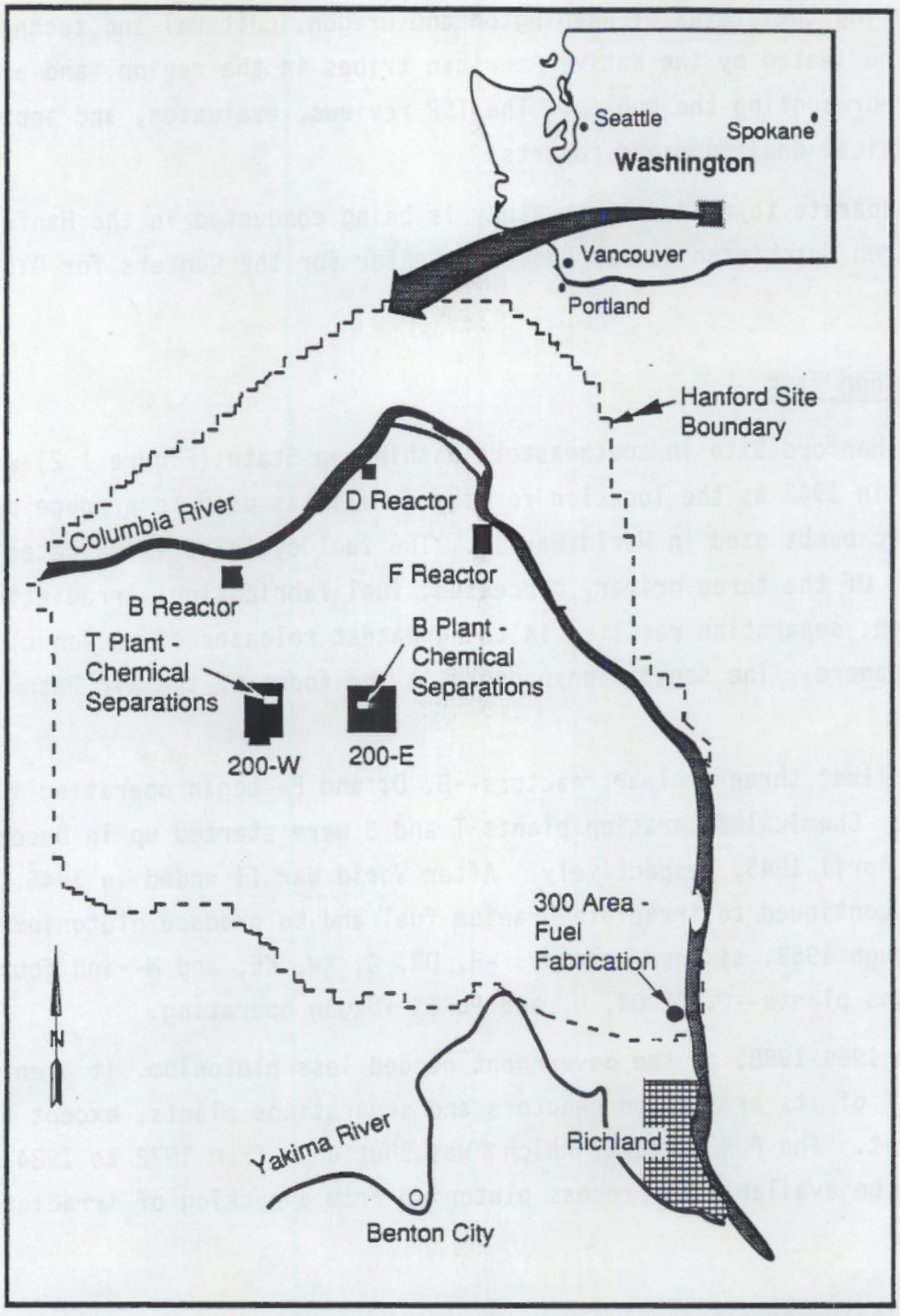



FIGURE 1.2. Hanford Site and Key Operating Facilities, 1944-1947

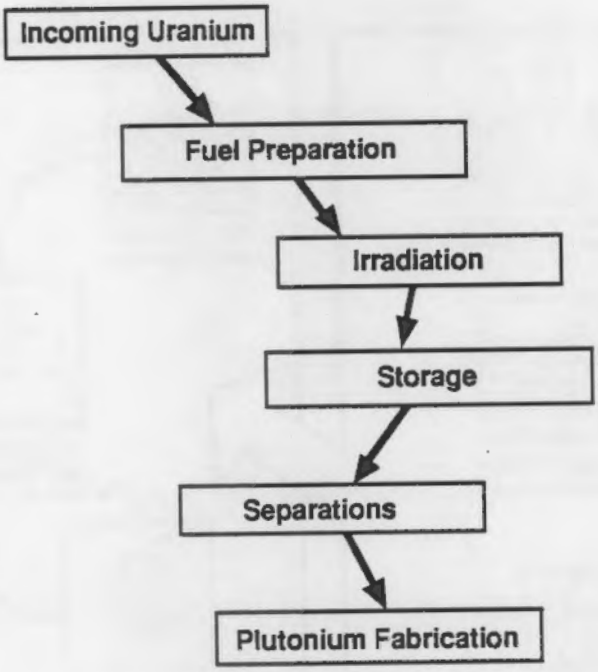



FIGURE 1.3. Nuclear Fuel Cycle

cooling times and process rates and by timing process operations to coincide with favorable weather conditions for diluting and dispersing releases to the atmosphere.

Each of these measures and its relative importance in controlling emissions changed as experience was gained in control and monitoring technology and as knowledge was developed about the potential for health effects from radiation exposure. Processes were adjusted and timed to result in releases that were considered safe (Gosline 1945). During early years of operation, releases and their potentials for exposing workers were compared with guidelines adopted from the medical community by Hanford health physicists (Wilson 1987, Parker 1980). Regulatory standards were not adopted until the 1950s.

Effluent monitoring, which began with the startup of Hanford facilities in 1944, consisted of measuring the amounts of radioactive materials vented to the atmosphere and released to soils and to the Columbia River. Measurements of materials released to the river were reliable from startup, but efforts to develop the technology to accurately measure atmospheric releases

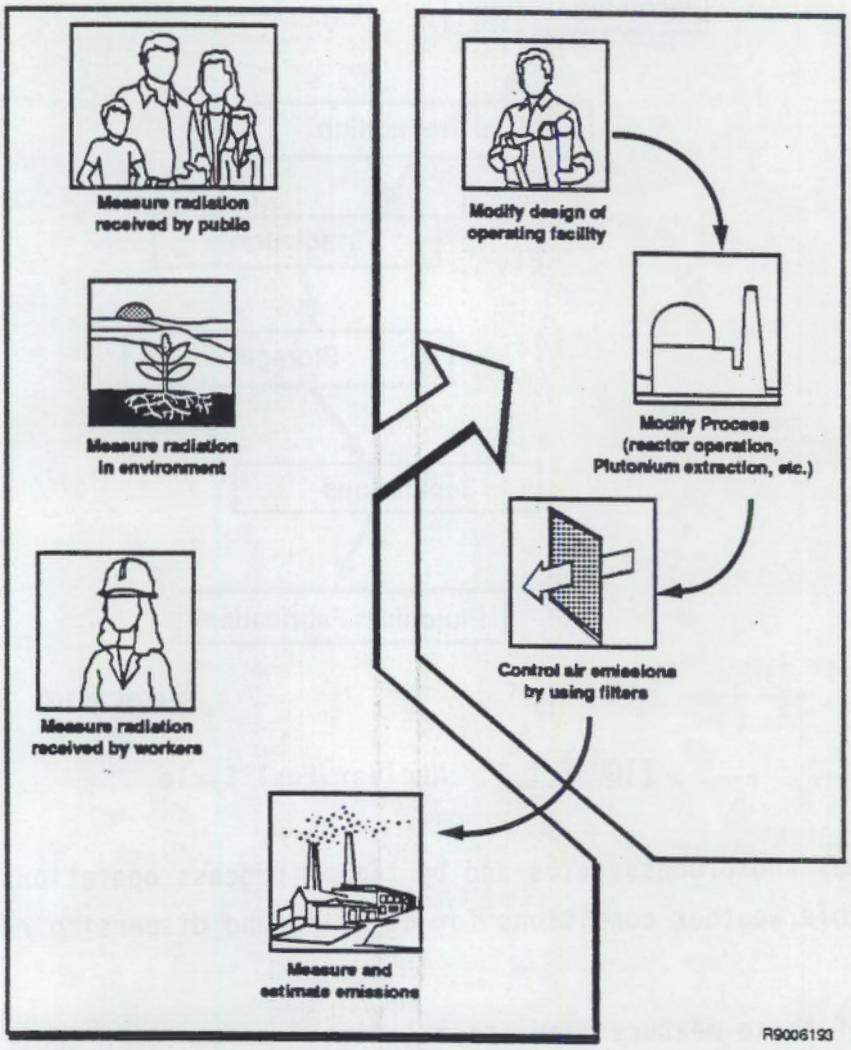



FIGURE 1.4. Methods Used to Control Releases from Hanford Site Facilities

continued for several years before measurements became reliable. In the interim, atmospheric releases were estimated from process information and from estimated filter efficiencies (effluent filters were installed beginning in 1948) (Ballinger and Hall 1989).

Meteorological measurements and observations of plume behavior began in 1943, in efforts to predict concentrations of atmospheric releases of radioactive materials. It was determined early that releases should be confined

to meteorological conditions that would limit the possibility of worker exposures and that would result in maximum dilution by the atmosphere (Gosline 1945).

Environmental monitoring was expanded to include measurements of radioactivity in the air, on the ground, on vegetation, in food and wildlife, and in Columbia River water, drinking water, ground water, sediment, fish, and other aquatic life. Not until the mid-1950s, however, did researchers discover the possibility of milk as an important pathway for radioactive iodine (Parker 1956; Comar et al. 1957). Consequently, milk, the major pathway for iodine-131 exposure, a pathway that resulted in exposures of from 10 to more than 100 times as high as the inhalation pathway, was not monitored during the period of highest releases of iodine-131, 1945-1947.

Monitoring of personnel for radiation exposure started when Hanford employees first began working at the site (Wilson 1987). In addition to measuring external exposure by using pencil dosimeters, hand and foot counters, and scans of clothing and extremities with Geiger counters, a bioassay program and limited scans of the thyroid glands of specific workers were also begun. The thyroid measurements provide an important check on exposures of offsite populations estimated by the HEDR Project, as described more fully by Ikenberry (1990).

Potential radiation doses to offsite populations were reported for the first time in 1957. Estimates of these doses have been included in annual environmental monitoring reports ever since. As technology has improved, dose-calculation methods have evolved and improved. Through 1973, dose estimates were based on measurements of radionuclides in the environment and in foods. By 1974, concentrations of radionuclides in the environment had decreased to the point where dose estimates had to be based on modeling from measured or estimated releases. The decreases in environmental concentrations of radionuclides originating from Hanford resulted from improved control technology, the closing of the original reactors, and the closing of major chemical processing facilities.

# 2.0 METHODS

This section describes the conceptual and computational approaches used during Phase I to reconstruct potential radiation doses to offsite populations from atmospheric releases. Detailed descriptions of all aspects of the HEDR Project are available in the more than 20 supporting documents listed in Appendix A. Table 2.1 lists those HEDR reports that contain information about models and parameters used in Phase I. The approach is discussed in Appendix B.

## 2.1 PHASE I AREA, TIME PERIODS, AND RADIONUCLIDES

The HEDR project consists of four distinct phases (Figure 2.1). The first phase, a pilot or demonstration phase, was purposely limited in geographic coverage, time, radionuclides, and pathways. This limited scope influenced the selection of models and parameters and resulted in forms and ranges of distributions, some of which could have overestimated upper and lower values.

Phase II is designated a review and testing phase, during which sensitivity analyses will be used to identify the influences of key parameters, model structure, and dose estimates. Phases III and IV will be used to refine parameters, modify models, expand areas, extend time periods, and ensure that all key emissions of radioactive materials from Hanford will have been addressed.

### 2.1.1 Area

The Phase I study area for the air pathway covers the 10 counties nearest to the Hanford Site (Figure 2.2). This area was selected because it includes populations likely to have received a broad range of exposures, including the highest; because it includes a largely self-contained milk production/consumption area; and because atmospheric models applicable to a domain that encompassed the 10-county area were readily available.

TABLE 2.1. Applicable HEDR Reports - Air Exposure Pathway

| Topic | Title | Author, Date |
|---|---|---|
| Demography, Food Consumption, Lifestyle | Demographic, Agricultural, Food Consumption, and Lifestyle Research for the Hanford Environmental Dose Reconstruction Project, PNL-6834 HEDR | Beck, DM, et al., 1989 |
| | Population Estimates for Phase I, PNL-7263 HEDR | Beck, DM, 1990 |
| | Estimates of Food Consumption, PNL-7260 HEDR | Callaway, M, 1990 |
| Facility Operations | A History of Major Hanford Operations Involving Radioactive Material, PNL-6964 HEDR | Ballinger, MY, and Hall, RA, 1989 |
| Thyroid Measurements | Evaluation of Thyroid Radioactivity Measurement Data From Hanford Workers, 1944-1946, PNL-7254 HEDR | Ikenberry, T, 1990 |
| Atmospheric Transport | Atmospheric Transport and Dispersion Modeling for the Hanford Environmental Dose Reconstruction Project, PNL-7198 HEDR | Ramsdell, JV, 1989 |
| | Atmospheric Transport Modeling and Input Data for Phase I of the Hanford Environmental Dose Reconstruction Project, PNL-7199 HEDR | Ramsdell, JV, and Burk, KW, 1989 |
| | MESOILT2, A Lagrangian Trajectory Climatological Dispersion Model, PNL-7340 HEDR | Ramsdell, JV, 1990 |
| Source Term | Radionuclide Sources and Radioactive Decay Figures Pertinent to the HEDR Project, PNL-7177 HEDR | Heeb, CM, 1989 |

TABLE 2.1. (contd)

| Topic | Title | Author/Date |
|---|---|---|
| Source Term (contd) | Uncertainties in Source Term Calculations Generated by the ORIGEN2 Computer Code for Hanford Production Reactors, PNL-7223 HEDR | Heeb, CM, 1989 |
| | Selection of Dominant Radionuclides for Phase I of the HEDR Project, PNL-7231 HEDR | Napier, BA, 1990 |
| | Fission-Product Iodine During Early Hanford-Site Operations: Its Production and Behavior During Fuel Processing, Off-Gas Treatment, and Release to the Atmosphere, PNL-7210 HEDR | Burger, LL, 1989 |
| | I-131 in Irradiated Fuel at Time of Processing From December 1944 Through December 1947, PNL-7253 HEDR | Morgan, LG, 1990 |
| Milk Production and Distribution | Milk Cow Feed Intake and Milk Production and Distribution Estimates for Phase I, PNL-7227 HEDR | Beck, DM, 1989 |
| | Summary of Workshop on Milk Production and Distribution, November 30, 1988 - HEDR Project, PNL-6975 HEDR | Beck, DM, et al., 1989 |
| Vegetation Concentrations | Preliminary Summaries for Vegetation, River and Drinking Water and Fish Radionuclide Concentration Data (DRAFT), PNL-SA-17641 HEDR | Woodruff, RK, 1989 |

**PHASE I**

Model Development & Testing

- Select limited scope: geographical area, time period, radionuclides, populations
- Find, evaluate, and summarize historical data
- Develop conceptual & mathematical models and incorporate uncertainty
- Apply models/data to limited scope to test the model

**PHASE II**

Sensitivity/Uncertainty Analysis

- Evaluate Phase I model results
- Identify key parameters for dose calculation via sensitivity analyses
- Determine feasibility/value of reducing uncertainty in parameters
- Propose to expand scope (geographic area, time period, populations) in context of established dose threshold
- Recommend action to reduce uncertainties and recommend changes in conceptual/math models

**PHASE III**

Expansion and Refining

- Expand scope as warranted by Phase II work
- Reduce uncertainty in key parameters per Phase II recommendations
- Modify models per Phase II recommendations

**PHASE IV**

Dose Calculation

- Calculate final estimated doses

FIGURE 2.1. The HEDR Phased Approach

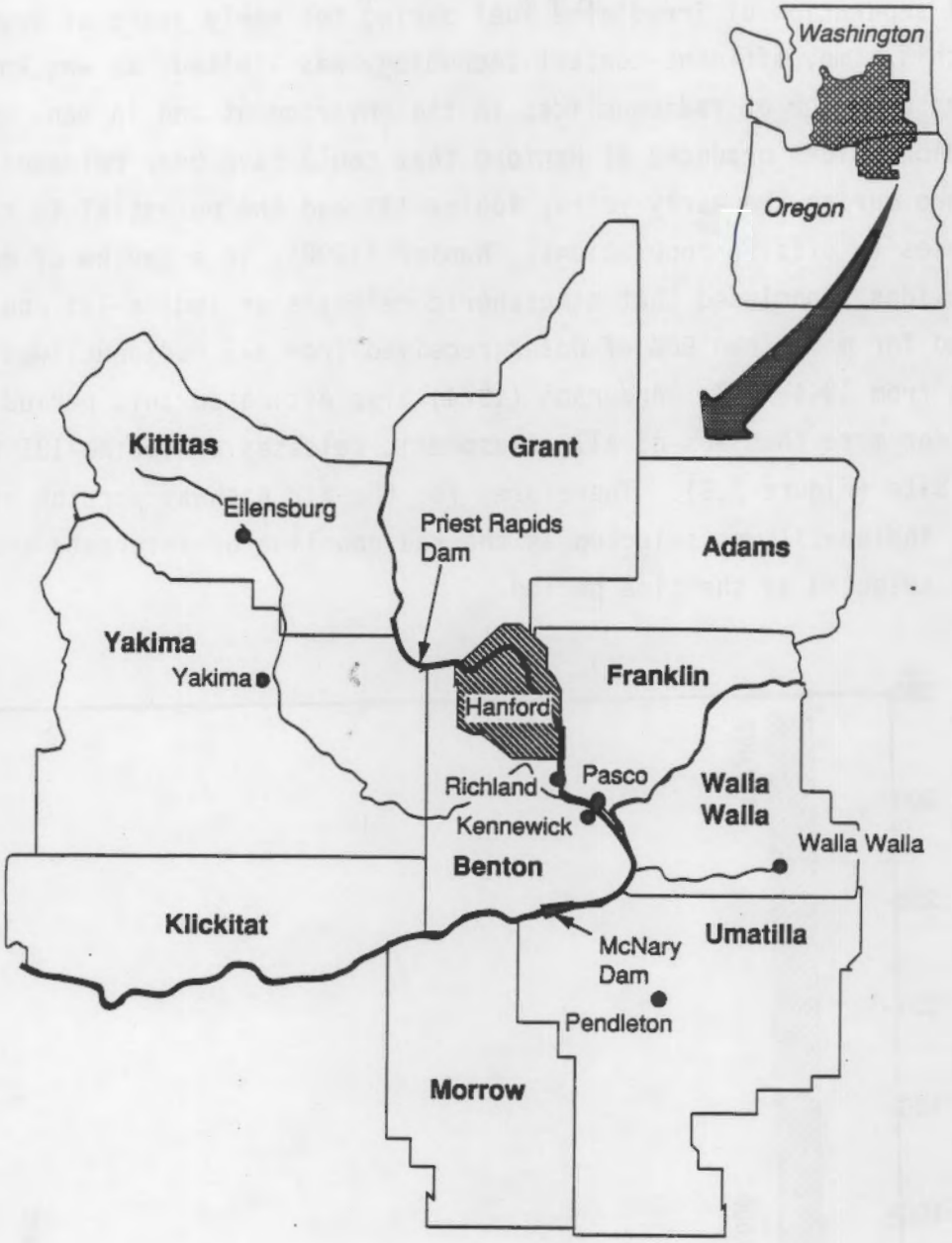



FIGURE 2.2. Phase I Study Area

### 2.1.2 Radionuclides and Time Periods

The largest atmospheric releases of radionuclides that could have resulted in significant doses to offsite populations originated from the

chemical separation of irradiated fuel during the early years of operation. During this time, effluent-control technology was limited, as was knowledge about the behavior of radionuclides in the environment and in man. Of the many radionuclides produced at Hanford that could have been released to the atmosphere during the early years, iodine-131 had the potential to result in large doses to offsite populations. Napier (1990), in a review of dominant radionuclides, concluded that atmospheric releases of iodine-131 could have accounted for more than 90% of doses received from all radionuclides and pathways from 1944-1947. Anderson (1974) also estimated this period to account for more than 90% of all atmospheric releases of iodine-131 from the Hanford Site (Figure 2.3). Therefore, for the air pathway portion of Phase I, iodine-131 was selected as the radionuclide of interest, and 1944-1947 was selected as the time period.

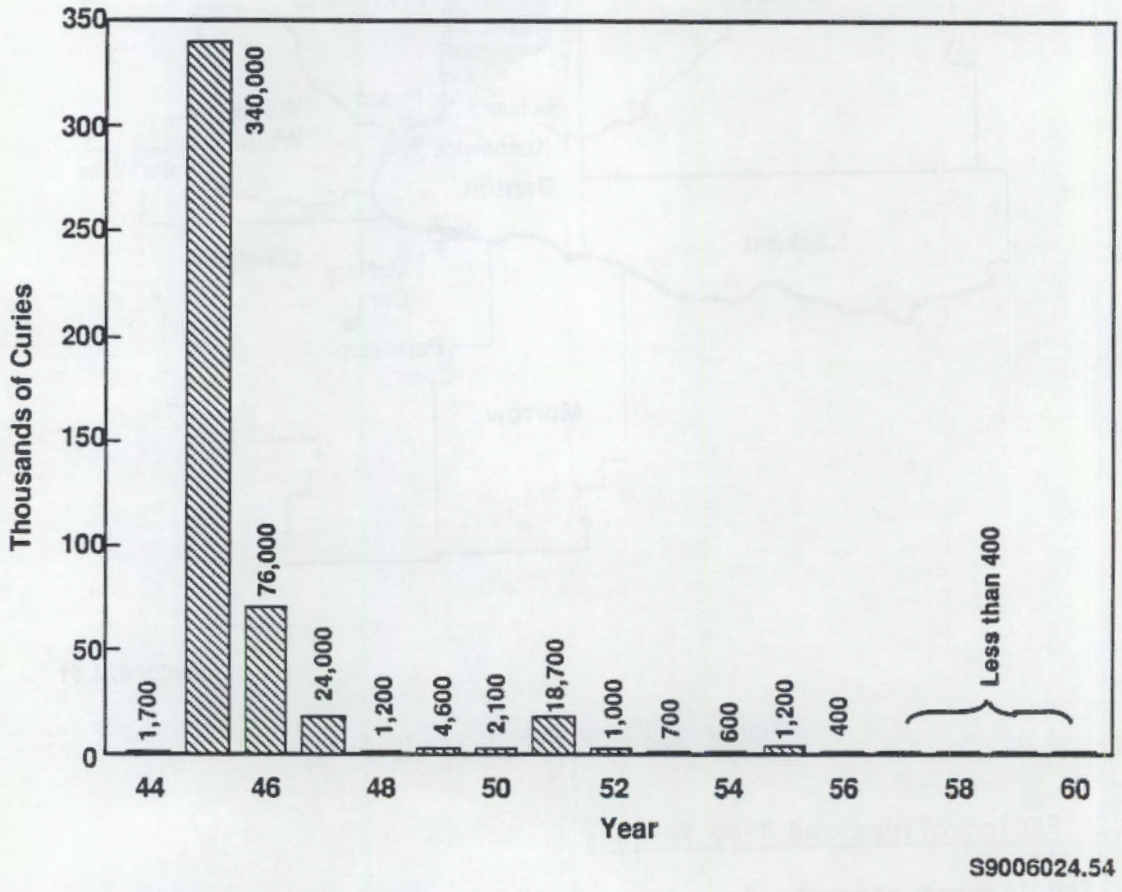



FIGURE 2.3. Estimated Releases of Iodine-131 from Separations Plants

## 2.2 EXPLICIT INCORPORATION OF UNCERTAINTY

An integral part of the dose-estimation process used in the project is assessing the uncertainties in those estimates using uncertainty and sensitivity analyses. Uncertainty and sensitivity analyses are needed because an individual's dose from exposure to radionuclides cannot be reconstructed with complete certainty. Uncertainty analyses are conducted to estimate lower and upper limits that are likely to include the true dose the person received. Moreover, a distribution of dose estimates is obtained to assess the likelihood of a person having received a dose anywhere within the upper and lower limits. The sensitivity portion of the analysis is conducted to identify those model parameters that most influence the estimates of dose and their uncertainties. Identifying important parameters helps to focus future work aimed at reducing dose uncertainties.

## 2.3 CONCEPTUAL AND COMPUTATIONAL APPROACHES

A simplified project conceptual-logic diagram for calculating doses from atmospheric releases is shown in Figure 2.4. Generic pathways are submersion in contaminated air, inhalation of contaminated air, exposure to surfaces contaminated from atmospheric deposition, consumption of contaminated food crops, and consumption of contaminated animal products. Animal products complicate calculations, because the feed consumed by the animal may come from areas distant from the animal's location, and in the case of milk, the product may be shipped to processing and accumulation centers and then redistributed. The process of identifying parameters that describe each of the terms in the equation is described below.

Although the modular construction used for the dose code in Phase I has several advantages, it has the disadvantage that correlations are lost, and are not used in subsequent calculations. The effects of this loss of correlation information on Phase I dose estimates is being evaluated by coding a reduced version of the Phase I dose model. This reduced code conducts a nonmodular Monte Carlo estimation of doses such that correlation information is not lost.

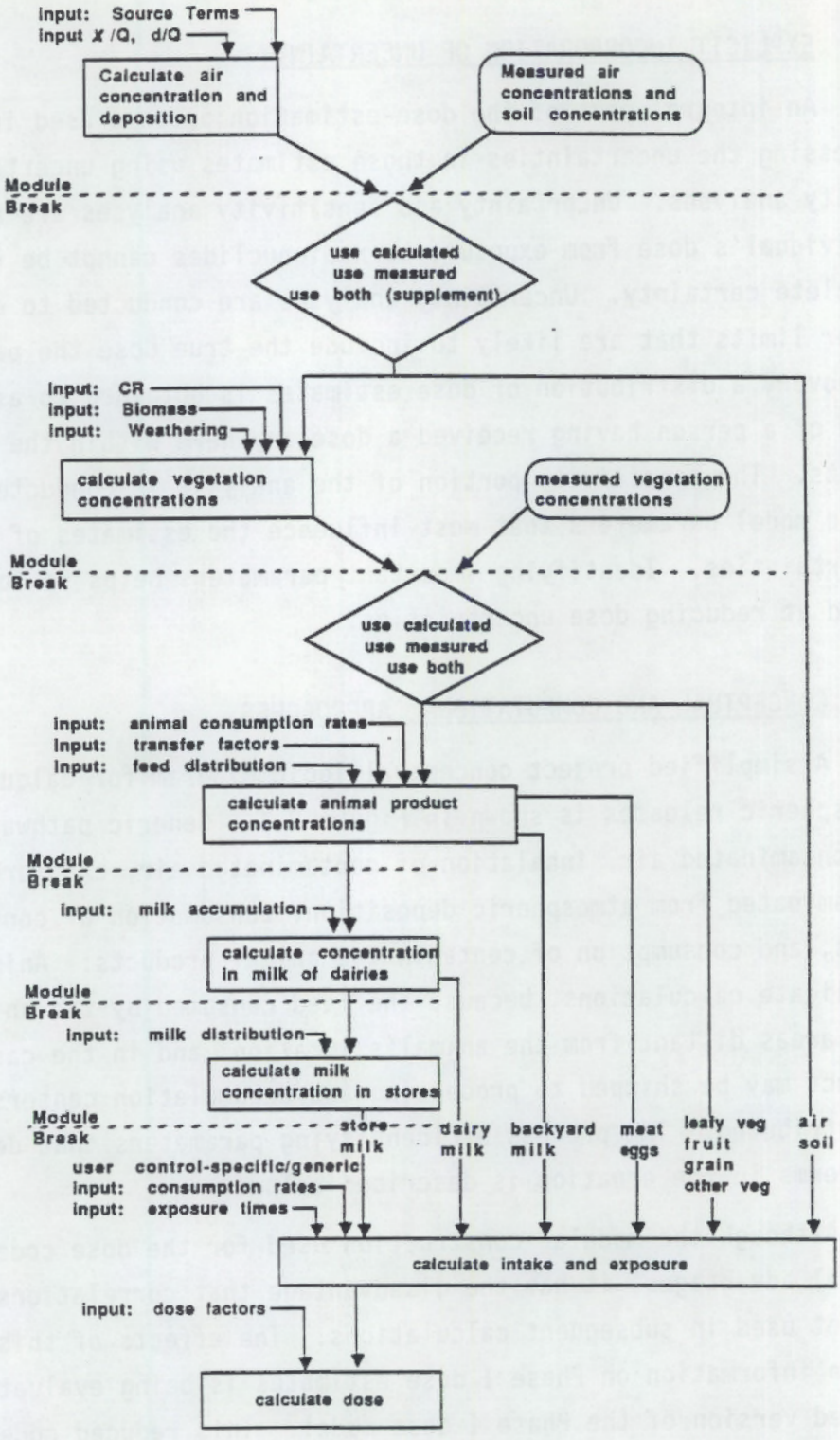



FIGURE 2.4. Conceptual-Logic Diagram for Calculating Doses from Atmospheric Releases

The reduced code was used to obtain dose estimates for a county subdivision where relatively high doses from milk consumption were expected. A major concern with loss of correlation information is in calculating the total dose from the different pathways. Because the Phase I doses are reported in terms of individual pathways instead of the total dose, the bias in doses resulting from loss of correlation information is insignificant. Additionally, the project so far shows that even when combining the doses from the different pathways into a total dose, the loss of correlation information does not appear to significantly affect calculated doses. The modular approach will be evaluated further for iodine-131 and other radionuclides, and the dose code will be modified to eliminate any loss of correlation information that is found to significantly affect estimates of dose.

The computer code for estimating doses obtains a dose distribution for each of the 36 months in the 1945-1947 Phase I period for each type of reference individual. For each reference individual, these monthly distributions were converted to a dose distribution for each of the 3 years and for the 3 years combined by randomly selecting a dose from each month's dose distribution and adding these 12 dose estimates together to get the dose for 1 year. This random selection and addition process was repeated 1000 times to generate the dose distribution for the 12-month period. The same procedure was used to obtain the total (3-year) dose.

### 2.3.1 Scale for Spatial and Temporal Resolution

This section discusses how the scales for spatial and temporal resolutions were selected for the dose reconstruction model.

#### 2.3.1.1 Spatial Resolution

A project similar to HEDR, the Off-Site Radiation Exposure Review Project (ORERP), is reconstructing doses from releases of radionuclides from the DOE's Nevada Test Site, using county-level grids, with specific locations sometimes superimposed (Dose Assessment Advisory Group, Final Report, 1987). For releases from the Hanford facilities, it was quickly determined that the county grid would be too coarse, because atmospheric concentrations and deposition could be shown to vary significantly within individual counties. A

simple rectilinear grid was found to be too inflexible, because no grid could be devised that did not have undesirable features such as the splitting of major population centers.

Demographic data are available mostly from the U.S. Census, and census divisions were found to be essentially unchanged over most of the potential study period, from initiation of Hanford operations in 1944 to the present. The census divisions were originally developed by the Census Bureau to create stable enumeration districts. Consideration was given in their development to trade and service areas, principal settlements, and major land uses and physiographic differences. The census divisions also tend to follow political boundaries such as township and range lines, which in much of the potential study area also tend to follow a fairly regular grid pattern. Each of these characteristics is favorable for use by the project. Therefore, the county division was selected as the basic unit of spatial area, with some minor modifications (usually combinations of very small adjacent divisions, although division of large areas into smaller ones also was done). The initial divisions selected for study are shown in Figure 2.5.

#### 2.3.1.2 Temporal Resolution

Meteorological data used to describe the atmospheric transport of released radionuclides are available in hourly intervals for much of Hanford's history. Census data on locations and numbers of exposed individuals are available for every decade. Reference dietary data are available on a seasonal basis, at best. Furthermore, it seems unreasonable to expect most people to remember habits and activities from up to 45 years ago on anything better than a seasonal or monthly basis. For some periods, data on releases from the Hanford Site facilities and on monitoring of environmental contamination resulting from those releases are available only from archived monthly reports. From these considerations, the unit of months was selected as the project temporal resolution for Phase I.

### 2.3.2 Calculating and Compiling Source-Term Data

For the atmospheric releases in the 1940s, the project focused attention on releases from the two major sources: the B-Plant and T-Plant chemical-separations facilities that were used to dissolve the irradiated fuel and

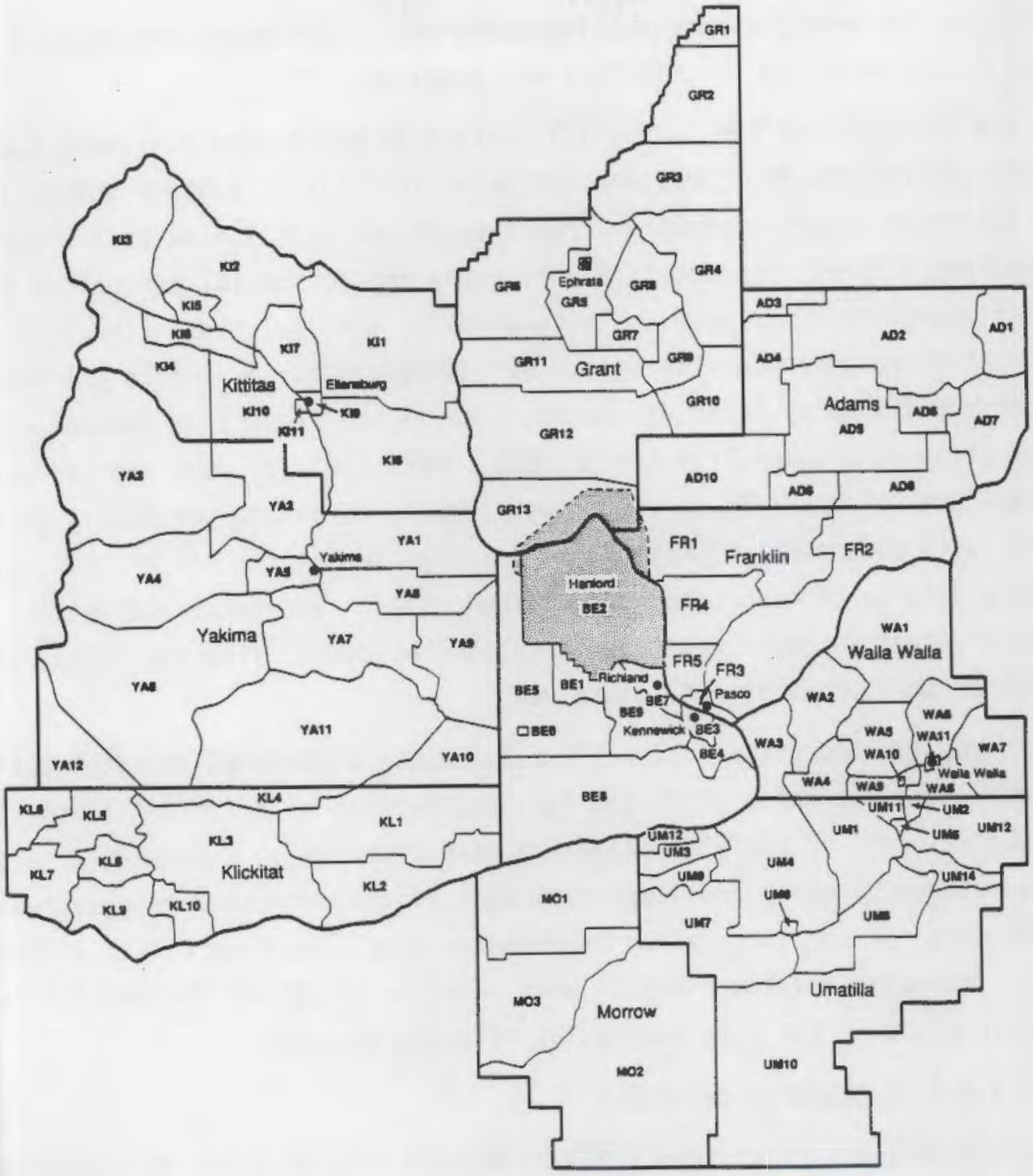



FIGURE 2.5. County Census Divisions in HEDR Phase I Study Area

extract the desired plutonium product (Figure 1.2). Specific process operations, emission controls, and waste-management practices were identified, and estimates of releases were prepared. These estimates were based on available emission-monitoring data and knowledge of probable operating conditions. In the early years of Hanford Site operations, technology did not permit

monitoring for specific radionuclide emissions. Therefore, for Phase I calculations, modeling of emissions was required.

The estimates of the iodine-131 content of discharged fuel were based on records and reports that provided the basic irradiation history and cooling time intervals between discharge from reactor and dissolution of the fuel at B-Plant and T-Plant. An equation that gives the iodine-131 content at the time of dissolution was used. The equation is a rigorous solution to the differential equation describing the buildup and decay of iodine-131 in the reactor and its decay after discharge. The values of nuclear parameters in the equation were taken from the ORIGEN2 (Croff 1980a,b) code and associated nuclear-data library. These values were chosen to assure continuity of data sources with subsequent HEDR Project activity, which will use ORIGEN2 to estimate amounts of other dominant radionuclides. The total iodine-131 inventory at dissolution was then calculated by multiplying the iodine-131 content by the amount of fuel dissolved.

Source-term data for iodine-131 releases were prepared as total activity per month released using estimates for the fraction of dissolved iodine-131 that was released to the atmosphere (release fraction). A triangular distribution bounded by upper and lower estimates of the potential releases was used to describe the uncertainty in releases resulting from a lack of knowledge. The upper and lower bounds were based on limits of the control technology in place at the time iodine-131 releases occurred.

#### 2.3.2.1 Meteorological Model

Concentrations of radionuclides of Hanford origin in air and subsequent deposition rates onto vegetation and the ground can conceptually be determined either from monitored values or from calculations. For the period of interest in Phase I, reliable monitoring data are limited to areas on and immediately adjacent to the Hanford Site and are not available for most of the grazing season of the period of highest releases, 1945. It was necessary, therefore, to develop a modeling capacity. The model selection process is described in Ramsdell (1989).

An interim atmospheric transport and dispersion model was developed for Phase I by modifying an existing version of the MESOI code (Ramsdell, Athey,

and Glantz 1983). The HEDR-modified version, called MESOILT2 (Ramsdell 1990), simulates the transport and diffusion of continuous plumes by dividing the plume into discrete increments, referred to as "puffs." The code generates puffs every 15 minutes at the source; the puffs are transported by historical wind fields until they leave the model domain. As the puffs move, they expand (i.e., diffuse) in response to turbulence, and airborne material is deposited as it comes in contact with the ground surface or is washed out by precipitation. The code also simulates radioactive decay. The winds and atmospheric stability data used by the model are updated each hour. Additional details concerning the structure of MESOILT2 are given in Appendix A. The code has been fully documented in Ramsdell (1990).

A square model domain--240 km on a side centered at 46° 37′ 30" N latitude, 119° 00′ W longitude--was selected for atmospheric transport modeling in Phase I (Figure 2.6). Physically, the domain extends from the Cascade Mountains east to approximately the Washington-Idaho border and from Spokane south to just beyond Pendleton. Factors considered in selecting the model domain for Phase I included prevailing weather patterns, topography, and the limitations of the interim atmospheric-transport modeling approach.

MESOILT2 was used to compute monthly average radionuclide concentrations in the atmosphere, monthly average rates of radionuclide deposition, and month-end surface contamination. These estimates were made at nodes within the model domain for a constant monthly release of iodine-131 from a stack between the 200-W and 200-E Areas (Figure 1.2).

Atmospheric transport calculations were based on meteorological conditions for January 1983 through December 1987 because the meteorological data for 1944 through 1947 were not available in time to be used in the Phase I atmospheric-transport calculations. The data available for 1983 to 1987 included wind speeds and directions from more than 20 locations on and adjacent to the Hanford Site and from 12 additional locations in eastern Washington, eastern Oregon, and northern Idaho. Figure 2.6 shows these locations relative to the model domain and the 10-county region.

Meteorological data for 1944-1947 became available after the Phase I atmospheric transport and diffusion calculations were completed. Transport

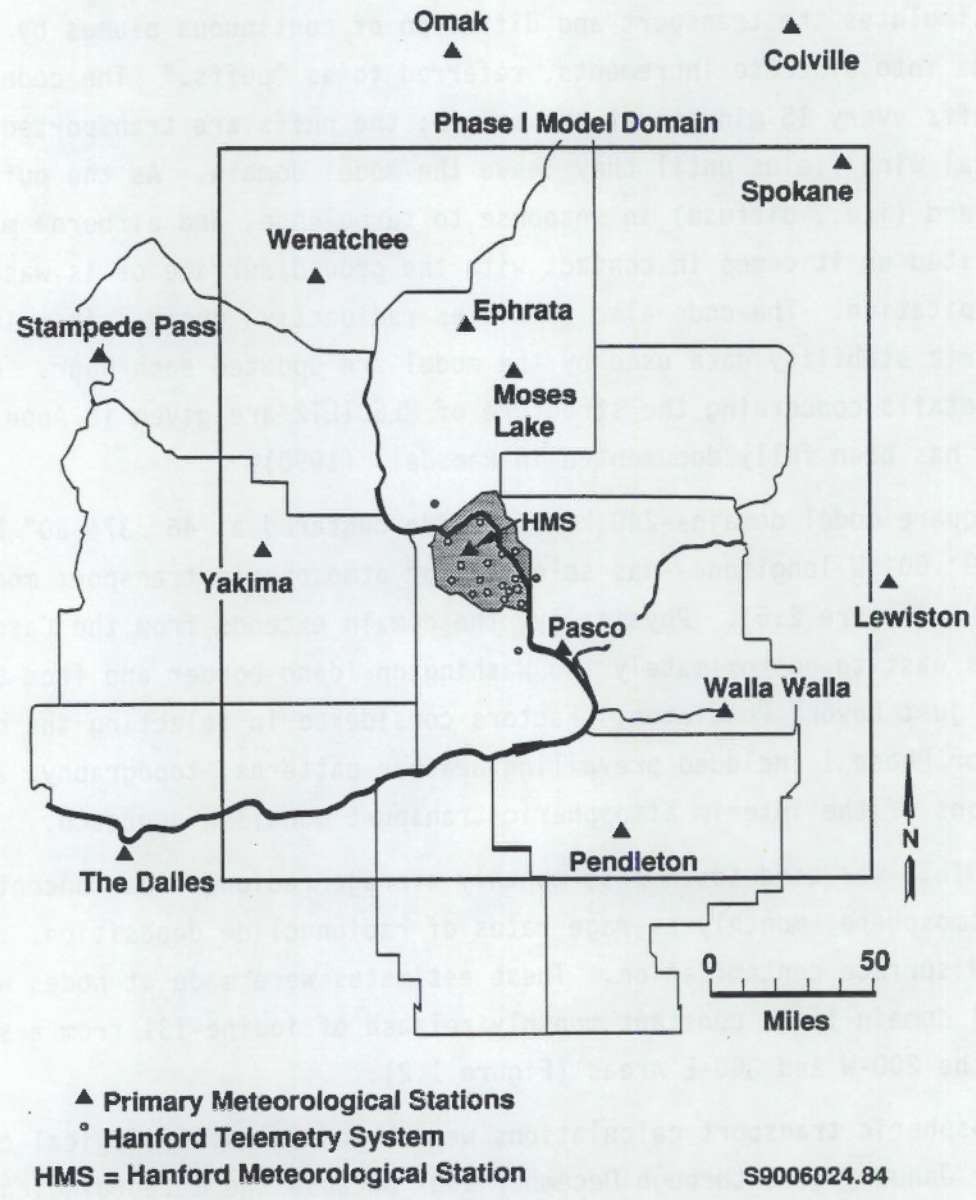



FIGURE 2.6. Model Domain Selected for Atmospheric Modeling

and diffusion were recalculated using these data, as can be seen from Figure 2.7, which compares estimates of concentrations of iodine-131 on sagebrush using both sets of meteorological data. Estimates made with the 1983-1987 meteorological data do not differ greatly from those made with the 1944-1947 data. Thus, it is reasonable to conclude that using the 1983-1987

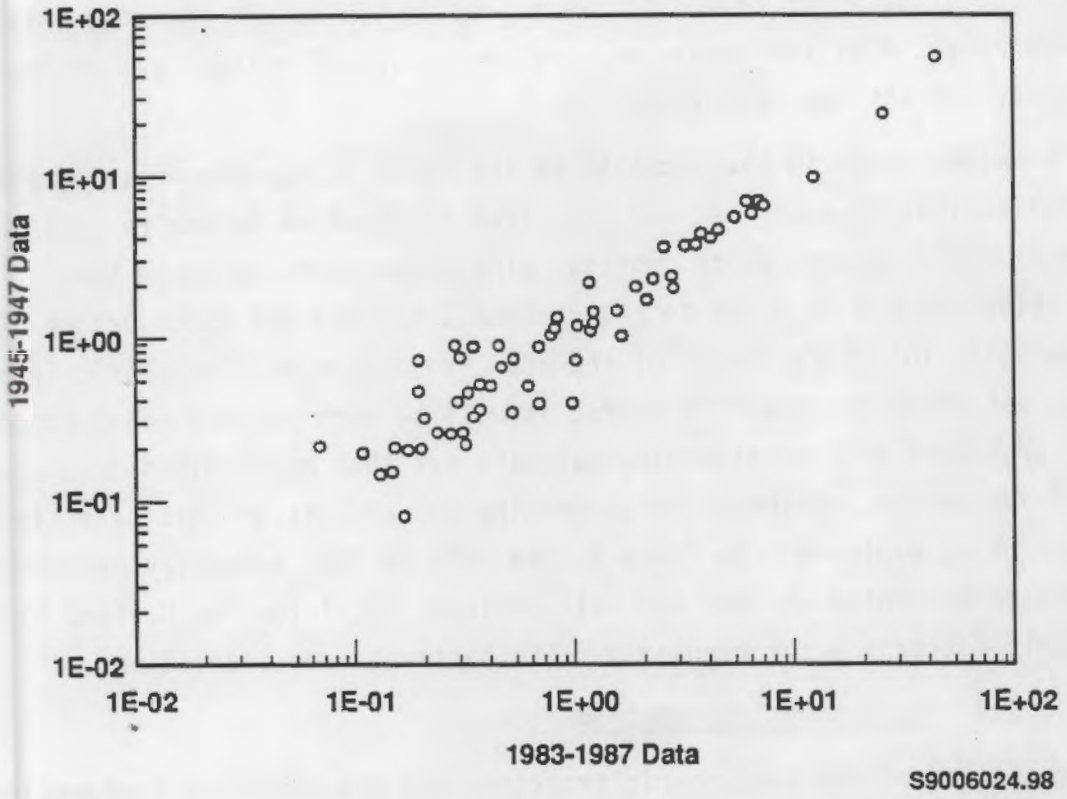



FIGURE 2.7. Calculated Concentrations of Iodine-131 on Sagebrush (μCi/kg) Based on 1944-1947 Meteorological Data Compared With 1983-1987 Meteorological Data (Benton and Franklin county census divisions)

meteorological data in Phase I does not invalidate the results of the calculations or prevent the achievement of Phase I objectives.

When the MESOILT2 computations were complete, a post-processor computer program was used to compute monthly average atmospheric concentrations, deposition rates, and month-end surface contamination for the HEDR census divisions. The post-processor program also computed a measure of the uncertainty of the census division values. The measure of uncertainty is a standard deviation for a log-normal distribution. The standard deviations are based on variations in meteorological conditions from year to year and within the census divisions. They also consider basic uncertainty in the model. Because meteorological data from 1983 to 1987, rather than the actual

meteorological data for 1944-1947, were used in the model, the concentrations for each census division should be considered typical values, rather than estimates, for any specific year.

The wind fields in the vicinity of the Hanford Site are well defined in the 1983 to 1987 data set because data from the Hanford Telemetry System are included. This system, which provides wind measurements at more than 20 locations on and adjacent to the Hanford Site, did not exist before 1979. Consequently, in future phases of the HEDR Project, when atmospheric transport is estimated for specific years, it will be necessary to model atmospheric transport with a meteorological data set that has limited data near the release points. Methods for minimizing the effects of this data limitation are being explored. In Phase I, the 1983 to 1987 telemetry data were examined to determine whether any well-defined, local (on the Hanford Site) wind-field patterns occur regularly. Six patterns were identified.

2.3.2.2 Deposition/Interception

Evaluation of the atmospheric transport and deposition of radionuclides on soil and vegetation is one of the major activities of the HEDR Project. Initial sensitivity studies for the iodine-air-cow-milk pathway indicated that the uncertainty of the deposition and vegetation uptake parameters accounted for much of the uncertainty in the dose estimates.

The flux of radionuclides to the ground and vegetation is proportional to the radionuclide concentration in the air just above the surface, with a constant of proportionality that is called a deposition velocity. Deposition velocities are generally determined experimentally. Sehmel (1980) summarizes the data for iodine-131 obtained prior to the Chernobyl reactor accident. The reported deposition velocities range from less than 0.001 to 0.1 m/s, with a large number of values near 0.01 m/s. Seinfeld (1986) also shows a larger range of deposition velocities for iodine, with a value of 0.01 m/s near the middle of the range. MESOILT2 assumes a constant value of 0.01 m/s for the deposition velocity of iodine-131 (see Section 2.3.2.3, "Vegetation Model," for further discussions).

Radionuclides deposited on the ground and vegetation are no longer available in the atmosphere. MESOILT2 uses source depletion to account for

the effects of deposition on air concentrations. This method maintains a mass balance, but it is not totally realistic from a physical standpoint. The use of a constant deposition velocity can overestimate surface contamination near the source and underestimate that at long distances. Other methods of accounting for deposition will be evaluated in later phases.

Theory, supported by research, indicates that deposition velocities are related to the type of material and its physical properties, wind speed, atmospheric stability, and the nature of the surface (Sehmel 1980, Seinfeld 1986). During Phase II, MESOILT2 will be modified to compute deposition velocities for each puff at each time based on radionuclide properties and atmospheric and surface conditions.

More detail on the evaluation of deposition and interception is found in Appendix B.

2.3.2.3 Vegetation Model

Radionuclide concentrations in vegetation may be obtained either from calculations based on source term, physical transport, and deposition or from environmental measurements. Both approaches are being used in the project's computational scheme.

Crop types considered in the model include those eaten directly by humans and those consumed by animals: leafy vegetables, other vegetables, fruits, and grains for direct consumption, and pasture, silage, hay, and grain for animals.

The original Hanford model for deposition/interception incorporated a "deposition velocity" term with a constant interception fraction (Soldat and Harr 1971). Combined with a feed-to-milk transfer factor, this model provided an accurate prediction of milk concentrations for the Hanford environment. Recent results of the Biospheric Model Validation Study (BIOMOVS), presented at the VII Workshop in Tokyo, Japan, November 7-10, 1988, but not yet published, indicate that this formulation tends to underpredict the concentrations on the grass but to overpredict the transfer from grass to

milk, so that the final answer is in the right range. The observation of underprediction of deposition/interception is observed by Pinder et al. (1989).

The current Hanford model (Napier et al. 1988) uses a variable interception fraction that is a function of vegetation biomass. The interception fraction, based on the model of Chamberlain (1970), generally results in a higher value of interception than the older constant fraction. The Chamberlain model is an empirical fit to a large amount of data, relating both to iodine and particulate radionuclides.

The model for interception fraction is variable as a function of plant biomass and moisture content, which means it is a function of crop type and time of year. This model should explain most of the variability seen in previously published environmental measurements. Monthly values of biomass of each type of crop were developed for use in this model (Appendix C).

Uptake of radionuclides by plants through the roots was addressed through the application of a soil-to-plant concentration ratio. This is a steady-state concept, but it is approximately correct for the month-long accumulation periods used in the remainder of the model.

Weathering of deposited material from vegetation surfaces was estimated with a weathering half-life. This rate constant can vary between about 5 and 18 days. A triangular distribution centered on 14 days, with upper and lower limits of 5 and 18 days, respectively, was used to describe the uncertainty in the correct value.

Monitoring data for the mid-1940s provide a second estimate of the vegetation concentrations resulting from Hanford releases. These data were corrected to account for past errors in estimating iodine-131 concentrations on vegetation.

The corrected, previous vegetation data were then compared with Phase I calculated results.

2.3.2.4 Agricultural Model

The concentration of radionuclides in animal products depends on the concentration in the animals' feed and on how much feed the animal consumes. Four basic types of feed (pasture, silage, hay, and grain) were considered.

Four prototypical feeding regimes are considered for milk cows. The simplest of these is a family cow that is fed grass hay year round, with a minor grain supplement. This regime was used in nonirrigated areas. Another feeding regime used in nonirrigated areas combines locally produced alfalfa hay with a grain supplement. A slightly more complicated feeding pattern is pasture supplemented with both hay and grain. This pattern could fit either a family cow or a small herd of dairy cows. The most complicated regime includes pasture, hay, grain, and silage. The feed may be stored for a period of time before being fed to the cow.

The feeding regimes were developed from information in the Yakima County Dairy Herd Improvement Association publications and from the expert opinions of dairymen, farmers, ranchers, and agricultural extension agents who are familiar with conditions in the dairy industry during 1944-1947 (Beck et al. 1990). The feeding regimes were allocated to the county census divisions based on the availability of irrigation during 1944-1947. The dates used to start and stop the various portions of the feeding regimes are linked to local variations in climate during the Phase I period.

A graphical representation of the most complicated feeding pattern is given as Figure 2.8 (adapted from Ward and Whicker 1987). Because there is considerable uncertainty in the reconstruction of these feeding patterns from over 40 years ago, associated uncertainties are addressed by using high and low estimates in addition to the central estimate. These are incorporated in the model through a triangular distribution of each fraction.

The amount of contaminant transferred from the feed to the animal product depends on the time of year and on the age, health, and state of lactation of the producing animal. The transfer of radionuclides to products also varies naturally for individual animals. These variabilities are addressed

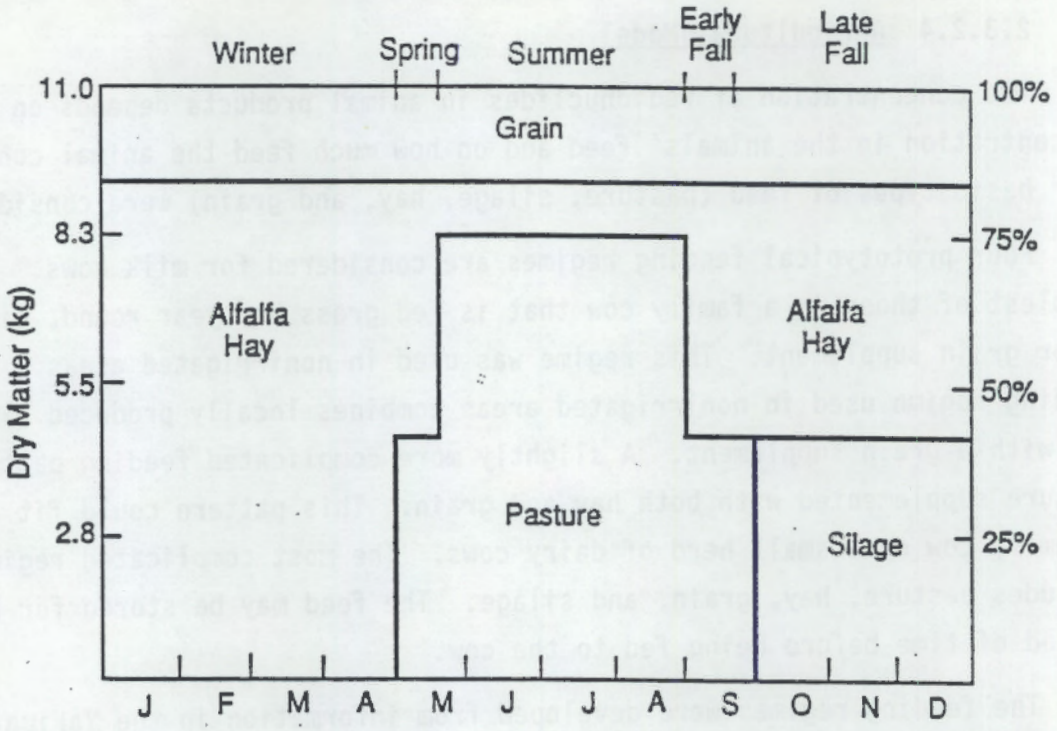



FIGURE 2.8. Most Complicated Feeding Regime (pasture, alfalfa hay, grain, and silage) used in the 10-County HEDR Area, 1944-1947

through the use of a distribution of transfer factors. A matrix of radionuclide- and product-dependent transfer factors from the literature has been established, with the distributions incorporated through associated high and low values (see Appendix B).

Food Product Distribution. Food products such as milk may be consumed directly by members of the producing farm family, or they may be sold. Most products sold were purchased for redistribution by distributors (e.g., milk purchases by creameries). These distributors tend to blend or average their inventory over a number of producers. The average radionuclide concentration of a product (fresh milk, cottage cheese, sour cream, etc.) available from a distributor is calculated via accumulation-fraction arrays, defining the fraction of the product at each distribution center that originated in the HEDR county subdivision by month. These, too, have associated estimates of high and low values to account for uncertainty in the reconstruction of the actual distribution patterns for the times of interest (Beck et al. 1990).

Information on milk production and distribution was gathered from U.S. Census of Agriculture data, Washington State Dairy Products Commission statistics, and interviews with retired dairy-industry employees. This information was used to identify the major milk-producing regions and the names of the commercial dairy producers and processing plants (Figure 2.9). Dairy brand market shares for each HEDR county census division were developed by eliciting information from a dairy-industry expert (Beck et al. 1990).

Some individuals consumed products from grocery stores, which may at times have changed distributors or sold items from competing distributors. Concentrations in these instances are averaged over the possible sources through distribution arrays. These distribution arrays provide the fraction of the product consumed in each county subdivision tract that was provided by each distributor (Beck et al. 1990). Associated uncertainty arrays were also prepared to provide triangular distributions of the probability of the distribution fraction.

2.3.2.5 Biological and Demographic Models

The demographics of each county census subdivision are accounted for by providing estimates for individuals with different ages, sexes, diets, and general lifestyles.

Calculations of radiation doses require information on intake of radionuclides, uptake by the body, distribution and retention of the radionuclides in various organs, and information on the impacts on the various organs of radionuclide decay in other organs. The intake information is being developed as a major portion of the HEDR Project. Uptake, distribution, and retention of radionuclides in the body are functions of the chemical and physical forms of each particular element. For metabolism, data are available for adults, and limited data for other age groups are available.

2.3.2.6 Age Groups

Seven age groups (with the inclusion of fetal thyroid) will eventually be considered. For Phase I, only the adult (20 years and older) and infant (0-1 years) categories were investigated. Each age group will also be subdivided into males and females.

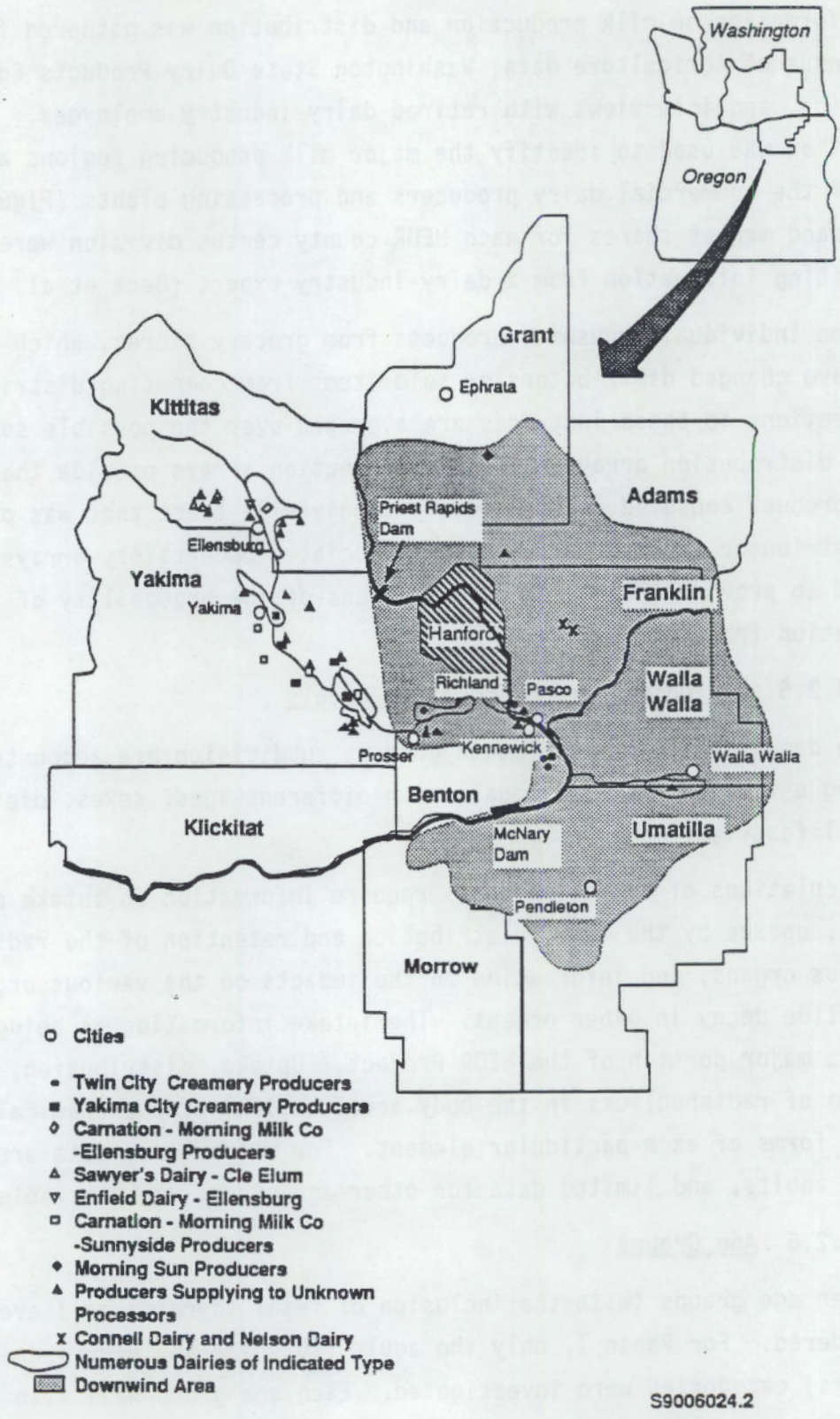



FIGURE 2.9. Milk Producers and Processing Plants Located to Date, 1944-1950

2.3.2.7 Population Groups

County population estimates were developed using the ratio-correlation procedure. County census division population shares and age-group estimates were developed using various census-year interpolation techniques (Beck et al. 1989).

The general population determined for each of the census subdivisions within the Phase I 10-county study area is further subdivided into urban and rural "lifestyle" categories. With the large number of subpopulation categories, and the very limited occupation information available, the data could not support a further breakdown of the population into smaller groups. Data on the food habits of Native Americans in and near the Phase I area are being collected and will be incorporated in later runs of the Phase I model.

2.3.2.8 Food Types

The consumption of contaminated food was a major pathway of exposure for people who lived in the Hanford environs from 1944-1947. A number of different general food types were identified as potentially important. These general categories are the ones typically used in radiological evaluations and are available in the preliminary mathematical models being used for HEDR sensitivity studies and Phase I initial development. Unfortunately, these categories do not correspond very well with the raw dietary survey information available.

The raw data available from U.S. Department of Agriculture dietary surveys tend to list foods under the common names, brand names, or mixture names (e.g., stew), which do not correspond to generic "meat" or "grain" categorizations.

Various ways of categorizing foods were investigated. Some overlap of categories is probably inevitable. Early HEDR sensitivity studies indicate that the primary exposure pathways for the atmospheric releases in the mid-1940s were fresh milk and other fresh milk products and fresh leafy vegetables. Fresh fruits were also important, depending on the quantities consumed. Other farm products such as grains or meats were of lesser

importance. These results imply that most of the dose will be received from eating locally produced fresh produce and dairy products.

For each category of "reference individual" (individuals that share location, lifestyle, age, etc.), distributions were prepared on the monthly consumption rates of the following foods (Callaway 1990):

- leafy vegetables
- other (protected) vegetables and root vegetables
- grains (generally dried and stored)
- orchard fruits, berries, melons
- milk.

Because the aquatic pathway was not included for the 1944-1947 period, fish were not considered. Phase I assumed that all vegetables and fruits were produced locally. HEDR modeled in detail the production and distribution of milk, because this product is the most important for iodine-131.

Input to the calculational system is via arrays of consumption rates as a function of age, lifestyle, and month. Associated arrays of high and low estimates of consumption rates are used to describe uncertainty in the consumption-rate values.

2.3.2.9 Model Structure

The logic diagram of Figure 2.4 indicates that the calculation of dose is broken into modules. These modules represent individual portions of the computer code that can be run in a stochastic simulation (Monte Carlo analysis). The modular structure was used for three reasons. First, because the cow/feed/milk distribution model is interconnected, doses cannot be calculated for individuals in a particular census subdivision without knowing the environmental conditions in many other locations. The dose calculations have been structured so that repetitive calculations are minimized; information on the potential distributions of environmental parameters such as air, vegetation, or milk concentrations can be saved and examined for each period.

Second, the modular structure of the model allows the input of either calculated or measured data at each step of the calculation. For Phase I only calculated values were used.

Finally, the modular structure supports the calculation of doses to both reference and specific individuals. This flexibility is important, because the dose reconstruction project is supporting a parallel project being conducted by Fred Hutchinson Cancer Research Center (FHCRC) for the Centers for Disease Control. The FHCRC is investigating thyroid disease that might have been caused by the atmospheric releases from Hanford in the 1940s and 1950s. The FHCRC will be interviewing many individuals about their past lifestyle and dietary habits and will be attempting to correlate estimated doses with thyroid disease. The HEDR computational model will be used to calculate doses for the FHCRC interviewees.

# 3.0 RESULTS AND DISCUSSION

This section presents preliminary results of the Phase I air pathway dose reconstruction. The results are compared with previously published source-term, vegetation-monitoring and thyroid-count data, to background radiation, and to historical regulatory standards. Potential sources of uncertainty in the results are also discussed.

## 3.1 SOURCE TERM

Monthly estimates of iodine-131 releases from the separations plants during December 1944 through December 1947 are tabulated in Table 3.1 and illustrated in Figure 3.1 (Morgan 1990). The estimates of average annual total releases agree well with previously published estimates of annual releases (Anderson 1974), as illustrated in Figure 3.2. Much of the uncertainty in these estimates is due to uncertainties in the release fraction, the proportion of potentially releasable iodine that actually was vented (released to the atmosphere). Previously published estimates of the release fraction vary from 50 to about 80%. The Phase I values that were used were 50 to 85%, with a best-estimated value of 75%. Several other factors, such as incomplete historical records and imprecision in cooling-time estimates, were likely to contribute to uncertainty in the source term.

## 3.2 AIR AND VEGETATION CONCENTRATIONS

Figures 3.3 and 3.4 show typical winter and summer modeled concentrations of iodine-131 on sagebrush are shown as monthly average values by county subdivision. These geographic patterns also reflect air concentrations of iodine-131. The pattern of concentrations is seasonally dependent. Because of these fluctuations, monthly air concentrations at specific locations do not necessarily reflect monthly differences in iodine-131 releases.

Comparisons of calculated sagebrush concentrations with measured values at locations where sufficient measured values exist indicate that the

TABLE 3.1. Estimated Monthly Iodine-131 Releases from Separations Plants, 1944-1947, curies

| Year | Month | 50 % Release | 75 % Release | 85 % Release |
|---|---|---|---|---|
| 1944 | December | 1055 | 1583 | 1794 |
| 1945 | January | 675 | 1013 | 1148 |
| 1945 | February | 835 | 1253 | 1420 |
| 1945 | March | 1120 | 1680 | 1904 |
| 1945 | April | 13600 | 20400 | 23120 |
| 1945 | May | 38000 | 57000 | 64600 |
| 1945 | June | 19861 | 29791 | 33763 |
| 1945 | July | 17206 | 25808 | 29249 |
| 1945 | August | 24055 | 36082 | 40893 |
| 1945 | September | 29490 | 44234 | 50132 |
| 1945 | October | 31264 | 46896 | 53149 |
| 1945 | November | 13077 | 19616 | 22231 |
| 1945 | December | 22005 | 33007 | 37408 |
| 1946 | January | 6321 | 9482 | 10746 |
| 1946 | February | 2740 | 4109 | 4657 |
| 1946 | March | 2507 | 3761 | 4262 |
| 1946 | April | 5398 | 8097 | 9177 |
| 1946 | May | 5190 | 7784 | 8822 |
| 1946 | June | 2450 | 3674 | 4164 |
| 1946 | July | 2632 | 3948 | 4474 |
| 1946 | August | 4607 | 6911 | 7832 |
| 1946 | September | 3567 | 5350 | 6063 |
| 1946 | October | 2578 | 3866 | 4382 |
| 1946 | November | 2780 | 4169 | 4725 |
| 1946 | December | 3095 | 4643 | 5262 |
| 1947 | January | 3474 | 5210 | 5905 |
| 1947 | February | 1562 | 2342 | 2655 |
| 1947 | March | 1984 | 2976 | 3373 |
| 1947 | April | 1995 | 2993 | 3392 |
| 1947 | May | 1949 | 2923 | 3312 |
| 1947 | June | 721 | 1082 | 1226 |
| 1947 | July | 891 | 1337 | 1515 |
| 1947 | August | 554 | 831 | 942 |
| 1947 | September | 490 | 734 | 832 |
| 1947 | October | 208 | 312 | 354 |
| 1947 | November | 169 | 253 | 286 |
| 1947 | December | 183 | 275 | 311 |

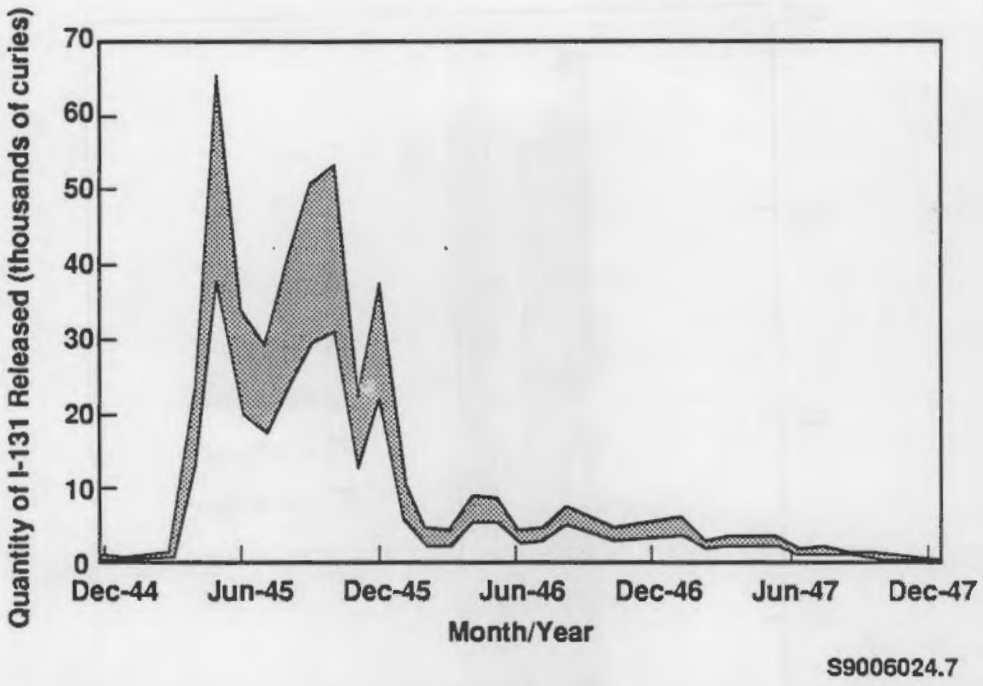



FIGURE 3.1. Monthly Estimates of Iodine-131 Releases from the Separations Plants, 1944-1947

calculated (modeled) and measured values are in good agreement (Figure 3.5). The modeled values appear to underestimate winter concentrations at the selected locations and to slightly overestimate summer concentrations. Because of detection-limit problems, the substantially greater measured concentrations in the latter part of 1947 do not accurately indicate differences. Agreements between cumulative modeled and cumulative measured values for a period when the measured values are most reliable indicate remarkably good agreement (Figure 3.6).

## 3.3 MILK PRODUCTION AND DISTRIBUTION

Thyroid doses are highly sensitive to the location of milk production. A considerable amount of the milk in the Phase I area was produced upwind and consumed downwind. Figure 3.7 illustrates excess and deficit milk production by county. Also, most of the milk sold during Phase I was used for producing

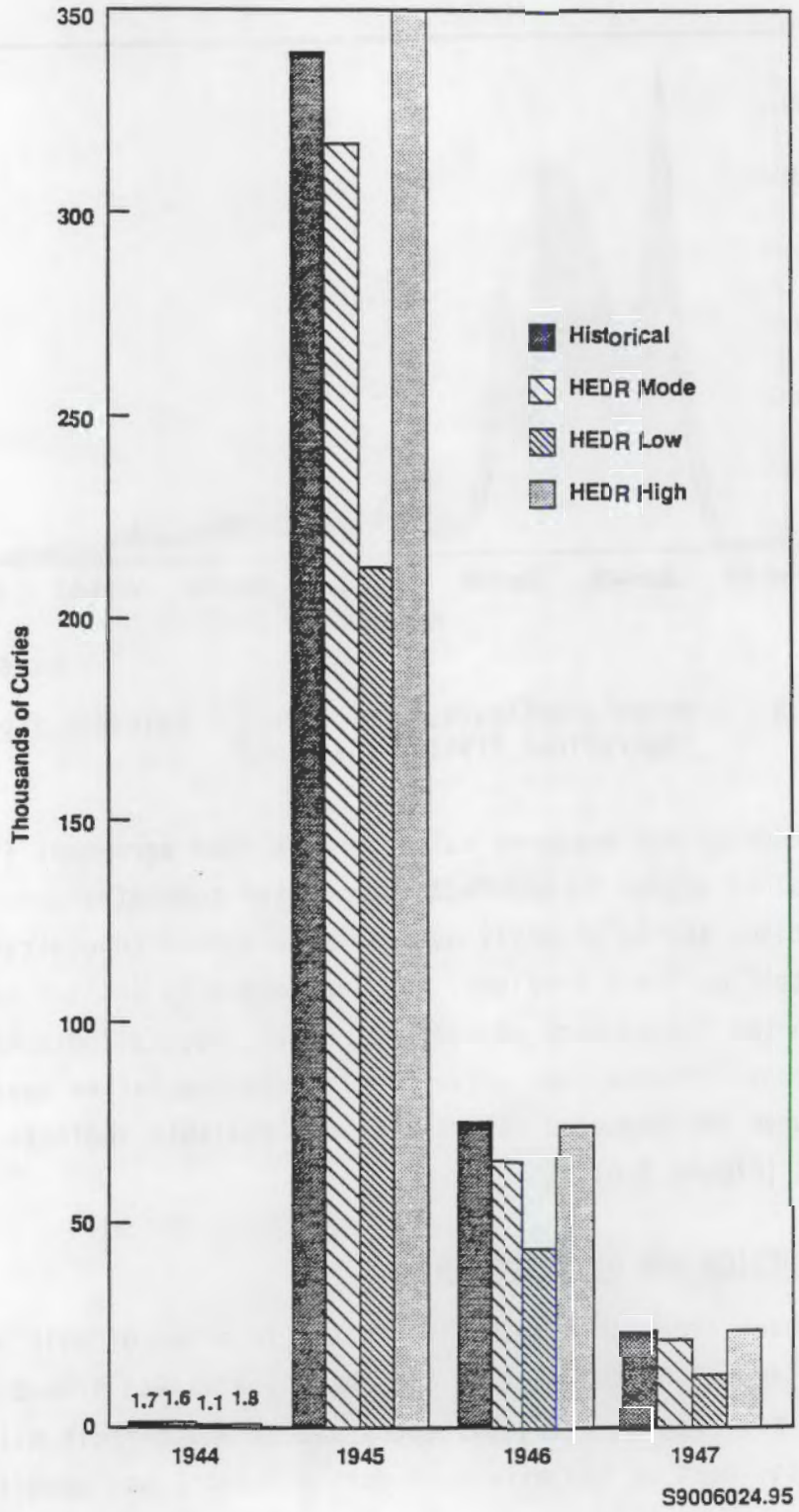



FIGURE 3.2. Comparison of HEDR and Previously Published (Anderson 1974) Estimates of Annual Iodine-131 Releases

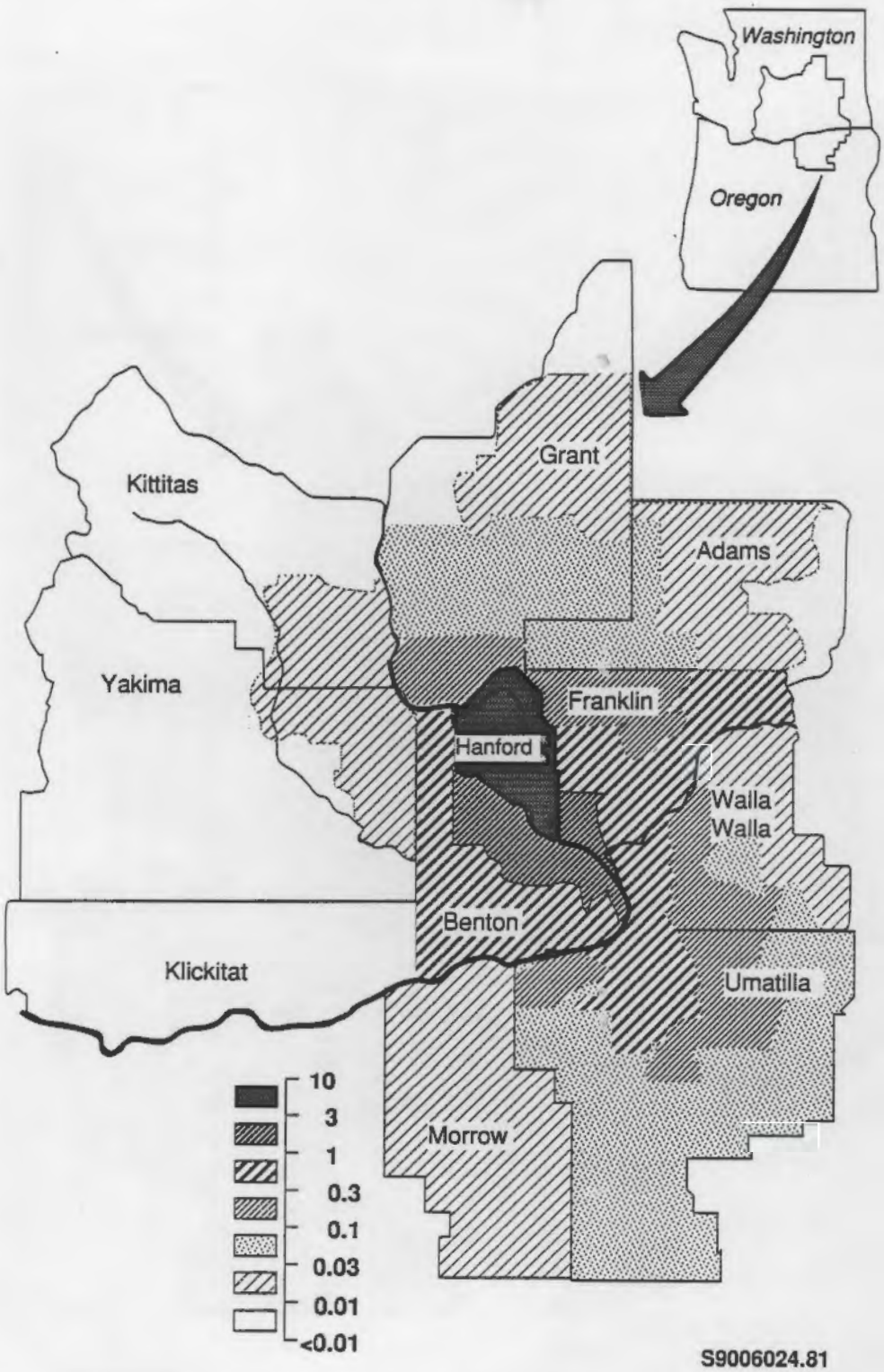



FIGURE 3.3. Calculated Concentrations ($\mu$Ci/kg) of Iodine-131 on Sagebrush, December 1945

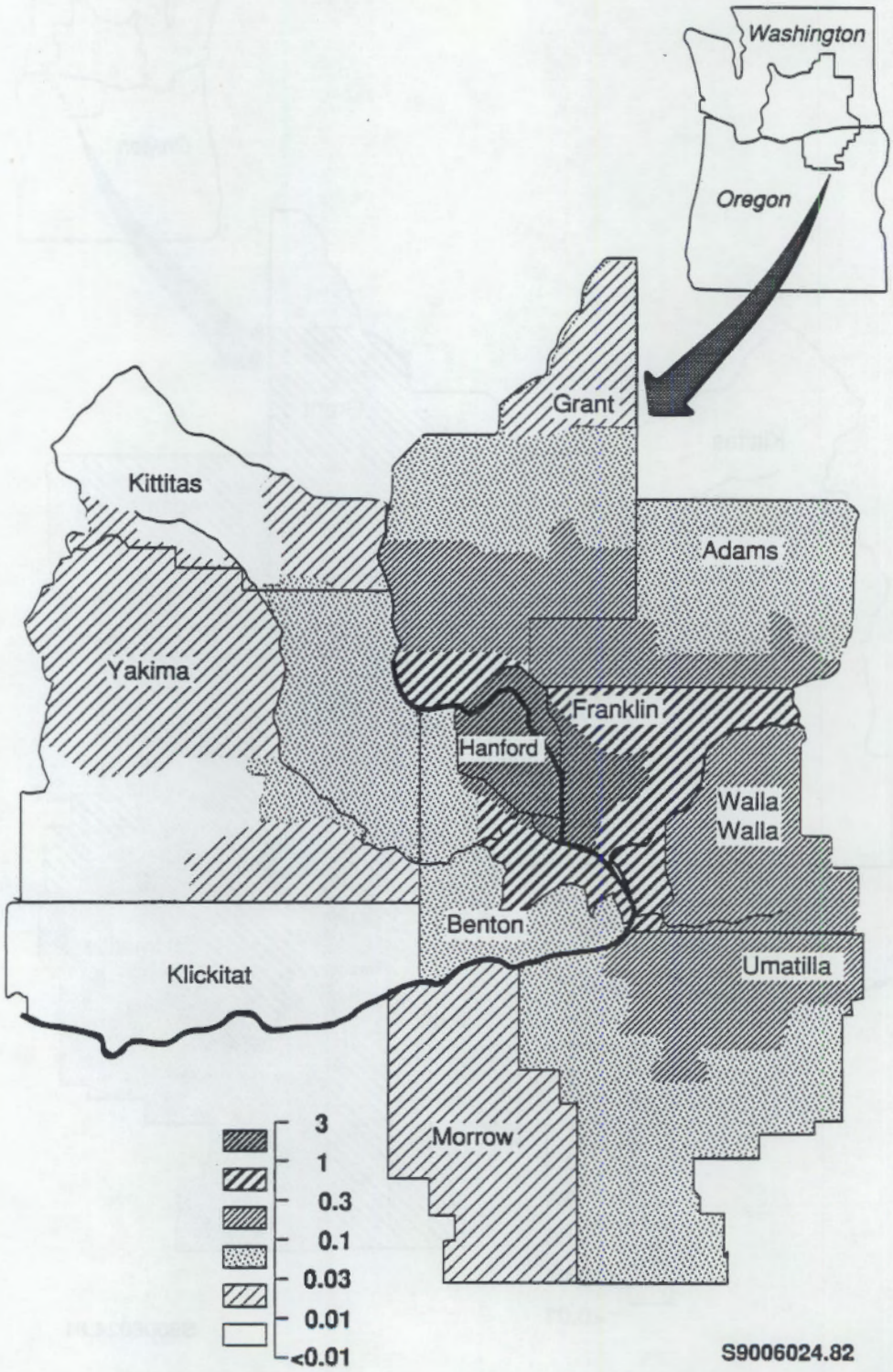



FIGURE 3.4. Calculated Concentrations ($\mu$Ci/kg) of Iodine-131 on Sagebrush, June 1945

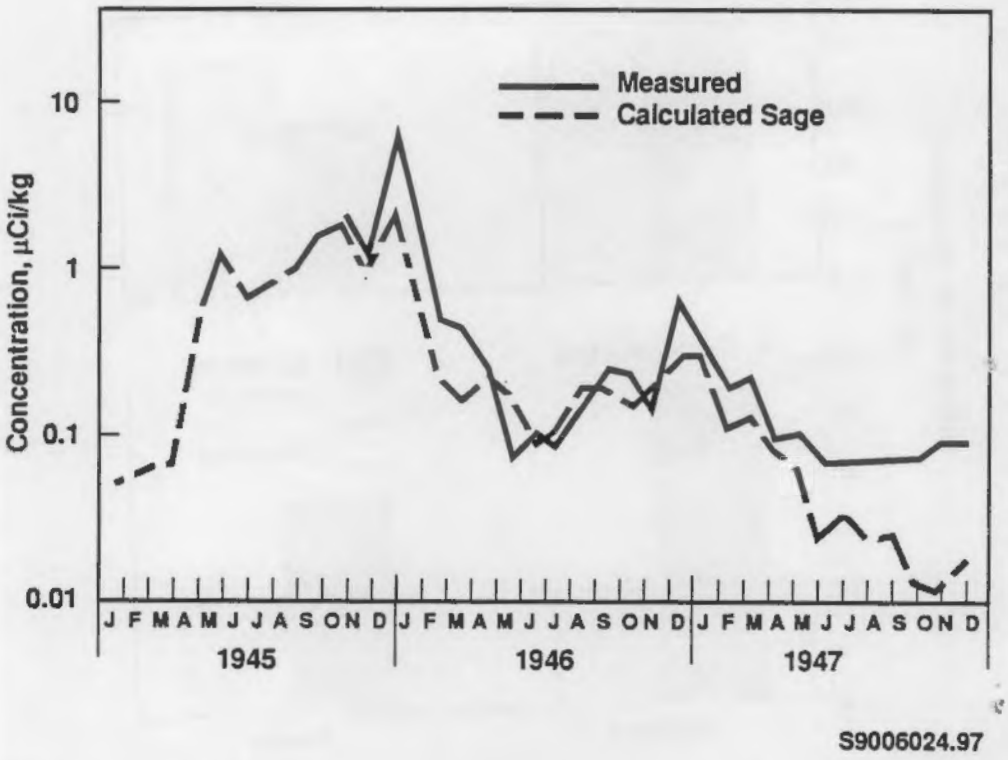



FIGURE 3.5. Calculated and Measured Concentrations of Iodine-131 on Sagebrush at Pasco, 1945-1947

milk products such as cheese, powdered milk, sour cream, and canned milk. Details concerning the dairy industry during the Phase I period are available in Beck et al. (1990).

## 3.4 MILK CONCENTRATIONS

Geographic patterns of estimated concentrations of iodine-131 in milk produced locally reflect typical air and vegetation concentrations during the summer. Seasonal changes in milk concentrations doe not include possible contributions to iodine-131 in milk from the ingestion of contaminated soil and inhalation of contaminated air by the dairy cows; these factors will be addressed in Phase II. Differences in milk concentrations as influenced by dairy cow feeding practices range widely. It is clear that the highest concentrations of iodine-131 in milk can be expected immediately downwind in areas where dairy cows were on pasture. Lowest concentrations occurred upwind and in milk from dairy cows not on pasture during the grazing season.

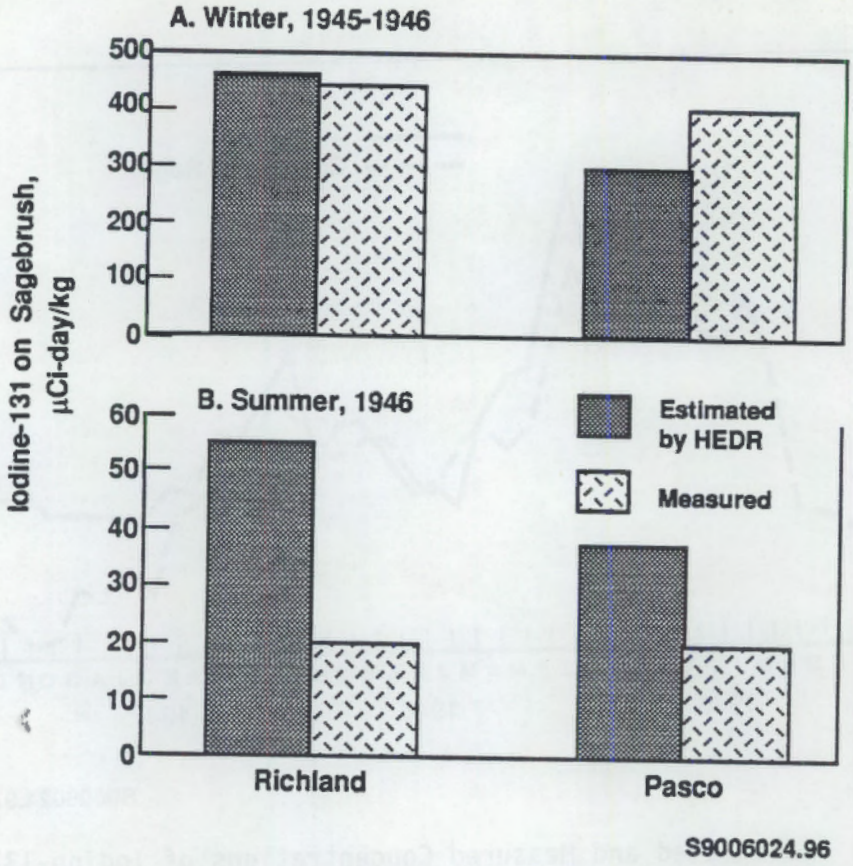



FIGURE 3.6. Comparison of Concentrations (median values) of Iodine-131 on Sagebrush Estimated by HEDR and Measured

## 3.5 POPULATION DISTRIBUTIONS

The relative size of the county census divisions within the Phase I study area reflect relative populations densities. The greatest changes in populations near the Hanford Site, and therefore the most critical changes for developing an assessment of population doses, occurred in Richland, as depicted in Figure 3.8.

## 3.6 INGESTION DOSES

Distributions of doses were calculated for "reference" individuals, individuals who shared combinations of characteristics such as age, sex, lifestyle, food habits, and geographic location. These distributions were also combined into distributions representing selected populations.

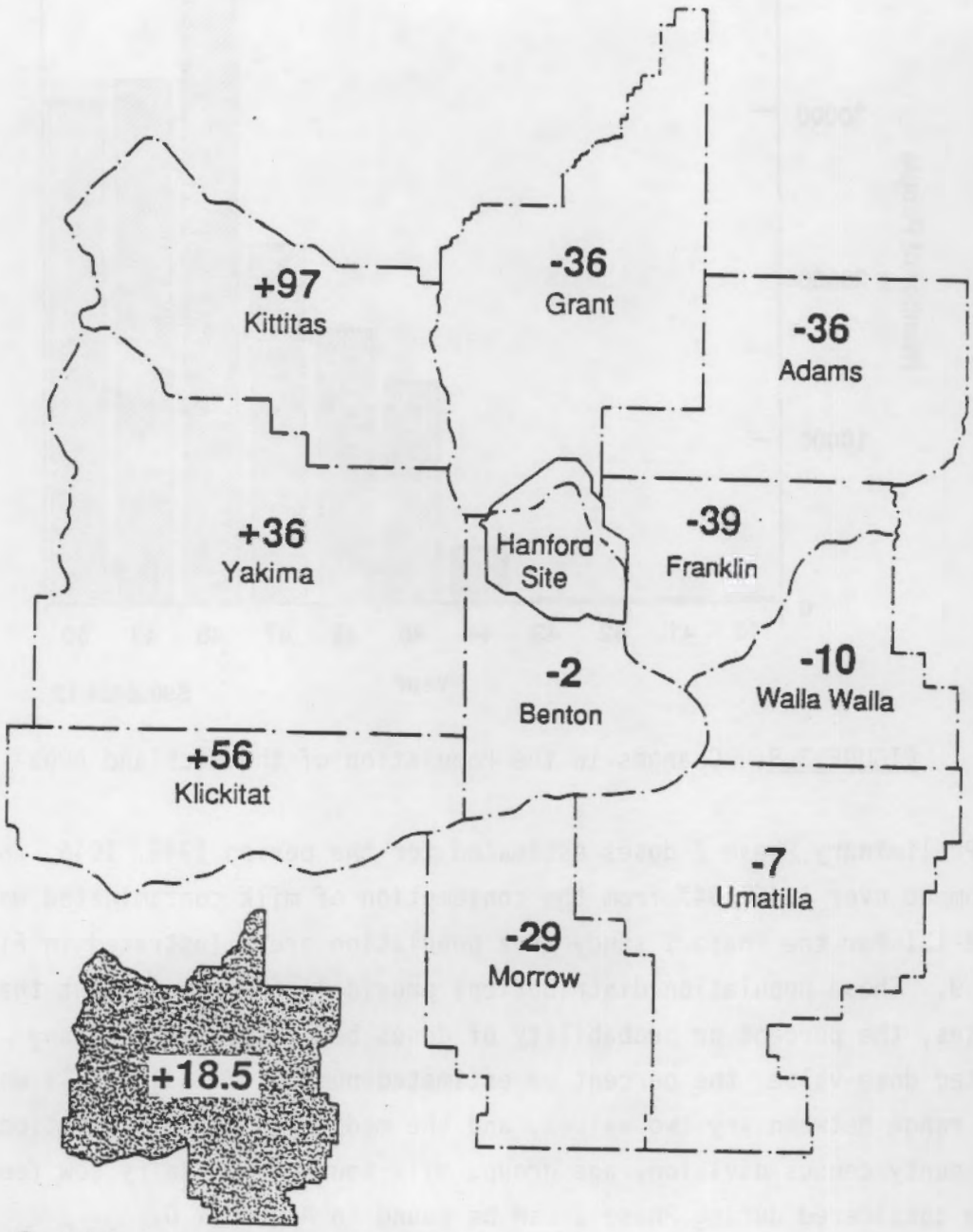



FIGURE 3.7. Per Capita Milk Surplus/Deficit (numbers indicate gallons per person)

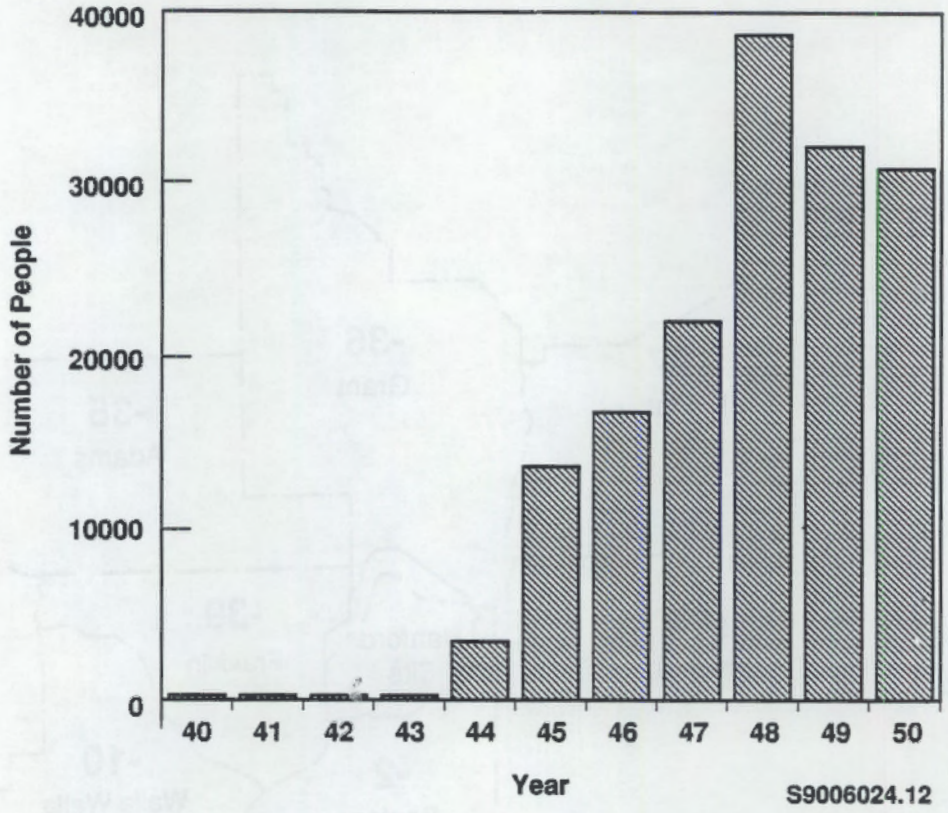
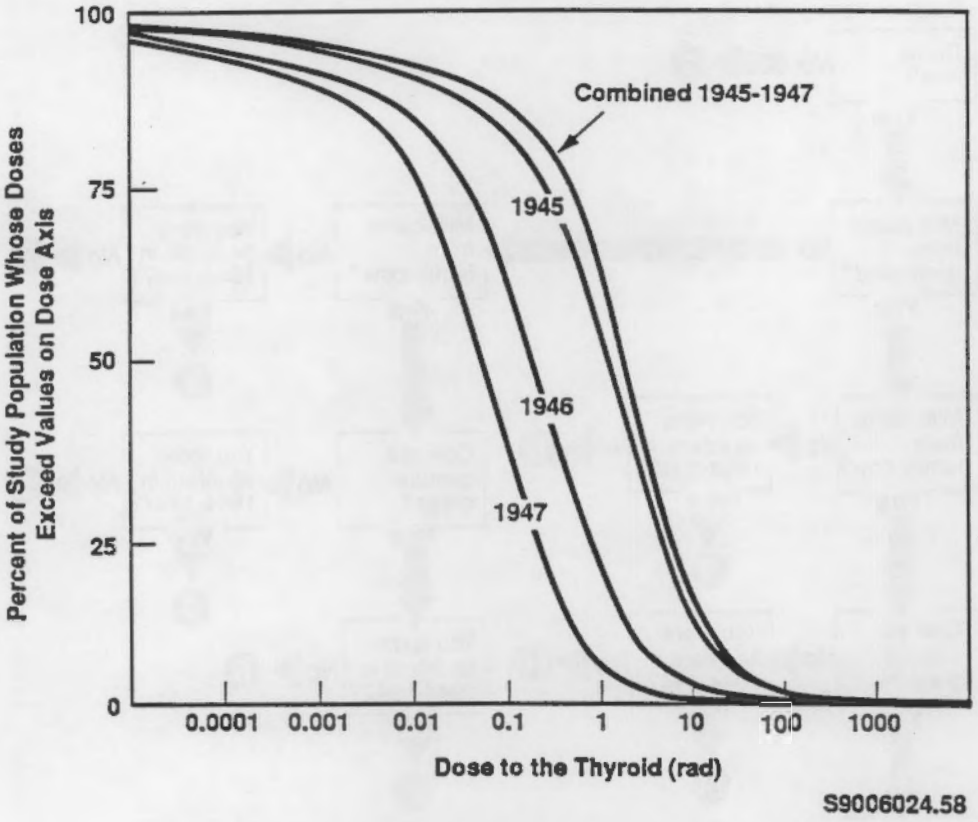


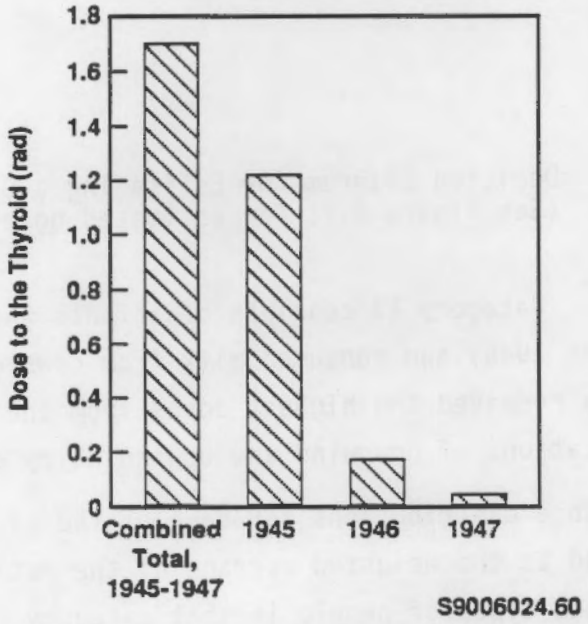

FIGURE 3.8. Changes in the Population of the Richland Area

Preliminary Phase I doses estimated for the period 1945, 1946, and 1947 and summed over 1945-1947 from the consumption of milk contaminated with iodine-131 for the Phase I study area population are illustrated in Figure 3.9. These population distributions provide information about the range of doses, the percent or probability of doses being greater than any selected dose value, the percent or estimated number of individuals whose doses range between any two values, and the median dose. Distributions for each county census division, age group, milk source, and dairy cow feeding regime considered during Phase I can be found in Appendix D.

One approach to enabling individuals who lived in the Phase I study area during 1945-1947 to roughly gauge their doses from the milk pathway is a decision diagram such as Figure 3.10. By answering questions with either yes or no, individuals can narrow uncertainties about their relative doses to one of 13 categories. The ranges and medians for each of the categories are




(a) Dose Distributions, 1945-1947




(b) Median Dose Estimates, 1945-1947

FIGURE 3.9. Dose Estimates From the Milk Exposure Pathway, for the Phase I Study Area Population, 1945-1947

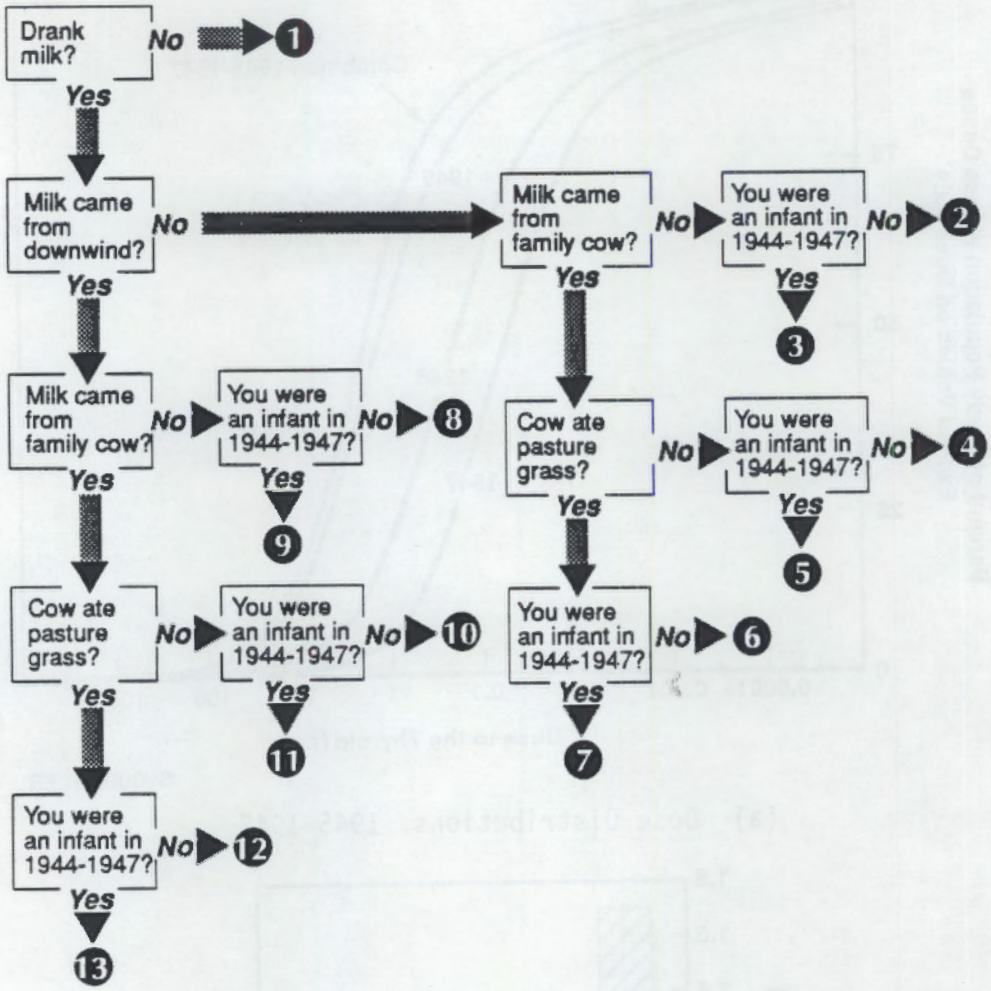



FIGURE 3.10. Decision Diagram for Estimating a Dose Category (See Figure 3.11 for estimated dose ranges)

shown in Figure 3.11. Category 13 consists of infants who lived downwind(especially in 1945) and consumed milk from cows grazed on local pastures, potentially received the highest doses from the milk pathway. Figure 3.12 shows locations of downwind and upwind dairy producers.

The population dose distributions for each of the 13 categories in Figure 3.11 were computed as the weighted average of the estimated dose distributions for the various types of people in that category. The "weight" for the distribution of a given type of person is the proportion of people of that type in the total population of the Phase I study area.

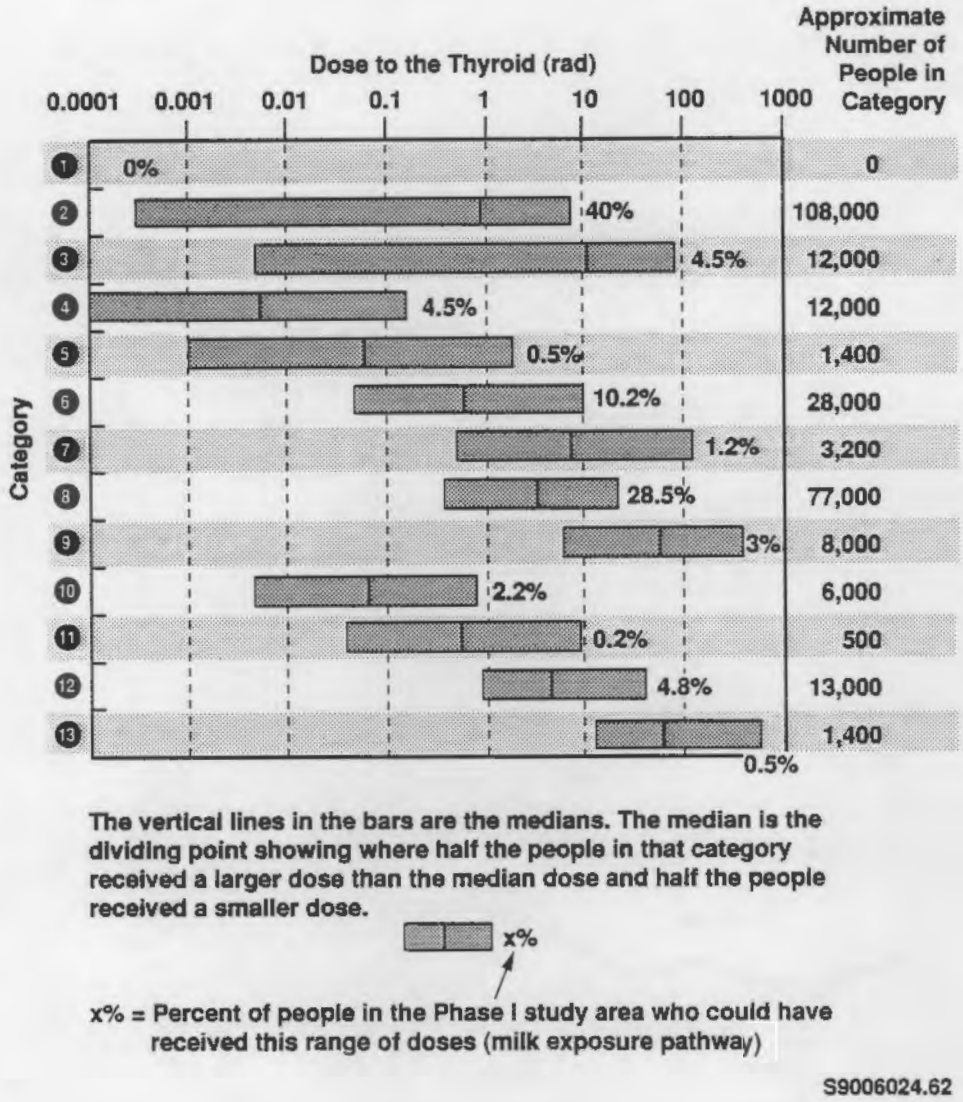



FIGURE 3.11. Preliminary Dose Estimates for Milk Exposure Pathway, 1945-1947. (Each bar shows the range of doses that people in the category opposite the bar could have received. Each bar covers 90% of the people in that category. Estimated radiation doses for people in both the lowest and highest 5% of each category are not included, because the numbers are much less accurate.)

Of pathways other than the milk pathway, doses from fresh vegetables grown in the backyards of downwind populations were the highest. For adults, the vegetable pathway was more important than the milk pathway, because of assumptions discussed in Section 3.8. For Phase I, it was assumed that all fresh vegetables eaten by individuals in a given census division during

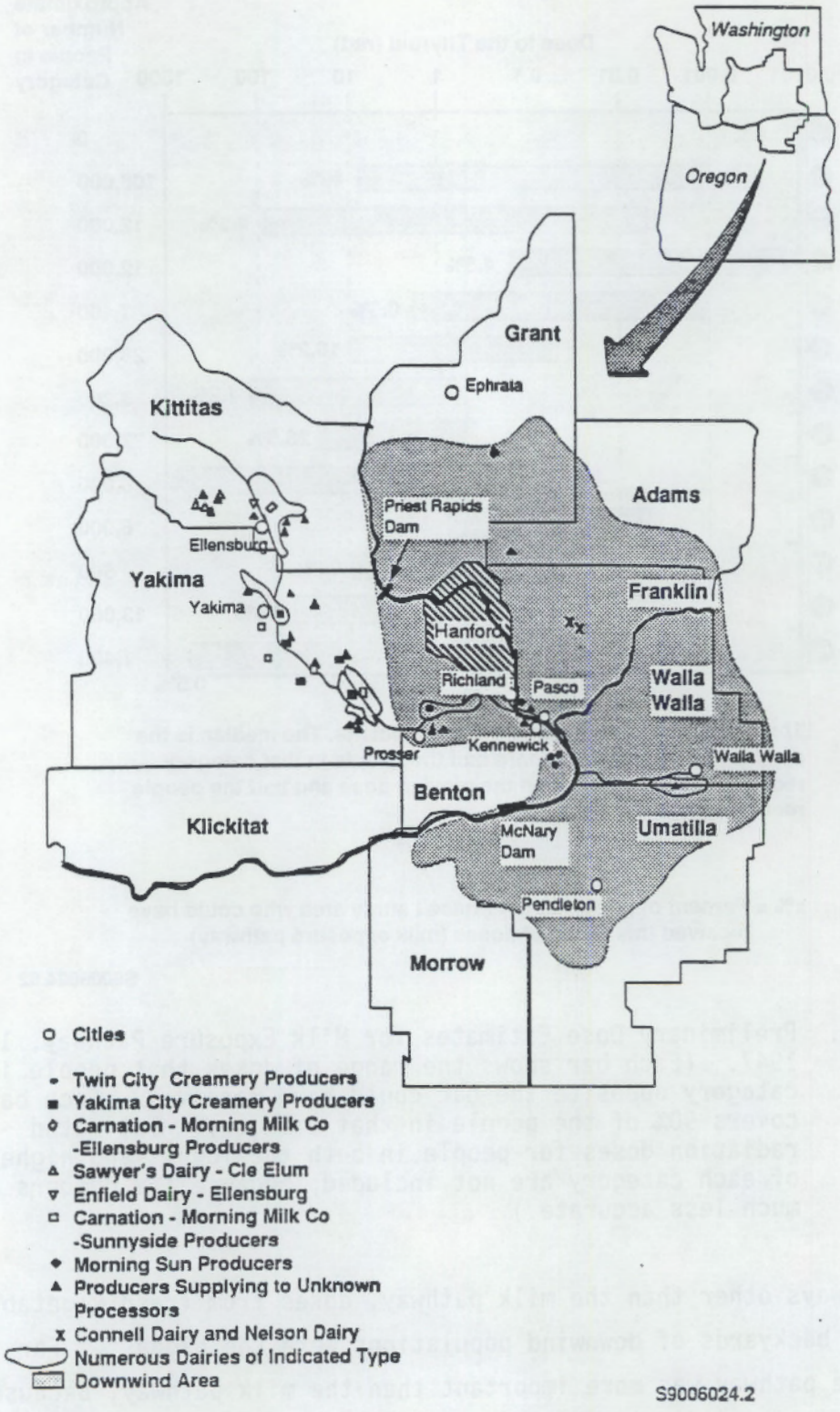



FIGURE 3.12. Milk Producers and Processing Plants Located to Date, 1944-1950 (shaded = downwind)

the Phase I growing season were grown within that census division. The distribution of doses for vegetables is shown in Figure 3.13.

## 3.7 DOSES FROM INHALATION AND FROM IMMERSION AND GROUND SHINE

Preliminary dose estimates for inhalation and for immersion and ground shine are depicted as CCD functions in Figure 3.14.

## 3.8 RANKING OF DOSES

The preliminary dose estimates vary with location, time, pathway, age, origin of milk, and dairy cow feeding regime. The relative importance of each pathway, for the case of infants downwind who drank milk from cows on local pasture, is illustrated in Figure 3.15. Doses generally decrease in the following order of pathways: milk from local cows on pasture, local vegetables, inhalation, and immersion and ground shine (external exposure).

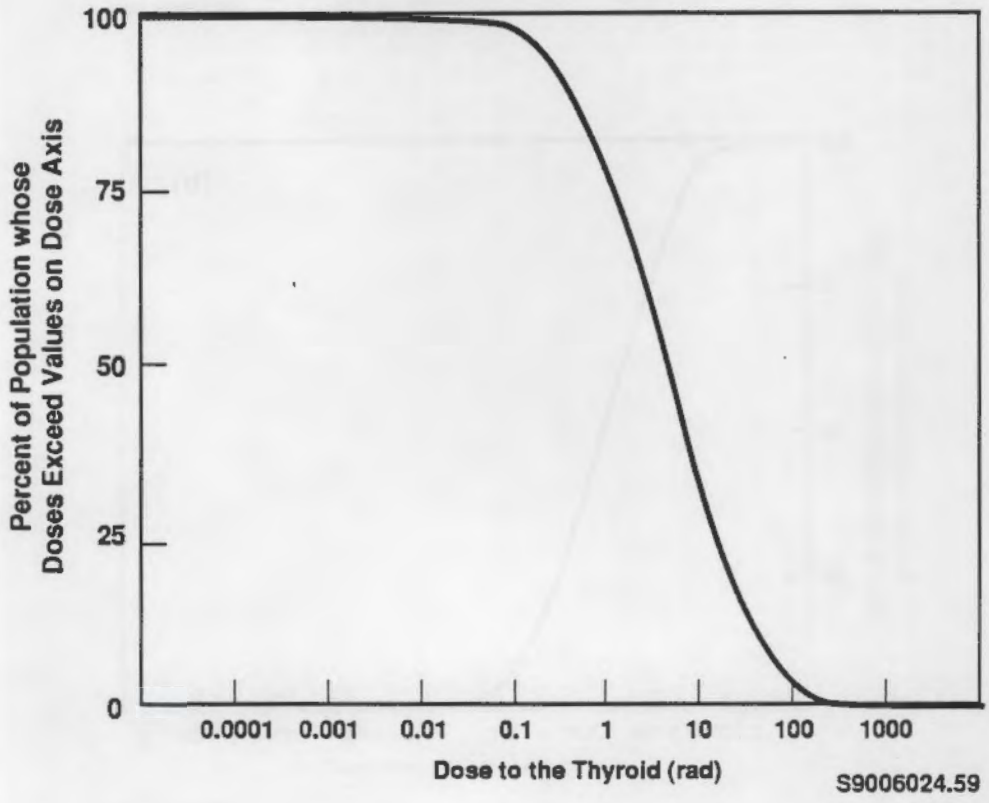
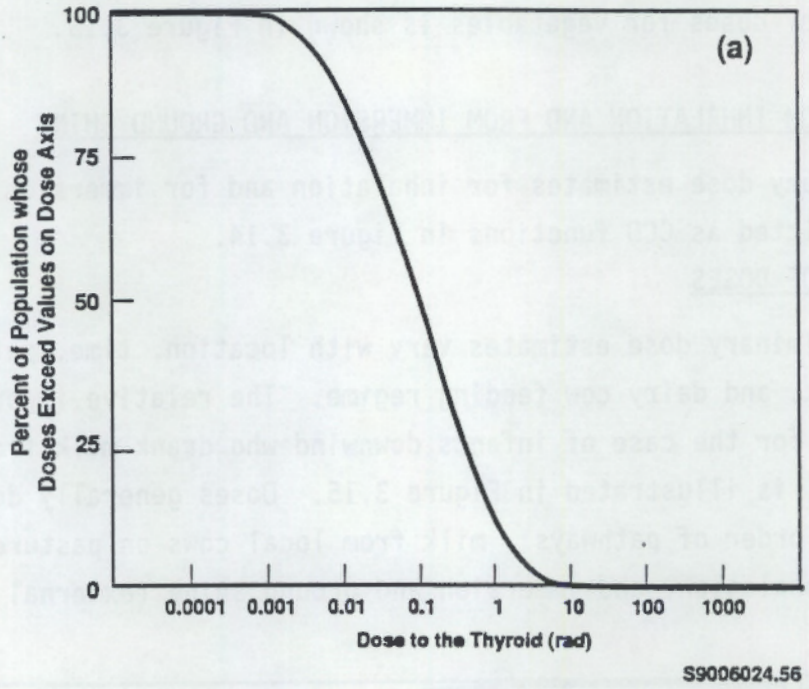



FIGURE 3.13. Distributions of Doses from Vegetables (assumes all vegetables are from local growers)



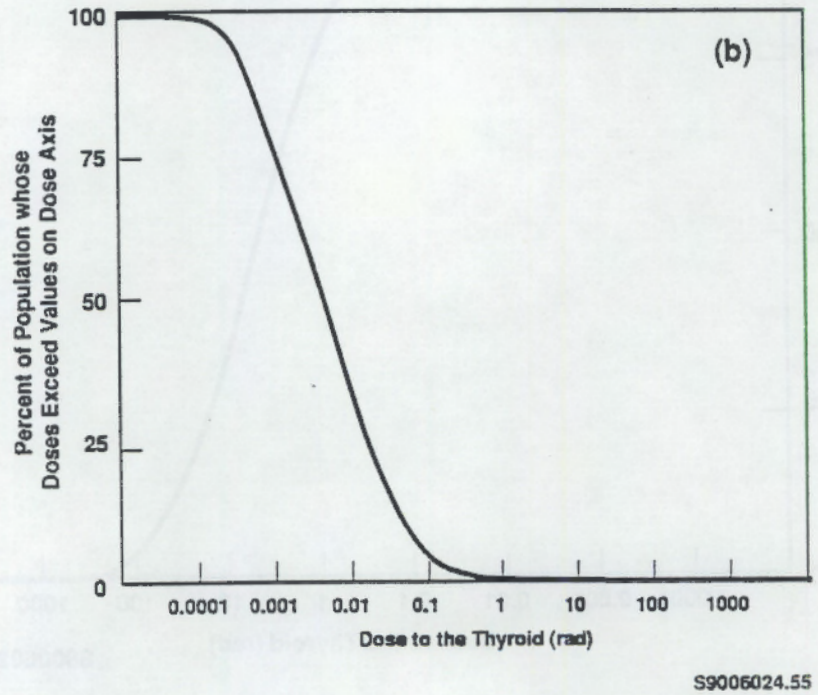




FIGURE 3.14. Estimated Doses to Phase I Study Area Populations from (a) Inhalation and (b) External Pathways

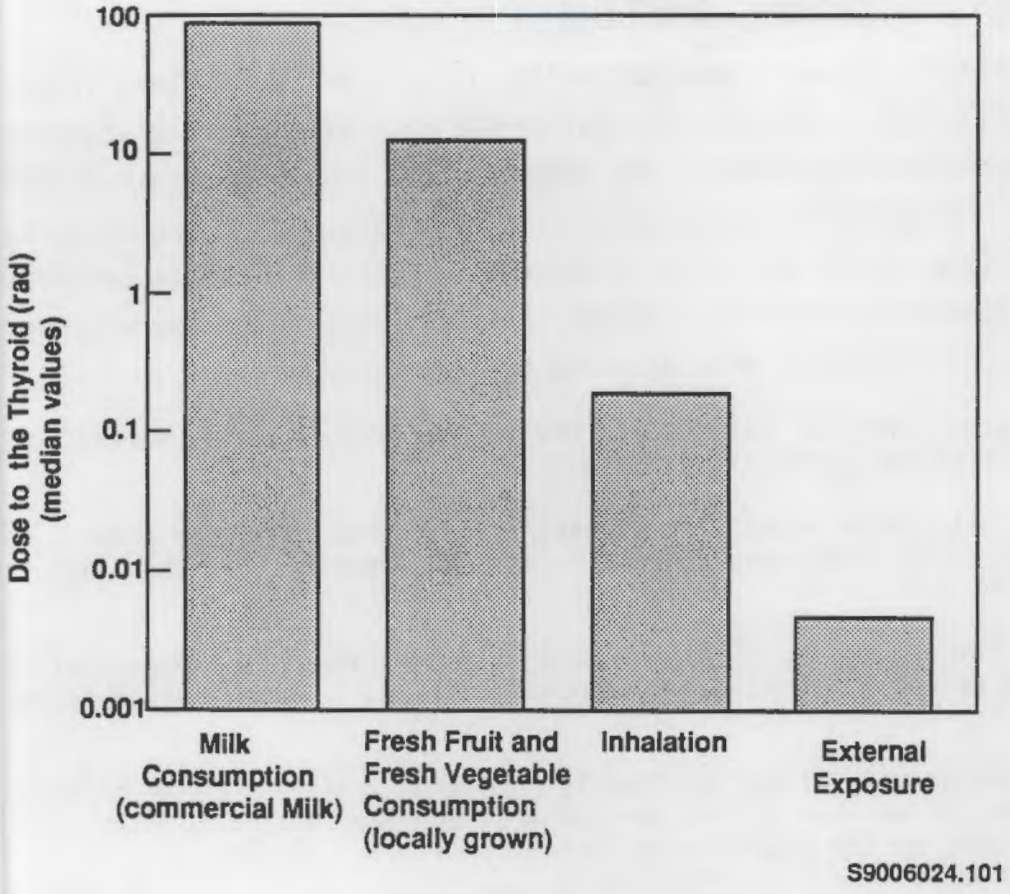



FIGURE 3.15. Relative Importance of Various Pathways Based on Median Values (downwind Walla Walla infant, local milk from dairy cows on pasture, locally grown vegetables and fruit, 1945-1947)

Doses from the separate pathways cannot be summed into a total dose. The preliminary dose distributions for produce and animal products other than milk are limited to the assumption that all fresh vegetables, fruits and grain were grown within each census division. Consequently, these distributions reflect maximally exposed individuals only, and do not represent the true range of doses from the consumption of foods other than milk. Nevertheless, doses downwind to infants from the consumption of locally produced milk are clearly several times greater than doses from the consumption of locally produced vegetables, fruit, and grain. Phase II will address the need to develop an agricultural production/distribution model similar to the milk model used in Phase I.

## 3.9 EVALUATION OF PHASE I OBJECTIVES

The Phase I results demonstrate that the key objectives were attained. First, sufficient historical information was retrieved and reconstructed. Second, preliminary conceptual and computational models were constructed to deal with uncertainties and to establish the foundation for extensive sensitivity analyses to be conducted in Phase II. Finally, the data and modeling approach produced plausible, although clearly preliminary, dose distributions. These objectives were attained by demonstrating

- that, as shown in Section 3.1, the source-term estimates agreed well with previously published estimates
- that calculated vegetation concentrations agree well with previously published measurements in several locations, as shown in Section 3.2
- that the range of preliminary dose estimates includes independent estimates of doses to maximally exposed individuals, as discussed below, and
- that relatively crude, previously published measurements of thyroid burdens of workers are in the range of average thyroid burdens estimated by the HEDR Project model for similar "reference individuals," as also presented below.

### 3.9.1 Previous Dose Estimate

In 1986, the Washington State Department of Social and Health Services (DSHS) (Washington State Office of Radiation Protection 1986) issued a preliminary dose estimate for 1945-1956. This preliminary estimate was based on past measurements of iodine-131 on sagebrush. The DSHS used a slightly modified model for a maximally exposed individual as provided in U.S. Nuclear Regulatory Commission (USNRC) Regulatory Guide 1.109 (USNRC 1977). The DSHS estimates for 1945-1947 of 2,530 dose to the thyroid in rem from this effort are indicated in Figure 3.16. About 0.004% of the Phase I population was estimated to have received thyroid doses exceeding the DSHS estimate of 2,530 rem to a maximally exposed infant in Pasco, 1945-1947.

The 95th percentiles of estimated doses to infants in county census division FR4 who drank milk from cows on local pasture (Appendix D) exceed the DSHS cumulative estimate for a Pasco infant from 1945-1947 (2,530 rem).

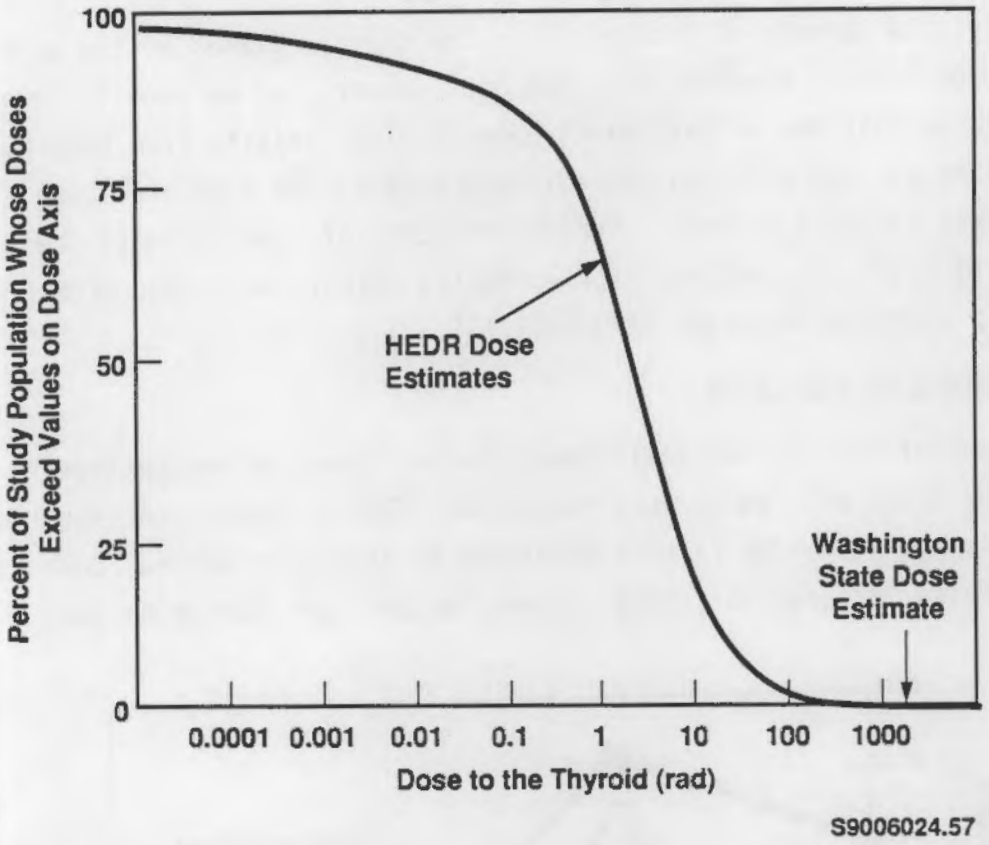



FIGURE 3.16. HEDR Preliminary Dose Estimates Compared with Washington State Dose Estimates (Pasco infant, 1945-1947)

The total population in FR4 is estimated to have been between 110 and 125 people in the period 1945-1947 (Beck et al. 1990).

### 3.9.2 Thyroid Counts

From the time Hanford operations began, workers in areas likely to experience relatively higher air concentrations of iodine-131 had their thyroids checked with a portable radiation detector. The thyroid checks were used not to obtain highly accurate measurement but as a screening tool. The intent was to detect levels above some arbitrary threshold, which was chosen to be 10% of the adopted radiation protection guideline.

Records of more than 7,900 measurements of thyroids from the period 1944-1946 were examined. More than one-third of the measurements did not register above background radiation, because of a combination of relatively high background levels, relatively insensitive instrumentation, and,

presumably, low amounts of iodine-131 in the thyroid glands of the workers who were monitored. Nevertheless, the measurements can be used to suggest the exposures that the workers might have received offsite from breathing contaminated air and drinking contaminated milk if the exposures were assumed to originate entirely offsite. The distribution of dose estimates based on the thyroid counts is compared with estimates calculated by the HEDR Project for adults living in Richland (Figure 3.17).

### 3.9.3 Background Radiation

One way of placing the preliminary Phase I doses in perspective is to compare the doses with background radiation. Such a comparison requires the use of risk and weighting factors developed by the International Commission on Radiological Protection (ICRP). These factors were developed for

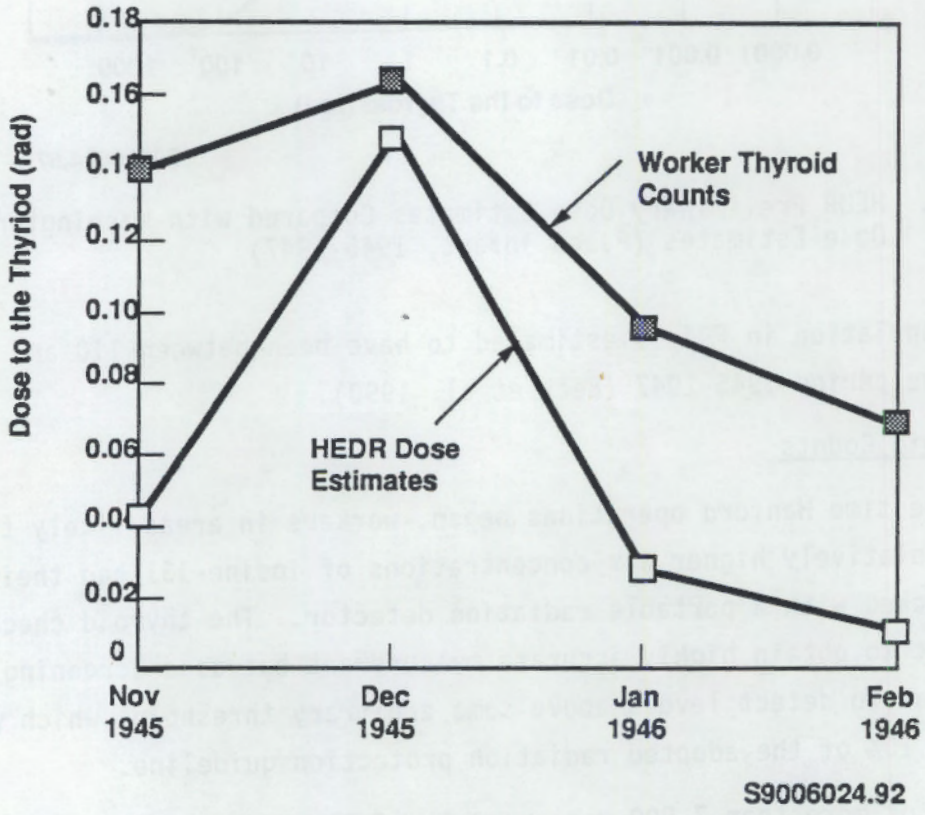



FIGURE 3.17. HEDR Preliminary Dose Estimates (Richland adults, inhalation exposure pathway, median values) Compared with Measurements (median values) of Iodine-131 in Thyroid Glands of Hanford Workers

radiation protection and therefore are purposely conservative. In particular, the ICRP factors are based on effects of high-dose, high-dose-rate external radiation, whereas major contributors both to background exposures and exposures from Hanford are relatively low-dose, low-dose-rate internally deposited radionuclides. With these caveats, the preliminary Phase I dose estimates for the milk pathway are compared with cumulative doses from background radiation.

According to recent publications (National Council on Radiation Protection and Measurements 1987), the average person in the U.S. is exposed to about 0.36 Effective Dose Equivalent (EDE) (rem) (0.0036 Sv)[a] a year [of which radon accounts for about 0.2 EDE (rem) (0.002 Sv)] or to about 25 EDE (rem) (0.25 Sv) during an average lifetime. Approximately 5% of the Phase I study area population, or about 13,000 people, might have received doses from the milk pathway that were higher than the annual, national, average background dose added over 3 years. About 1% of the Phase I population, or about 3,000 people, might have had doses from the milk pathway greater than an average, national lifetime dose from background radiation (Figure 3.18).

### 3.9.4 Historical Regulatory Standards

Some readers may be interested in what guidelines were used to control radiation exposures in 1944-1947. Hanford Site officials adopted guidelines recommended by the medical profession for exposure of medical employees and reduced the allowable exposures for Hanford employees to half of those guidelines (Wilson 1987). Exposures to iodine-131 were based on amounts that could be inhaled during a 24-hour period. The guideline translates roughly to about I rad to the thyroid per day. (There was also a guideline for vegetation in efforts to protect sheep and cattle that might graze on contaminated forage.) The guideline was not based on doses that might result to offsite populations from drinking contaminated milk because that pathway was not recognized as being the critical pathway until the mid-1950s (Comar et al. 1957; Parker 1956).

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(a) All doses here are Effective Dose Equivalent (EDE), rather than organ dose.

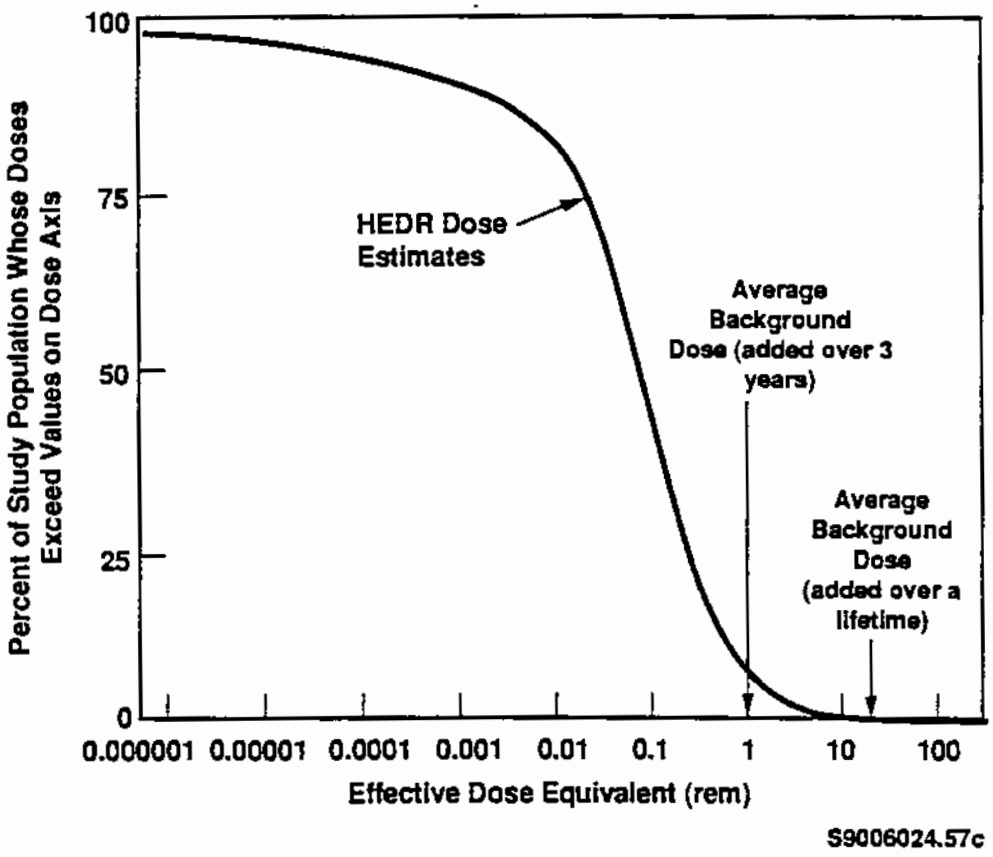


FIGURE 3.18. Average Background Radiation Received by U.S. Residents over a 3-Year Span and over a Lifetime Compared with Preliminary Radiation Doses from the Milk Exposure Pathway

## 3.10 UNCERTAINTIES IN PRELIMINARY DOSE ESTIMATES

Preliminary dose estimates were calculated during Phase I to demonstrate the feasibility of the dose-reconstruction process, rather than to provide definitive dose estimates for offsite populations. The degree to which these preliminary dose estimates might represent actual or relative doses that populations in the Phase I area during 1944-1947 received from atmospheric releases from Hanford is discussed briefly here.

Uncertainties in the preliminary Phase I dose estimates result from parameter uncertainties, model uncertainties, and variability as these terms are discussed in Finkel (1990) and IAEA (1989). The extent of these uncertainties and their contributions to the uncertainties in dose estimates will

be assessed during Phase II of the project. Examples of some of the variabilities and uncertainties that are known to be inherent in the preliminary Phase I estimates include

- Uncertainty regarding the time elapsed between reactor shutdown and dissolution of irradiated fuel. Because of the short half-life of iodine-131 (8 days), uncertainties of 1 to 3 days result in uncertainties of up to 20% in the amount of iodine in irradiated fuel at irradiation.

- Uncertainty in the release fraction. Estimates of the release fraction range from 50 to 85%, resulting in uncertainties that are reflected in the dose estimates.

- Uncertainty in concentrations of iodine-131 in air and in vegetation at any specific location or time. These concentrations vary because of variability in amounts released from Hanford and because of variability in wind speed, wind direction, and factors that affect the degree of mixing of contaminated with uncontaminated air during transport to a specific geographic location. Concentration estimates are also uncertain because of uncertainties in the model(s) used to describe the complex meteorological and physical/chemical phenomena that affect the dispersal of iodine-131 in the atmosphere.

- Uncertainties arising from the use of average meteorological data from 1983 to 1987 in place of data for 1944-1947, which were not available in time for the Phase I calculations.

- Uncertainty about the iodine-131 release rate. For Phase I, releases during a month were assumed to be continuous, when in fact they were episodic. (Information about release times is still being retrieved and assessed.)
- The inclusion and exclusion of certain parameters in the model structure.

- The applicability of values of iodine-131 deposition onto vegetation obtained under circumstances that differ from conditions in the Phase I area.

- The structure of the model(s) used to describe the process of deposition of iodine-131 from the atmosphere onto vegetation or the interception of deposited iodine-131 by vegetation.

- The amount of contaminated pasture consumed by dairy cows.

- The amount of iodine-131 transferred from the pasture to milk by individual cows, by location and time.

- The pooling of contaminated milk from different locations and times.
- The dairy cow feeding regime actually used by individuals with backyard cows.
- The amount of milk distributed to various outlets by a producer/distributor.
- The source(s) of milk consumed by an individual.
- The amount of milk consumed by an individual.
- The amount of iodine transferred to and retained by an individual's thyroid.
- The metabolic condition and thyroid mass of an individual.

Future dose estimates will change as a result of efforts to reduce uncertainties in key variables and as a result of modifications in model structure. These changes will include reductions in uncertainty and changes in mean values and distributions of dose. Of the contributors to uncertainty/variability in dose estimates listed above, reductions in uncertainty in the atmospheric-transport/deposition parameters and submodels are the most likely to result in reductions in uncertainties in the dose estimates.

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# APPENDIX A

## HEDR PUBLICATIONS - TO DATE

| Title | Author | Publication Date | Publication No. |
|---|---|---|---|
| Hanford Environmental Dose Reconstruction Project Monthly Report | Haerer, HA | Monthly | PNL-6450 HEDR |
| Work Plan for the Hanford Environmental Dose Reconstruction Project | Haerer, HA | 1989 | PNL-6696 HEDR REV 1 |
| Proposed Approach for Developing Information on Population Food Consumption and Lifestyles of Native Americans in the HEDR Study Area | Rhoads, RE, and Bruneau, CL | 1989 | PNL-6803 HEDR |
| Summary Report of HEDR Workshop on Sensitivity and Uncertainty Analysis | Sagar, B., and Liebetrau, AM | 1989 | PNL-SA-16804 HEDR |
| Demographic, Agricultural, Food Consumption, and Lifestyle Research for the Hanford Environmental Dose Reconstruction Project | Beck, DM, et al | 1989 | PNL-6834 HEDR |
| Response to TSP Directive 88-4, Ground-Water Contamination Data | Freshley, MD | 1989 | PNL-6847 HEDR |
| A History of Major Hanford Operations Involving Radioactive Material | Ballinger, MY, and Hall, RA | 1989 | PNL-6964 HEDR |
| Summary of Workshop on Milk Production and Distribution, November 30, 1988 - HEDR Project | Beck, DM, et al. | 1989 | PNL-6975 HEDR |
| Feasibility of Using $^{129}I$ Concentrations in Human Tissue to Estimate Radiation Dose From $^{131}I$ | McCormack, WD | 1989 | PNL-6889 HEDR |
| Hanford Environmental Dose Reconstruction (brochure) | Bruneau, CL | 1989 | PNWD-1323 HEDR |
| Radionuclide Sources and Radioactive Decay Figures Pertinent to the HEDR Project | Heeb, CM | 1989 | PNL-7177 HEDR |
| Uncertainties in Source Term Calculations Generated by the ORIGEN2 Computer Code for Hanford Production Reactors | Heeb, CM | 1989 | PNL-7223 HEDR |
| Atmospheric Transport and Dispersion Modeling for the Hanford Environmental Dose Reconstruction Project | Ramsdell, JV | 1989 | PNL-7198 HEDR |
| Preliminary Summaries for Vegetation, River and Drinking Water and Fish Radionuclide Concentration Data (DRAFT) | Woodruff, RK | 1989 | PNL-SA-17641 HEDR |

| Title | Author | Publication Date | Publication No. |
|---|---|---|---|
| Atmospheric Transport Modeling and Input Data for Phase I of the Hanford Environmental Dose Reconstruction Project | Ramsdell, JV, and Burk, KW | 1989 | PNL-7199 HEDR |
| Fission-Product Iodine During Early Hanford-Site Operations: Its Production and Behavior During Fuel Processing, Off-Gas Treatment, and Release to the Atmosphere | Burger, LL | 1989 | PNL-7210 HEDR |
| The Hanford Environmental Dose Reconstruction Project: Background Information (flier) | Byram, SJ | 1989 | PNL-SA-17658 HEDR |
| Summary of Literature Review of Risk Communication | Byram, SJ | 1989 | PNL-7226 HEDR |
| Milk Cow Feed Intake and Milk Production and Distribution Estimates for Phase I | Beck, DM | 1989 | PNL-7227 HEDR |
| Estimations of Traditional Native American Diets in the Columbia Plateau | Hunn, ES and Bruneau, CL | 1989 | PNL-SA-17296 |
| Estimates of Columbia River Radionuclide Concentrations: Data for Phase I Dose Calculations | Richmond, Walter | 1990 | PNL-7248 HEDR |
| Evaluation of Thyroid Radioactivity Measurement Data From Hanford Workers, 1944-1946 | Ikenberry, T | 1990 | PNL-7254 HEDR |
| I-131 in Irradiated Fuel at Time of Processing From December 1944 Through December 1947 | Morgan, LG | 1990 | PNL-7253 HEDR |
| Population Estimates for Phase I | Beck, DM | 1990 | PNL-7263 HEDR |
| Estimates of Food Consumption | Callaway | 1990 | PNL-7260 HEDR |
| Soil Ingestion by Dairy Cattle | Darwin, RF | 1990 | PNL-SA-17918 HEDR |
| Computational Model Design Specification for Phase I of the Hanford Environmental Dose Reconstruction Project | Napier, BA | 1990 | PNL-7274 HEDR |
| Selection of Dominant Radionuclides for Phase I of the HEDR Project | Napier, BA | 1990 | PNL-7231 HEDR |
| A Preliminary Examination of Audience-Related Communications Issues: Hanford Environmental Dose Reconstruction Project | Holmes, CW | 1990 | PNL-7321 HEDR |
| MESOILT2, A Lagrangian Trajectory Climatological Dispersion Model | Ramsdell, JV | 1990 | PNL-7340 HEDR |
| Draft Summary Report | HEDR Staff | 1990 | PNL-7410 HEDR |
| Draft Air Pathway Report | HEDR Staff | 1990 | PNL-7412 HEDR |
| Draft Water Pathway Report | HEDR Staff | 1990 | PNL-7411 HEDR |

# APPENDIX B

## COMPUTATIONAL MODEL DESIGN SPECIFICATION FOR PHASE I OF THE HANFORD ENVIRONMENTAL DOSE RECONSTRUCTION PROJECT

PNL-7274 HEDR
UC-707

# COMPUTATIONAL MODEL DESIGN SPECIFICATION FOR PHASE I OF THE HANFORD ENVIRONMENTAL DOSE RECONSTRUCTION PROJECT

HANFORD ENVIRONMENTAL DOSE
RECONSTRUCTION PROJECT

B. A. Napier

February 1990

Prepared for
review, evaluation, and approval
by the Technical Steering Panel

Pacific Northwest Laboratory
Richland, Washington 99352

COMPUTATIONAL MODEL DESIGN SPECIFICATION FOR PHASE I
OF THE HANFORD ENVIRONMENTAL DOSE RECONSTRUCTION PROJECT

This document has been reviewed by the Technical Steering Panel and is approved for public release.

J. E. Till, Chair
Technical Steering Panel

Date

## PREFACE

In recent years, concern has been mounting about possible health effects to the public from over 40 years of operations at the Hanford Site. This concern prompted the Washington State Nuclear Waste Board and the Indian Health Service to request the Centers for Disease Control (CDC) to convene a Hanford Health Effects Review Panel to review and evaluate epidemiological and environmental data relevant to Hanford operations. In 1986, based on this review, the Panel recommended a study be initiated to reconstruct radiation doses potentially received by the public residing in the vicinity of Hanford, and a separate study of thyroid morbidity in the same population. The HEDR Project is the outgrowth of that recommendation.

The HEDR Project is divided into the following technical tasks. These tasks address each of the primary steps in the path from radioactive releases to dose estimates:

- Source Terms
- Environmental Transport
- Environmental Monitoring Data
- Demographics, Agriculture, and Food Habits
- Environmental Pathways and Dose Estimates.

The Source Terms Task will develop estimates of radioactive emissions from Hanford facilities since 1944. These estimates will be based on historical measurements and production information.

The Environmental Transport Task will reconstruct the probable movement of radioactive materials from the areas of release to populations. Movement via the atmosphere, surface water (Columbia River), and ground water will be studied.

The Environmental Monitoring Task will assemble, evaluate, and report historical monitoring data.

The Demographics, Agriculture, and Food Habits Task will develop the data needed to determine which population groups could have been affected by the releases. Population and demographic information will be developed for

the general population within the study area. This information will also be developed for several special population groups including the Native American tribes in the study area, military personnel stationed at Hanford, Hanford construction workers, and migrant farm workers. The food and water consumption patterns and practices and sources of food and water must also be estimated.

Historical dairy farming practices and milk distribution systems will be studied because milk is a significant pathway for iodine-131 to enter the human body. Cows could have eaten vegetation contaminated with this radionuclide.

The Environmental Pathways and Dose Estimates Task will use the information produced by the other tasks to estimate the radiation doses people could have received from Hanford operations.

This report is the result of a collaboration of the Statistics Task and the Environmental Pathways and Dose Estimates Task. This report outlines the computations that will be needed to incorporate all of the data collected by the various tasks to produce radiation dose estimates. Preliminary models are defined and the structure and logic of the envisioned computer code are outlined.

## SUMMARY

The objective of the Hanford Environmental Dose Reconstruction (HEDR) Project is to estimate the radiation dose that individuals could have received as a result of emissions from nuclear operations at Hanford since their inception in 1944. The purpose of this report is to outline the basic algorithm and necessary computer calculations to be used to calculate radiation doses to both specific and hypothetical individuals in the vicinity of Hanford. The system design requirements, those things that must be accomplished, are defined. The system design specifications, the techniques by which those requirements are met, are outlined. Included are the basic equations, logic diagrams, and preliminary definition of the nature of each input distribution.

## ACKNOWLEDGMENTS

The author would like to acknowledge the efforts of D. L. Strenge in reviewing the basic approaches to the calculational scheme, and to J. W. Brothers, W. V. DeMier, and R. A. Burnett for practical advice on applications. A. M. Liebetrau and R. O. Gilbert provided information on incorporating statistical techniques in the computer code.

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## FIGURES



## TABLES

# 1.0 INTRODUCTION

The objective of the Hanford Environmental Dose Reconstruction (HEDR) Project is to estimate the radiation dose that individuals could have received as a result of emissions from nuclear operations at Hanford since their inception in 1944.(a) This report documents the algorithms that will be implemented for initial computer calculations.

In response to a directive from HEDR's Technical Steering Panel, the reconstruction of doses to offsite populations is being performed in a series of phases. The first phase is the development of basic techniques and proof of principle. The objective of Phase I is to demonstrate through calculation that adequate models and support data exist or can be developed to allow estimation of realistic doses to individuals from releases of radionuclides to the environment that occurred as long as 45 years ago. Later phases will expand the capabilities and refine the dose estimations. Much of the data being used in Phase I is preliminary or approximate and, therefore, the doses calculated must also be considered preliminary approximations. Within the constraints of Phase I, a computational methodology has been developed. This report documents the requirements that the resulting computer code must meet and outlines a method of meeting the requirements.

The work described in this report was conducted in accordance with the requirements of ANSI/ASME NQA-1 1986 Edition (ASME 1986), Quality Assurance Program Requirements for Nuclear Facilities, as interpreted by the Pacific Northwest Laboratory (PNL) Quality Assurance (QA) Program.

Development of the HEDR computer code(s) will be guided by the PNL QA program requirements, which are embodied in a series of Software Control Procedures (SCPs). There are seven applicable procedures, dealing with 1) determining and documenting software requirements (SCP-312), 2) final review and acceptance of codes and documentation (SCP-313), 3) software configuration management (SCP-314), 4) conversion testing, verification, and/or validation of software (SCP-315), 5) application control (SCP-316),

(a) The project is being managed and conducted by Battelle staff at the Pacific Northwest Laboratory under the direction of an independent Technical Steering Panel.

6) transfer of software, data, and documentation into and out of the project (SCP-317), and 7) control of databases (SCP-318).

Preparation of this document partially fulfills the requirements of SCP-312, which stipulates code design requirements, design specifications, data input and output, testing, and verification. Upon completion of the code, a Final Internal Development Review (FIDR) will be performed according to SCP-313, resulting in a documented review of the code for adequacy, applicability, and correctness. Following the FIDR, the code will be placed under configuration management, which controls methods of backup, storage, user access control, change requests, and updating. All applications of the code will be tracked and documented under the requirements of SCP-316.

All procedures used to support this report were written and controlled in accordance with PNL QA program requirements. Records that support the derivations in this report were created and stored in accordance with applicable HEDR Project record control requirements, including requirements on the generation of computer output, verification of computer codes, and review of all intermediate output.

Drafts of this document underwent internal independent technical review. Review comments were satisfactorily resolved, and there were no controversial resolutions to the comments.

## 2.0 SYSTEM DESIGN REQUIREMENTS

This section identifies the system design requirements needed to make the computer codes easy to use, compatible with current computer facilities, and well-suited to the calculational requirements of the project.

The goal of the project is the calculation of estimates of radiation dose, with associated variability and uncertainty, for both hypothetical Reference Individuals and actual Specific Individuals. For representative Reference Individuals, information is being developed on the basis of geographic location, age, lifestyle, ethnic group, and dietary habits. For Specific Individuals, additional information will be required on actual values for each of these data categories, along with definitions of the time frames of changes in each. It becomes immediately obvious that the number of variables and potential permutations is very large, and the level of detail is very fine, so a major undertaking is simply the control and explanation of this much information.

All final dose results are being provided in terms of a range of potential doses, with a distribution of expected values. The calculations incorporate the uncertainty caused by both natural variability and lack of knowledge.

### 2.1 GENERAL COMPUTATIONAL APPROACH

Appropriate scales for spatial and temporal resolution have been identified. Recent similar projects that attempt to reconstruct doses for releases of radionuclides from the Department of Energy's (DOE's) Nevada Test Site have used county-level grids, with specific locations sometimes superimposed (Dose Assessment Advisory Group 1987). For releases from the Hanford facilities, it was quickly determined that the county grid would be too coarse because atmos-pheric concentration and deposition could be shown to vary significantly within individual counties. A simple rectilinear grid, such as that used in most atmospheric dispersion models, was found to be too inflexible; that is, no grid could be devised that did not have such undesirable features as splitting major population centers. Demographic data are mostly available from the U.S. Census Bureau, and census subdivisions

were found to be essentially unchanged over most of the potential study period from initiation of Hanford operations in 1944 to the present. The census subdivisions were originally developed by the Census Bureau to create stable enumeration districts. Consideration was given in their development to trade and service areas, principal settlements, major land uses, and physiographic differences. Additionally, the census tracts tend to follow political boundaries such as township and range lines, which in much of the potential study area also tend to follow a fairly regular grid pattern. Each of these characteristics is favorable for use by the project with the added advantage of tending to follow a regular grid. Therefore, the census subdivision was selected as the basic unit of spatial area, with some minor modifications (usually combinations of very small adjacent subdivisions, although decomposition of large areas into smaller ones was also done). A map of the initial subdivisions selected for study is shown in Figure 2.1.

Selection of a unit of temporal measure proceeded in a manner similar to that for spatial resolution. The Hanford releases have for the most part been routine and continuous. Meteorological data used to describe the atmospheric transport of released radionuclides are available for 15-minute intervals for much of Hanford's history. Census data on locations and numbers of exposed individuals are available for every decade since 1944. For some time periods, data on releases from the Hanford facilities and monitoring of environmental contamination resulting from those release are available from archived monthly reports. However, other information cannot be expected to be so well documented. Reference dietary data are available, at best, on a seasonal basis. For lifestyle surveys, also, it seems unreasonable to expect most people to remember habits and activities up to 45 years ago on anything more than a seasonal or monthly basis. Based on these considerations, therefore, the month was selected as the project's unit of temporal resolution.

For the Phase I work to date, the 10-county area shown in Figure 2.1 has been investigated. The years of initial interest have been 1944-1947 for the atmospheric releases and 1964-1966 for the surface water releases. These were selected to represent periods of relatively high release and, in the case of the surface water releases, comprehensive monitoring data.

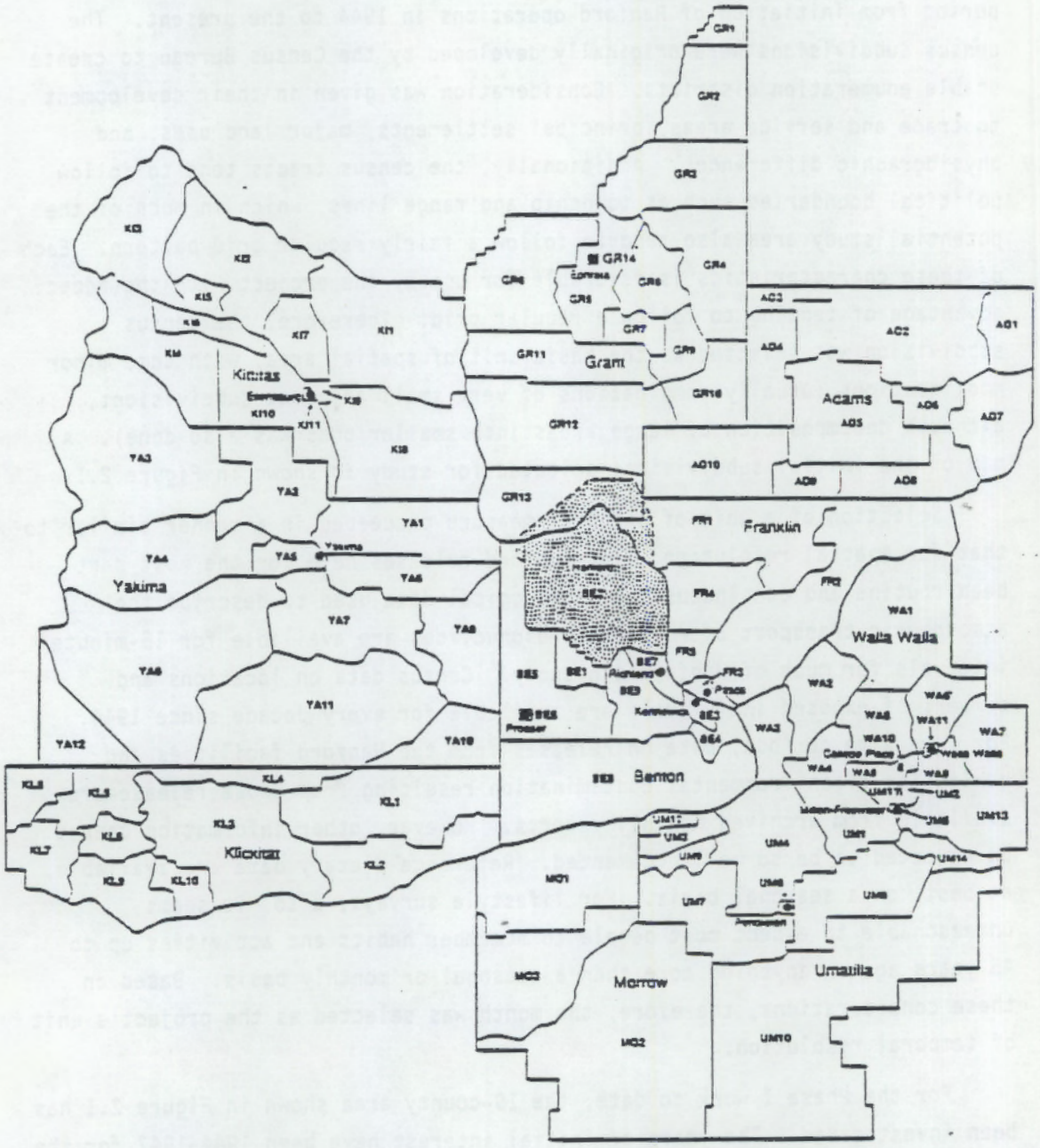



FIGURE 2.1. HEDR Census Divisions

## 2.2 COMPUTATIONAL FACILITIES, HARDWARE, AND DATABASES

The computer code shall be designed for implementation on the PNL Y-VAX in conjunction with the Sequent database system. The code shall be secondarily designed for in-house microVAX and other minicomputer systems. If it is necessary to improve data processing speeds, provision should be made for the code to run on the NAS-9060 LSIS (large-scale information system) Cray computer.

Input data will be generated in several of the technical tasks on the project. Each task will be responsible for maintaining its own separate database and transferring the documented results to the main HEDR database. The main HEDR database should be kept on a central PNL mainframe, such as the Sequent system in the Sigma V Building. A database management system, e.g., Oracle, should be considered for controlling and accessing this data.

Because of the large quantities of spatially related data that must be maintained and analyzed, provisions shall be made to adapt the calculated outputs to a Geographic Information System (GIS). Input and output data stored in a coherent form on the Sequent should facilitate transfer to a GIS.

## 2.3 CODE LANGUAGE

The computer code shall be written in standard ANSI FORTRAN-77 language. This choice will facilitate the communication and understanding of the code calculations, conversion to other computing systems, modifications to the code, and necessary updating.

## 2.4 CODING STANDARDS

Programming shall follow the guidelines of the following coding standard. This coding standard is intended to provide a concise, uniform, and complete form of documentation and quality control; to streamline review efforts; and to simply software maintenance. All FORTRAN routines shall consist of three blocks:

1. Definition block (routine name, limitations and prerequisite, arguments, logical names and files used, routines used),

2. Implementation block (development information, modification history, algorithms, constants, parameter statements, common blocks, and variables), and

3. Code block (data statements and executable statements).

Where applicable, the programmer should

- localize system-dependent calls
- avoid dependency on internal word size
- place constants in an up-front parameter file
- put variables in common blocks
- use logical device names in front of file names
- hold to a limit of one routine per file.

## 2.5 DATA INPUT

The code will need to access the following types of information in arrays of data logically prepared as functions of spatial location and time period:

Source Terms

- source terms by radionuclide (probably only two or three nuclides in Phase I, up to 20 later)
- number of curies released for each month
- associated low and high estimates for each nuclide and time period
- atmospheric releases assigned to a single location mid-site for Phase I.

Transport

- atmospheric dispersion data in terms of time integrated air concentrations, curie-second/cubic meter per curie released at each location for each month
- best estimate and uncertainty descriptors given as the mean and standard deviation of the logarithm (base 10) of the time-integrated air concentration

- atmospheric deposition data in terms of monthly averaged deposition rates, curies/square meter/second per curie released at each location for each month

- cumulative atmospheric deposition data in terms of curies/square meter at the end of each month per curie released at each location for each month

- best estimate values and an uncertainty descriptor - The transport model will perform this calculation on a single-month basis and the subsequent software models will aggregate the running total in order to allow the statistical portion of the calculation to proceed.

- river water concentrations in terms of curies/liter monthly average with an uncertainty descriptor for each river-adjacent location (approximately one for each river-adjacent census tract)

- sediment concentrations in terms of curies/square meter monthly average, if available (probably not available for Phase I) with an uncertainty descriptor for each river-adjacent location.

Monitoring Data

- measured vegetation concentrations in terms of curies/kilogram monthly average for each location - This requires prior averaging of data, which results in a distribution descriptor. This is likely to be a sparse matrix.

- measured fish concentrations in terms of curies/kilogram monthly average at each of the locations used above for water and sediment concentrations - This requires prior averaging of data, which results in a distribution descriptor. This has the potential to be a fairly sparse matrix.

- for later phases, measured air concentrations in terms of curies/cubic meter for each location for each month - This requires some averaging of data, which should result in a distribution descriptor. This is likely to be a sparse matrix.

- for later phases, measured animal product concentrations in terms of curies/kilogram or liter for each location for each month - This requires some averaging of data, which should result in a distribution descriptor. This is likely to be a sparse matrix.

Demography and Food Habits

- animal feeding practices (kilogram/day per animal for each feed type) by location and month - Five feed types will be used for Phase I. Associated uncertainty descriptors will be defined as high and low estimates.

- for later phases, feed distribution arrays (the fraction of feed consumed in one location that is produced in another location) by feed type and month - Associated uncertainty arrays, probably high and low estimates. This may be a sparse matrix. For Phase I, it will be assumed that all feeds are produced locally.

- milk accumulation arrays, the fraction of milk received at a distribution center (dairy) from each location - We anticipate about 20 dairies for Phase I. Associated uncertainty arrays, probably high and low estimates. This may be a sparse matrix.

- milk distribution arrays, the fraction of milk available to be consumed in each location from each distribution center - We anticipate about 20 dairies for Phase I. Associated uncertainty arrays, probably high and low estimates. This may be a sparse matrix.

- dietary consumption rates, in terms of kilograms/month for each food type, as a function of age, sex, lifestyle, and month. Associated distributions derived from the 1977 National Food Consumption Survey.

Environmental Pathways and Doses

- radiation dose factors in terms of rem/curie ingested or inhaled, by age and sex - There will probably be only two age groups in Phase I. Uncertainty distributions parameterized as log-normal.

## 2.6 OUTPUT REQUIREMENTS

Radiation doses will be calculated for various intakes of radionuclides, including uptake by the body, distribution and retention of the radionuclides in various organs, and information on the resulting dose in the various organs from radionuclide decay in other organs. Seven age groups, based on the resolution provided by available data (with the inclusion of fetal thyroid), will eventually be used for interpolation to specific ages. For Phase I, only the adult and infant categories are being investigated. Provisions for the age groups shown in Table 2.1 will be made in the code structure. Each age group is also subdivided into male and female, with the adult female further subdivided into pregnant and non-pregnant. Dosimetry for male and female children through about age 15 will be the same; the only potential variable would be uptake if there is a sex difference in food consumption. After age 15, the dosimetric calculations vary, as well. The number of people in the seven age groups will be provided for each of the major

TABLE 2.1. Age Groups Included in Code Structure

| Age Group | Age | Nominal Mass |
|---|---|---|
| Prenatal | 0 - 270 days | Variable |
| Newborn | About 0 days | 3.4 kg |
| 1 - 4 yr | 1 yr | 9.8 kg |
| 5 - 9 yr | 5 yr | 19 kg |
| 10 - 14 yr | 10 yr | 32 kg |
| 15 - 20 yr | 15 yr | 55 kg (58 kg adult female) |
| Adult | 20+yr | 70 kg (male) |

subpopulations defined below, subdivided by spatial location on the census subdivision grid.

2.6.1 Population Groups

Population groups specifically identified in the HEDR Work Plan approved by the TSP include Native American tribes, Army personnel stationed at Hanford, unbadged Hanford construction workers, migrant workers, and the general population. The subcategories of population groups included in Table 2.2 are required. Those having a higher emphasis are needed for the Phase I study area in FY 1989-1990. Those having lower emphasis will be addressed in future work; however, this does not preclude some data collection when appropriate.

The groups of higher emphasis are being investigated for each of the census subdivisions within the Phase I 10-county study area. Each will be

TABLE 2.2. Population Groups Emphasized in Code

| Subpopulation | Emphasis | Additional Notes |
|---|---|---|
| General population | Higher | Air and river releases |
| Native Americans | Higher | Air and river releases |
| Unbadged site workers | Lower | Air releases |
| On-site military | Lower | Air releases |
| Migrant workers | Lower | Air and river releases |

further subdivided into the lifestyle categories, urban and rural. With the number of subpopulation categories, and the very limited occupation information available, a further breakdown probably could not be supported by the data at this time. We have deliberately not included race as a discriminator for Phase I.

### 2.6.2 Food Types

The consumption of contaminated food was a major pathway of exposure for people who lived in the Hanford area during the years 1944-1947. A number of different general food types, which were identified as potentially important, are typically used in radiological evaluations and are available in the preliminary mathematical models being used for HEDR sensitivity studies and Phase I initial development. For each subpopulation/age/sex/lifestyle category, distributions of monthly consumption rates of the locally produced foods listed in Table 2.3 are required. Because of the similarity of the lists of general population and Native American foods, the same basic models will be used for each. All foods will be examined as both fresh and stored.

## 2.7 GRAPHICS

Although no graphics have been explicitly identified as necessary, a future need is expected for displaying numbers calculated by the computer code, for instance, a plot of air concentration versus distance from the point of release. A mechanism shall be designed to retain output in files for later graphics applications.

## 2.8 DOCUMENTATION AND INSTRUCTIONS

Documentation shall be prepared during code development. Documentation shall include code algorithms as well as a user manual that is updated as changes are made. A record of changes made once the code is under configuration management shall be retained as project records.

## 2.9 ERROR MESSAGES

Error messages shall assist the user when improper input parameters or formats are used, or when illegal calculations are requested. All input

TABLE 2.3. Local Foods Requiring Calculation of Monthly Consumption Rates for Population Categories

General Population
- Leafy vegetables
- Other (protected) vegetables and root vegetables
- Legumes (if they can be broken out of other vegetables)
- Grains (generally dried and stored)
- Orchard fruits, berries, melons
- Milk (subdivided into cow and goat, if possible)
- Eggs
- Beef, pork, lamb
- Poultry
- Fish
  - -anadromous
  - -piscivorous
  - -benthic
- Any other aquatic biota

Native American
- Exposed produce (leafy vegetables, pine moss, etc.)
- Other vegetation (roots, bulbs, etc.)
- Legumes (if available)
- Grains and seeds
- Fruit, berries, melons, etc.
- Milk (subdivided, if possible)
- Eggs (chicken and others as applicable)
- Beef, pork, lamb, elk, deer, other native mammals
- Birds (including chicken, pheasant, partridge, quail, geese, etc.)
- Fish
  - -anadromous
  - -piscivorous
  - -benthic
- Other aquatic biota (freshwater clams, any water plants, etc.)
- Miscellaneous other protein sources

errors shall be identified by the input routines prior to main program execution. Messages shall identify the issuing subroutine and provide a concise definition of the error.

## 2.10 UPDATES AND REVISIONS

Notices of code updates and revised instructions shall be provided to known users. A list of potential users shall be maintained so that revisions and notices may be distributed as appropriate. This shall be performed by a designated code custodian.

## 2.11 SECURITY

The computer code and associated databases are to be considered sensitive. Security measures shall be implemented to protect the code from access by unauthorized users. A control mechanism with sign-off procedures shall be implemented to protect the software from unauthorized modifications. Needed changes shall be verified before modifications are permitted to the final versions.

## 3.0 SYSTEM DESIGN SPECIFICATIONS

The computer codes developed for Phase I of the HEDR Project are to be fully modular and stochastic (using Monte Carlo techniques). The codes will use distributions of input data and produce dose estimates in the form of distribution rather than simply producing deterministic (single-point) estimates.

A simplified project diagram for calculating doses from atmospheric releases is shown in Figure 3.1. Generic pathways are submersion in contaminated air, inhalation of contaminated air, exposure to surfaces contaminated from atmospheric deposition, consumption of contaminated food crops, and consumption of contaminated animal products. Animal products such as milk are complicated by the fact that the feed consumed by the animal may come from areas distant from the animal's location, and the milk itself may be shipped to accumulation centers and then redistributed.

A similar diagram has been prepared for surface water releases (Figure 3.2) and similar pathways are considered: immersion (swimming or boating) in contaminated water, drinking of contaminated water, consumption of fish and other aquatic foods, and consumption of foods contaminated via irrigation with contaminated water. The overall calculation of radiation dose will be the sum of parallel pathway calculations. Parameterization of each of the terms in the equation is described in this section.

The initial calculation of dominant radionuclides indicates no important decay chains that cannot be treated as either single radionuclides or pairs in equilibrium (Napier 1989). For the equilibrium pairs, the decay energies of the daughter can be effectively considered to be included in the energies of the parent. Therefore, calculation of radioactive decay in the HEDR Monte Carlo routines is greatly simplified. Decay can be explicitly written into each module as a simple exponential term.

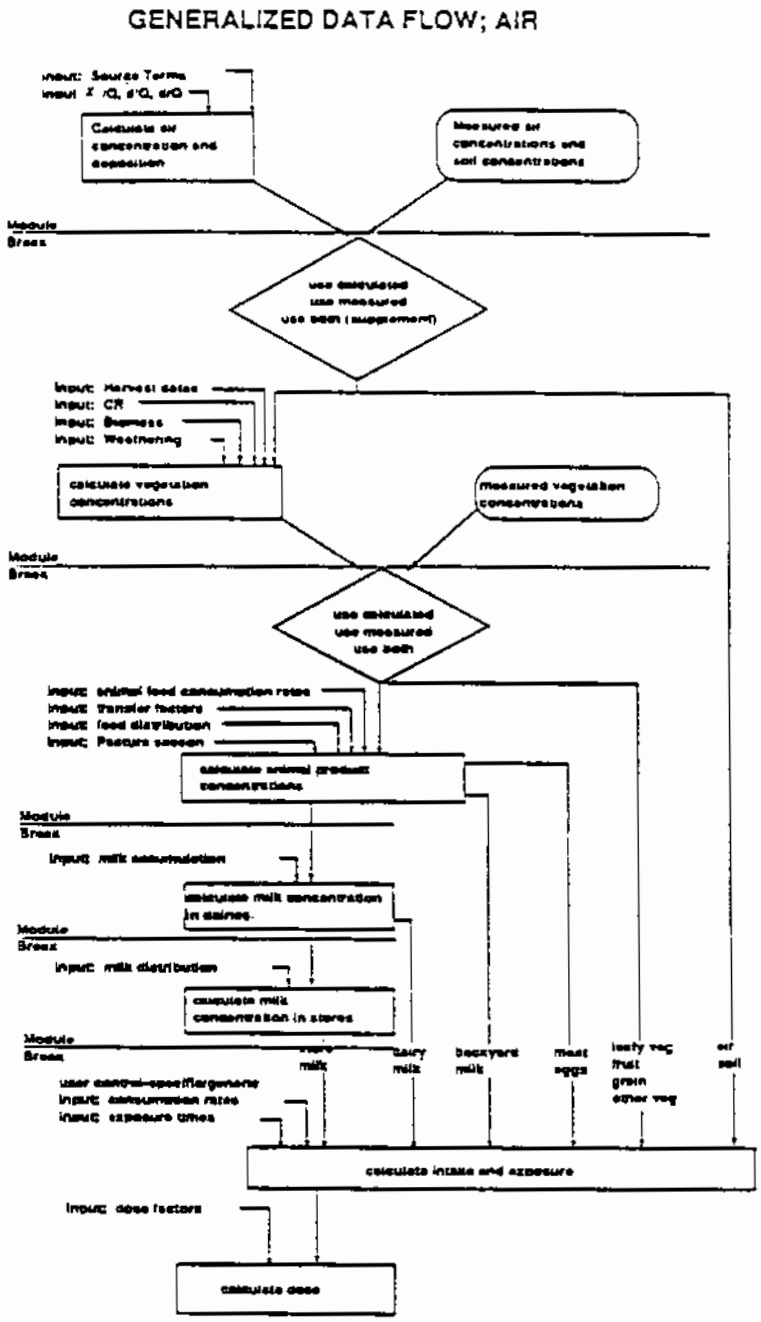



FIGURE 3.1. Project Steps Required for Calculating Doses from Atmospheric Releases of Radionuclides

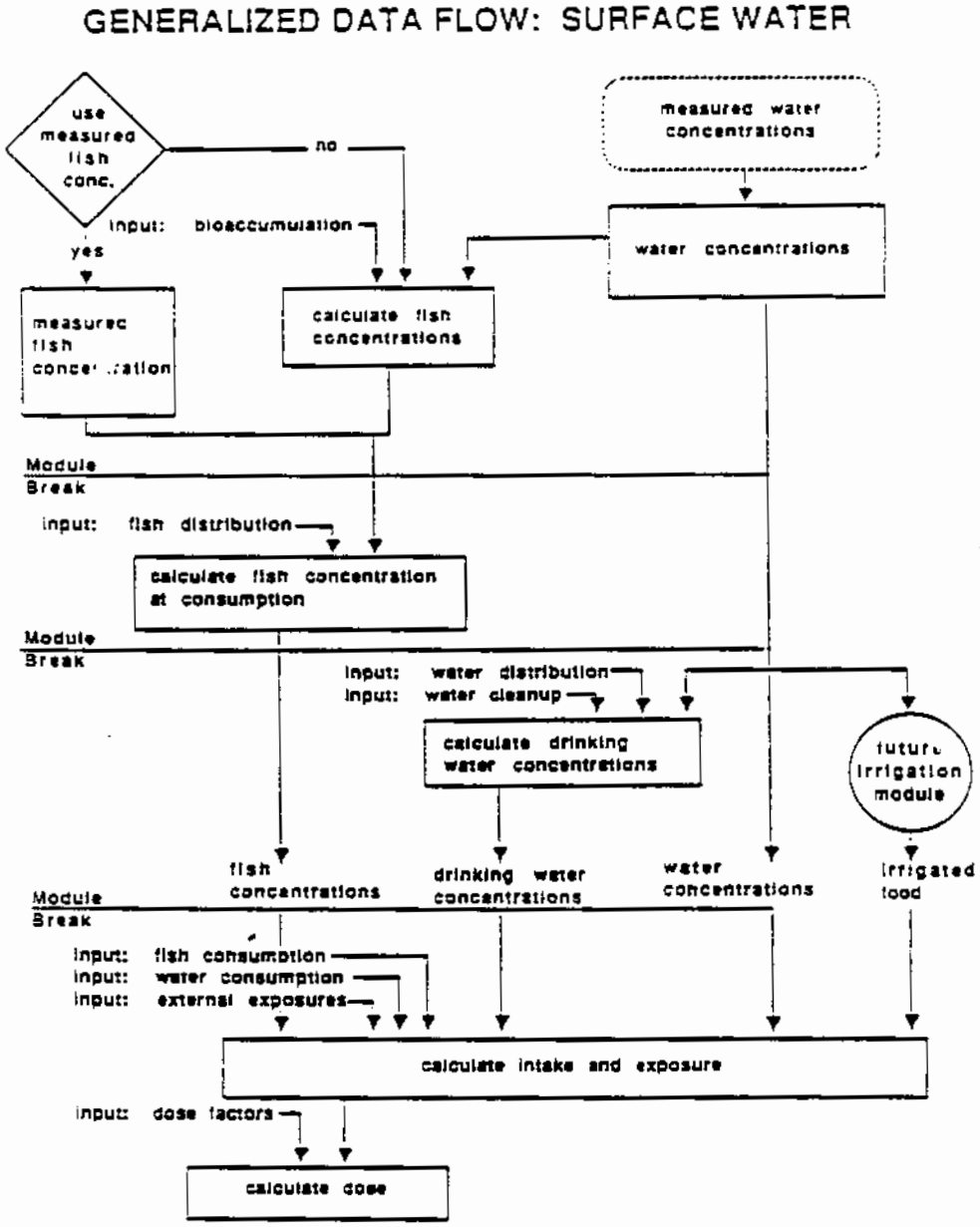



FIGURE 3.2. Project Steps Required for Calculating Doses from Surface Water Releases of Radionuclides

## 3.1 ATMOSPHERIC RELEASE MODEL

The logic diagram of Figure 3.1 indicates "module breaks" for individual portions of the calculation. These represent individual portions of the computer code that can be run in a stochastic simulation (Monte Carlo analysis). There are three reasons for structuring the calculation with module breaks: the interdependence of information, the need to input data during calculations, and the use of the code in another ongoing Hanford study.

Because of the interconnected nature of the cow feed/milk distribution model, no doses can be calculated for individuals in a particular census subdivision without knowledge of the environmental conditions in many other locations. The calculation has been structured so that repetitive calculations are minimized, and information on the potential distributions of environmental parameters such as air concentration, vegetation concentration, or milk concentration can be saved and examined for each time period.

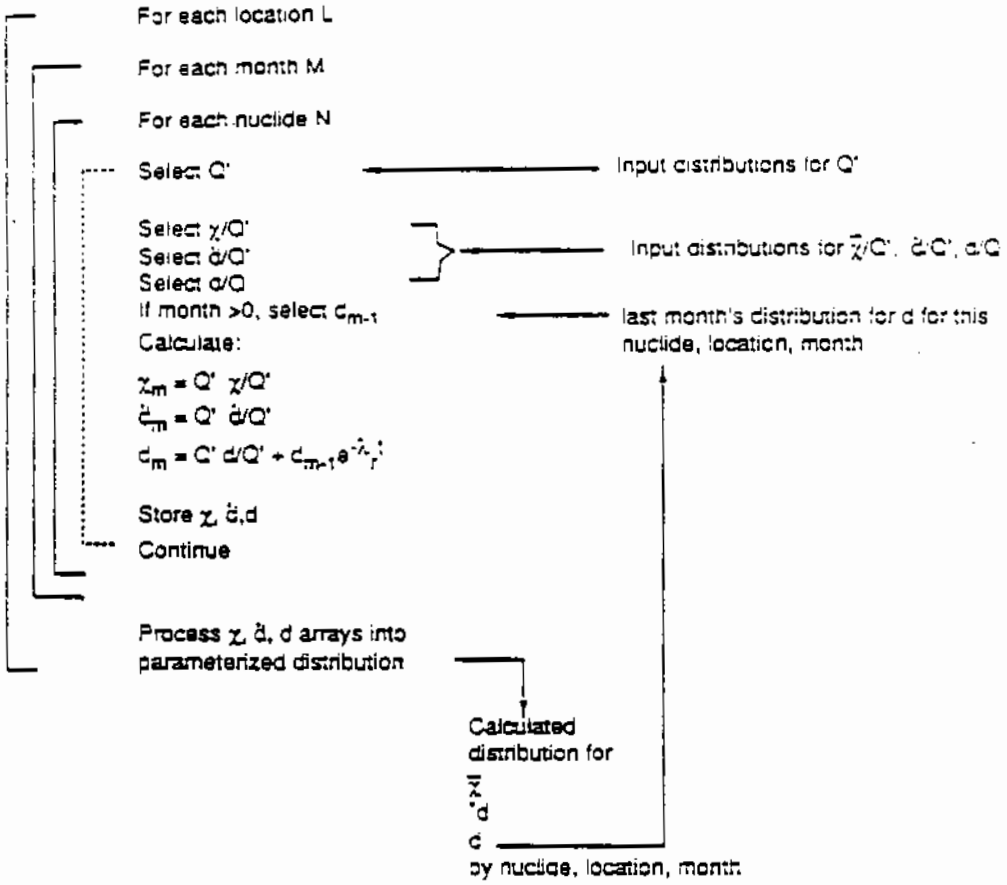
A second reason for the structure of the model is that it allows the input of either calculated or measured data at each step of the calculation. Where monitoring data are available, it makes sense to rely on it rather than on simulated data. However, since the monitoring is not complete over all times, locations, and pathways, the structure allows use of measurement data supported by calculations when necessary.

This structure also supports the calculation of doses to both reference individuals and specific individuals. This is important because the dose reconstruction project supports a parallel project being conducted by the CDC, which is investigating potential thyroid morbidity caused by the early Hanford releases. The a CDC contractor will be interview-ing many individuals about their past lifestyle and dietary habits and attempting to correlate dose with thyroid disease. The HEDR computational model will be used for the calculation of doses for those interviewed by the CDC's contractor.

### 3.1.1 Module 1: Atmospheric Transport and Deposition

The proposed logic for Module 1 is illustrated in Figure 3.3. The objective of this module is to initiate calculations by providing

MODULE 1: ENVIRONMENTAL TRANSPORT




Notes: 1) dotted line ( _____ ) indicates Monte Carlo routine
2) "Select" means pick from distribution systematically
3) "Store" means add to histogram array
4) "Process" means convert stored histogram array into a mean + standard deviation or other distribution parameters and save as output.

FIGURE 3.3. Proposed Logic for Module 1: Environmental Transport

time-integrated air concentrations, deposition rates, and month-end concentrations of radionuclides on the ground for each of the census divisions and monthly increments. (See Appendix A for equations used in calculating these parameters.) The solid lines in Figure 3.3 represent the computer looping structure, i.e., the code routines which repeat the same type of calculations for each location, each month, and each radionuclide. The dashed line indicates that portion of the code that must operate in a Monte Carlo fashion, repetitively calculating multiple values of each output variable on the basis of randomly selected parameter values from the multiple input distributions. The inputs to this module are the source-term vectors and atmospheric dispersion, deposition rate, and month-end deposition arrays described in Section 2.5. The techniques for selecting realizations from these distributions for the Monte Carlo analysis are defined in a memo by A. Leibetrau (see Appendix B).

The definitions of the equations for calculating air concentration, deposition rate, and total month-end ground deposition are presented in Appendix A. Variables and units are also presented. The anticipated nature of each of the input distributions is presented in Table 3.1.

The output of Module 1 will essentially contain intermediate values for input to Module 2. Output shall be stored in the form of histograms of the Monte Carlo results. The use of histograms provides a convenient mechanism for storing arbitrary distribution shapes. Histograms should contain a minimum of 20 bins. A memo by A. Leibetrau defining the nature of storing and retrieving data from histograms is provided as Appendix C.

Source terms for Phase I will include only iodine-131. Allowance should be made in the code for expansion to additional radionuclides, as illustrated in Figure 3.3. Atmospheric transport results for Phase I will be the result of an interim model. In later phases, it may be found to be more convenient to combine source terms with dispersion modelling. The modular structure of the HEDR code should allow this with minimal disruption.

TABLE 3.1. Anticipated Parameter Distribution Types for Module 1

| Parameter Distribution | Type of Data Input |
|---|---|
| $\chi$ / Q' | Lognormal |
| $\dot{}_d$ / Q' | Lognormal |
| d / Q' | Lognormal |
| Q' | Triangular |
| $\lambda_r$ | Constant |
| $\chi$ | Calculated Histogram |
| $\dot{}_d$ | Calculated Histogram |
| d | Calculated Histogram |

### 3.1.2 Module 2: Vegetation Concentrations

The proposed logic of Module 2 is shown in Figure 3.4. The purpose of this module is to calculate or input concentrations of radionuclides on vegetation. The nomenclature of this figure is the same as that of Figure 3.3. Input to this module may be either the histograms of deposition rate and total deposition from Module 1 or measured values of air concentration from the monitoring database. For Phase I, it may be assumed that no monitoring data will be available, but the coding should anticipate the possibility that it may become available in later phases. Vegetation types that must be considered are those for human consumption (leafy vegetables, other vegetables, fruits, and grains) and for animal consumption (grains, pasture grass, silage, and alfalfa hay). The grains for human and animal consumption may be considered to be the same. An additional category, sagebrush, will be added to allow direct comparison to monitoring measurements.

The equations to be used for Module 2 are presented and the parameters defined and units given in Appendix A. Additional detail on the interception/retention model is presented in a memo by B. A. Napier provided as Appendix D. These equations are derived from differential equations of the rate of increase and weathering of the various types of vegetation. They have been integrated over the monthly time increment to a quasi-steady-state formulation. Important parameters include time-dependent biomass, rates of wash-off and weathering, and soil-to-plant concentration ratios. Provision should be made to incorporate periodic harvesting of certain types of

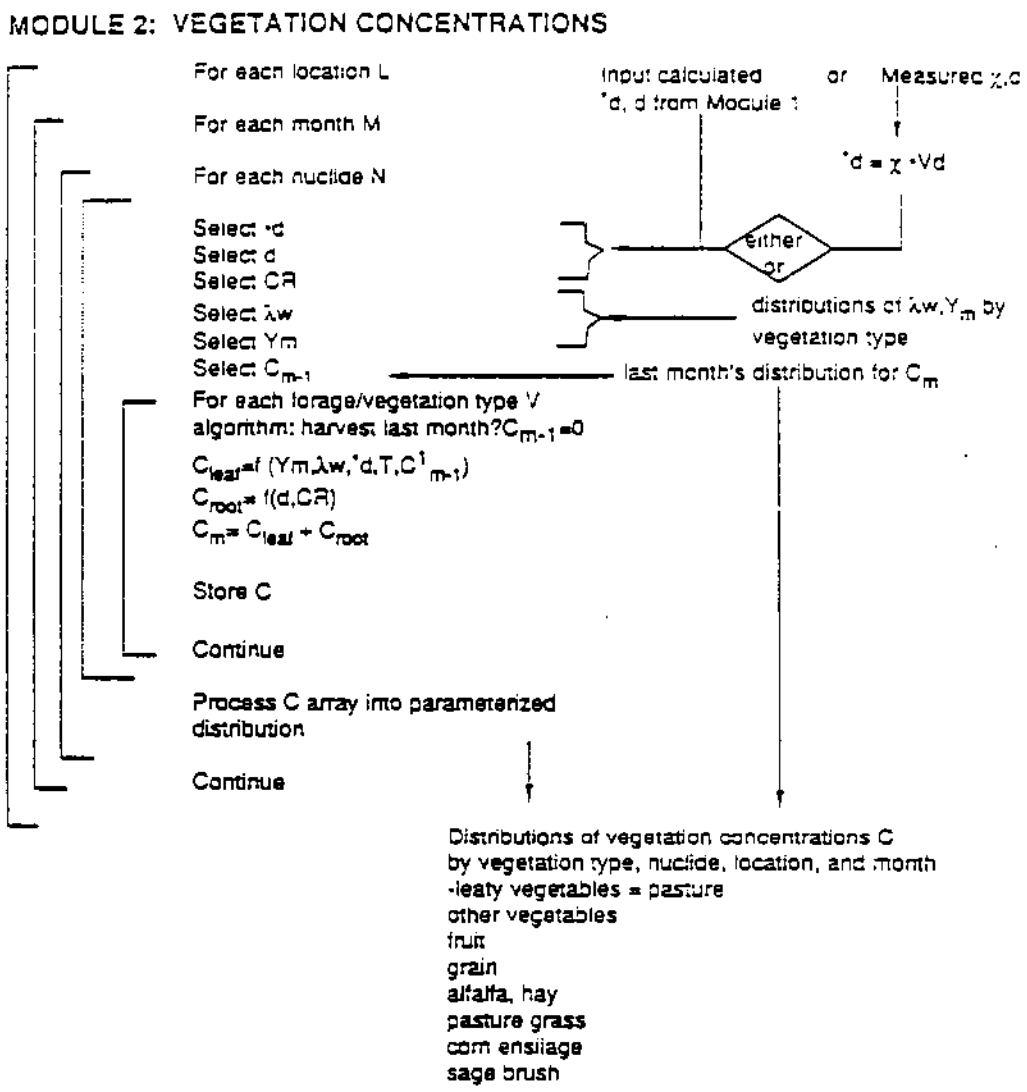



FIGURE 3.4. Proposed Logic for Module 2: Vegetation Concentrations

vegetation by biomass reduction and concentration reduction. The anticipated distributions of the input parameters are provided in Table 3.2.

### 3.1.3 Module 3: Animal Product Concentrations

The proposed logic structure for Module 3 is given in Figure 3.5. The purpose of this module is to calculate concentrations of radionuclices in meat, milk, and eggs produced in each census division for each monthly increment. Input to this module is either calculated vegetation concentrations from Module 2 or measured vegetation concentrations from the monitoring database. Data structures for monitoring data should be established in formats similar to those for the calculated values. These may be used to supplement or replace the calculated values. Additional input shall include information on the diets of farm animals as a function of location and time, provided to the main database by the Demographics, Agriculture, and Food Habits Task. (In later phases, this will include feed transport between census divisions.)

TABLE 3.2. Anticipated Parameter Distribution Types for Module 2

| Parameter Distribution | Type of Data Inout |
|---|---|
| $T_p$ | Constant for leafy vegetables, alfalfa, forage, ensilage, sagebrush |
| $Y_m$ | Constant for each plant type and month |
| $\lambda_w$ | Triangular |
| $B_v$ | Triangular distributions of Log(10) B |
| P | Constant |
| $C_m$ | Calculated histogram |
| K | Constant for each plant type |

MODULE 3: ANIMAL PRODUCT CONCENTRATIONS

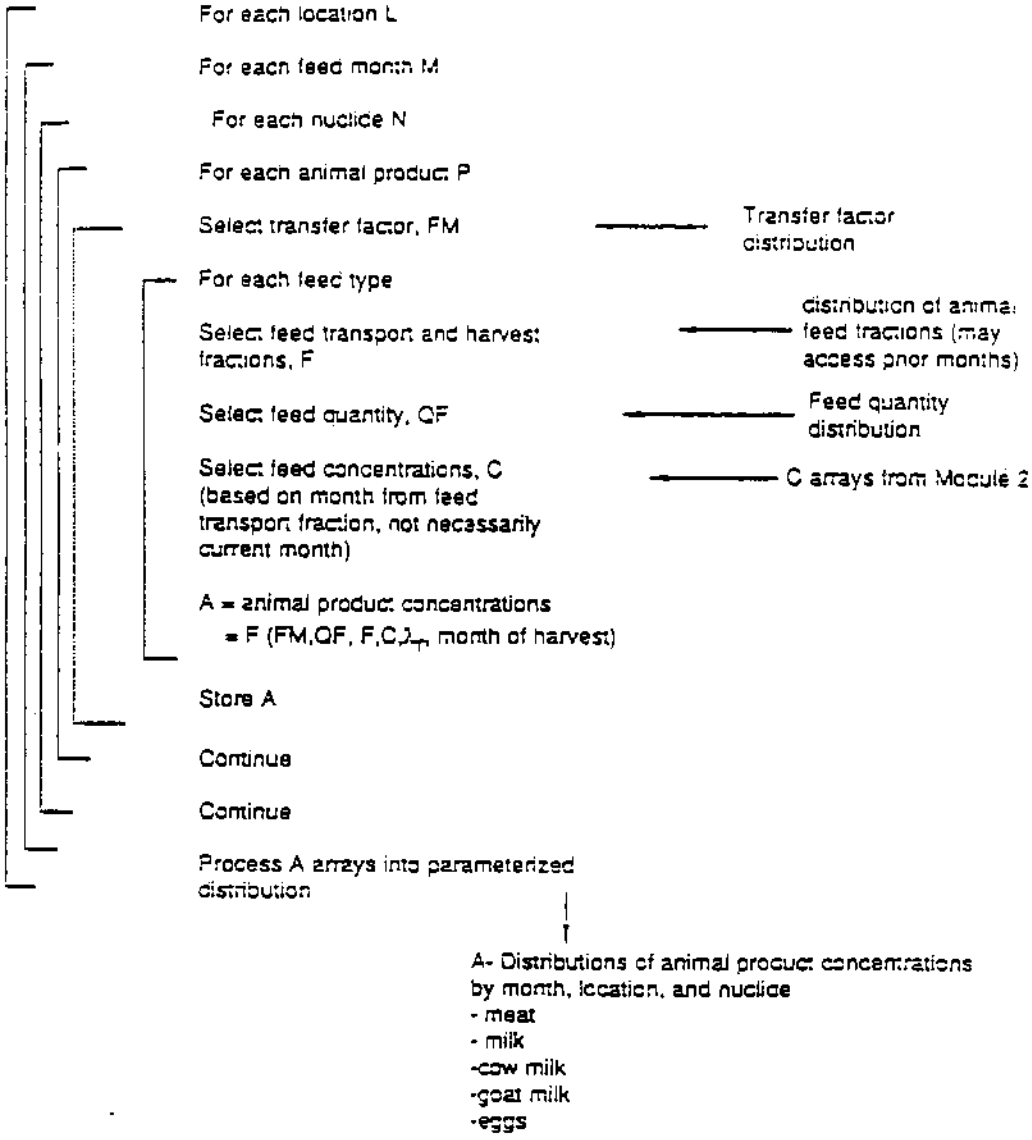



FIGURE 3.5. Proposed Logic for Module 3: Animal Product Concentrations

The equations to be used in Module 3 are listed in Appendix A, with parameter definitions and units. Provision should be made for calculation of concentrations in meat, poultry, eggs, and milk. Milk may be assumed to be produced by cows or goats. Cows must be assumed to eat several types of diets. Each diet will be defined as a sum of fractional feed type intakes. The fraction of each feed type eaten by the various animals may be graphically represented, as illustrated in Figure 3.6. Currently, four feeding regimes are planned to be provided by the Demographics, Agriculture, and Food Habits Task.

Anticipated parameter distributions to be used as input to Module 3 are presented in Table 3.3.

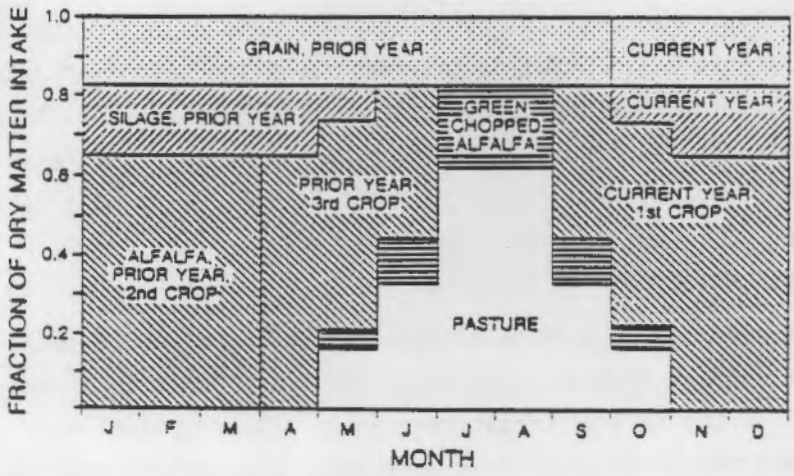



FIGURE 3.6. A Food-Chain Model to Predict Radionuclide Ingestion (Whicker and Kirchner 1987)

TABLE 3.3. Anticipated Parameter Distribution Types for Module 3

| Parameter Distribution | Type of Data Input |
|---|---|
| $f_t$ | Triangular |
| Qf | Triangular |
| $FM_p$ | Log-normal |
| Aml | Calculated histogram |

The use of fractional intakes of various types of feed introduces a minor complication within the Monte Carlo routine for Module 3. Each of these fractions has its own distribution. The results of the selection process of the fractions must, however, sum to 1, which implies a correlation structure. The means of handling this implied correlation is described in a memo by B. A. Napier, provided as Appendix D. This approach may be used in subsequent modules, as well.

The output of this module may be used directly in Module 6 (meat, eggs, and milk from backyard cows) or as input to Module 4.

### 3.1.4 Modules 4 and 5: The Milk Accumulation/Distribution Model

Milk produced in the various census divisions may be combined or pooled at creameries (milk-bottling plants). The proposed logic structure for Module 4 for handling the calculations in concentration of brand-name milk is presented in Figure 3.7. Input to this module is the output of Module 3, along with extensive data on sources of milk for creameries, from the Demographics, Agriculture, and Food Habits Task. Output of this module is the concentration of milk from each creamery in the Phase I study area as a function of time. This may be used directly in Module 6, if the milk source is known by name, or as input to Module 5.

Calculation of doses to certain classes of individuals will require knowledge of the average concentration of all milk available in a census tract. Module 5 is the milk distribution module. The proposed logic structure for this module is given in Figure 3.8. This module requires as input the pooled milk concentrations of Module 4, and a milk distribution database that is conceptually the inverse of that used to collect milk in Module 4.

Equations and parameter definitions for Modules 4 and 5 are presented in Appendix A. The anticipated distribution types of the variables for Modules 4 and 5 are listed in Table 3.4.

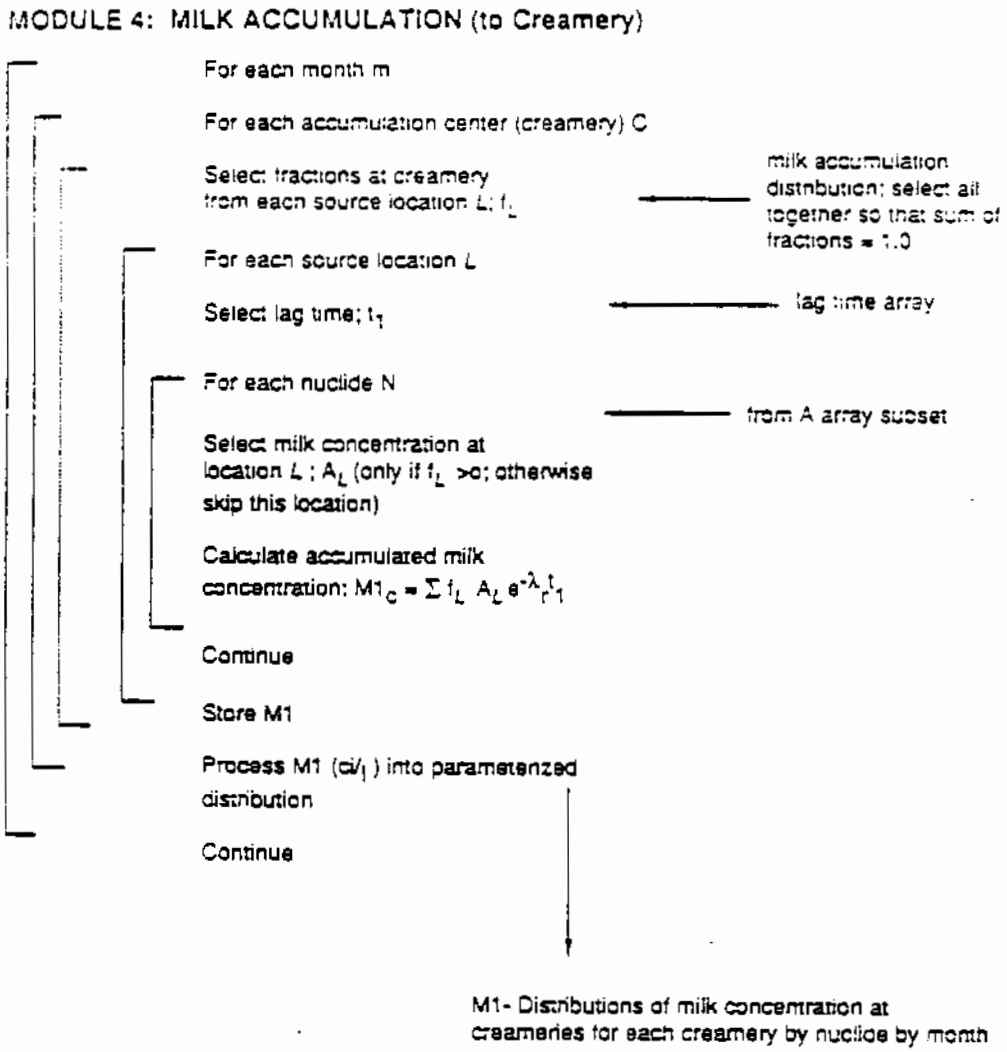



FIGURE 3.7. Proposed Logic for Module 4: Milk Accumulation at Creameries

MODULE 5: MILK DISTRIBUTION (to stores at each location)

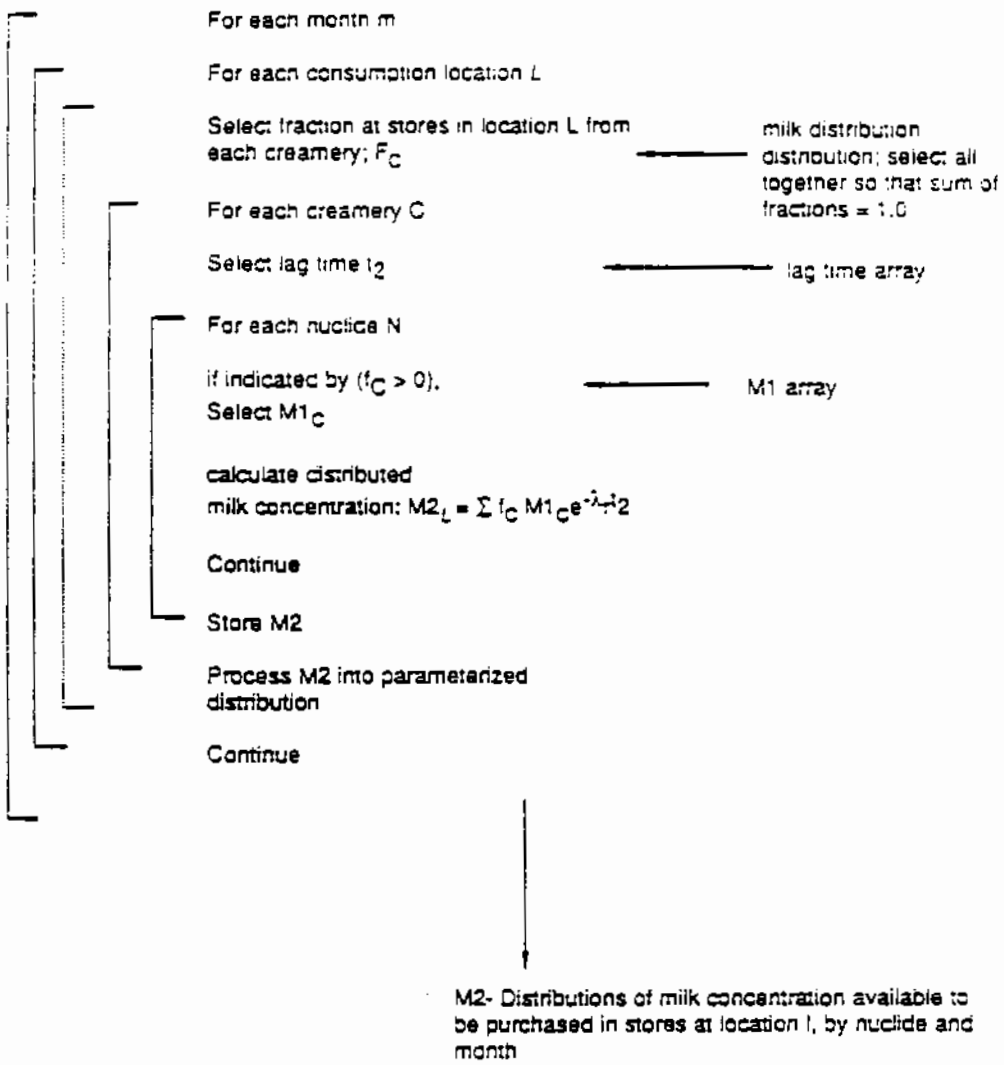



FIGURE 3.8. Proposed Logic for Module 5: Milk Distribution to Stores in Each Census Tract

TABLE 3.4. Anticipated Parameter Distribution Types for Modules 4 and 5

| Parameter Distribution | Type of Data Input |
|---|---|
| t1 | Triangular |
| t2 | Triangular |
| t3 | Probably = t2 |
| $f_i^c$ | Triangular |
| $F_i^g$ | Triangular |
| M0 | Calculated Histogram |
| M1 | Calculated histogram |
| M2 | Calculated histogram |

### 3.1.5 Individual Exposure and Dose

Modules 1 through 5 establish the environmental concentrations of radionuclides in environmental media for all census subdivisions and months of interest. Module 6, however, introduces humans exposed to the radionuclides. Module 6 is designed for the calculation of doses to either "reference" or "specific" individuals. (Note that for Phase I, only input data for reference individuals will be available.) The proposed logic structure for Module 6 is shown in Figure 3.9. Inputs to this module are the outputs from all prior modules, plus an extensive database of generic consumption and exposure rates for each category of individual type (age, sex, and lifestyle) developed by the Demographics Task. For calculations to reference individuals, exposure conditions shall be selected stochastically from this database. For calculations to specific individuals, specific input values or distributions will be used, where known, and data from the generic database will be used for unspecified or unknown parameters.

Equations to be used for dose calculations are provided in the system design outline for Module 6 (Appendix A). These equations describe dose via inhalation and exposure to contaminated air, irradiation by contaminated surfaces and soils, and ingestion of local farm products. Note that, for this phase of the code development, the formulations imply that all foods other than milk are produced in the census tract in which they are consumed.

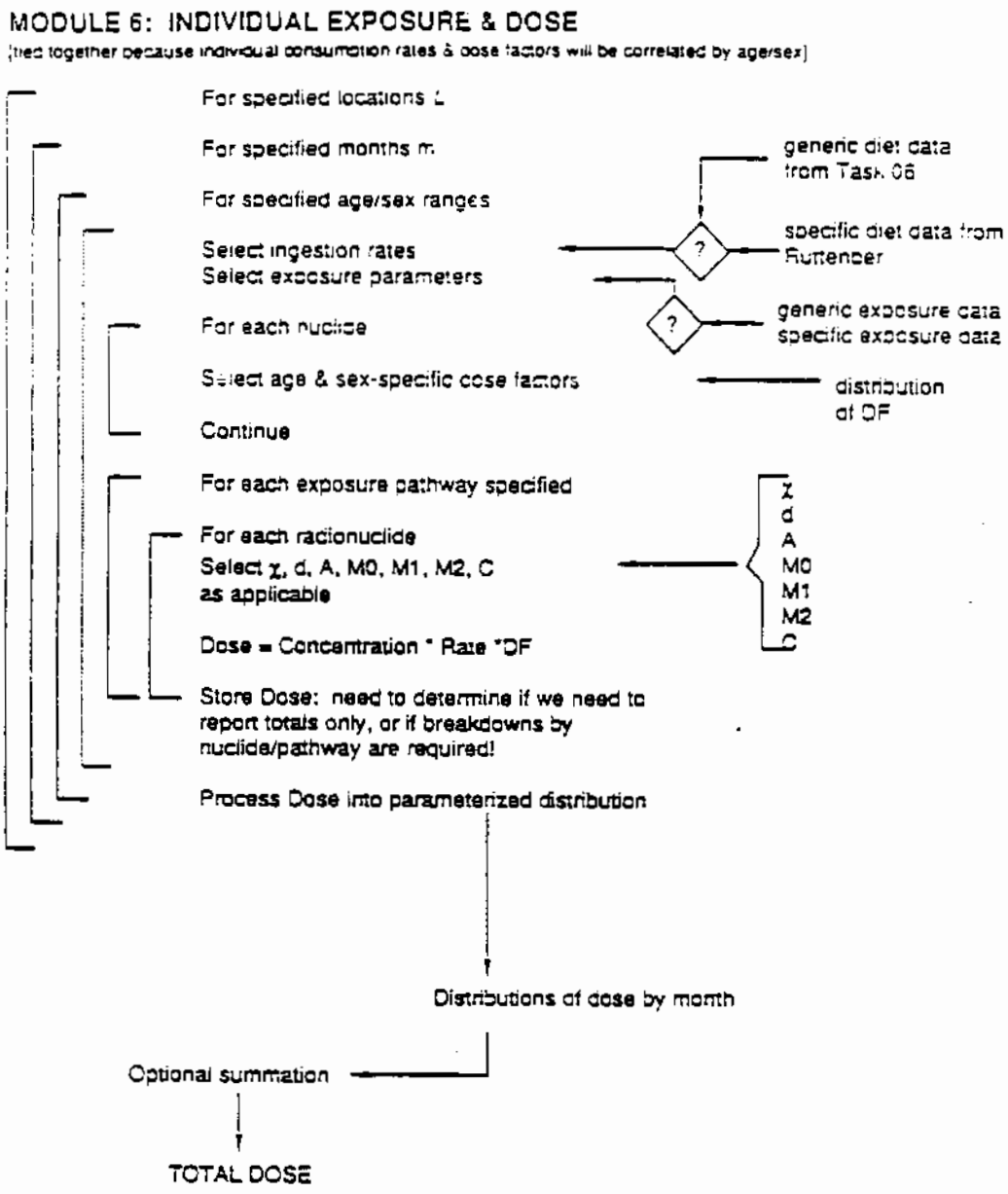



FIGURE 3.9. Proposed Logic for Module 6: Individual Exposure and Dose

For certain individuals, this practice will tend to overestimate the dose, while for others it may tend to underestimate. The magnitude of the error in estimation will be evaluated as the project progresses, and revised formulations (similar to the milk distribution model) may be used.

Because the results of Module 6 may be required to support projects other than HEDR (e.g., the CDC thyroid morbidity study), the input to Module 6 should be structured such that at a later time, a simple interactive driver may be developed for ease of use. This will simplify the calculation of large numbers of individual doses.

The dose calculations shown in Figure 3.9 do not fully reflect the number of calculations required. Doses must be provided for a number of internal organs, as must a weighted effective dose equivalent, which will require looping on the actual dose calculation once the radionuclide exposures are known. Thus, consideration must be given to convenient storage of multiple outputs.

The anticipated distributions of input and output parameters are listed in Table 3.5.

## 3.2 SURFACE WATER RELEASE MODEL

The HEDR Phase I dose model for surface water release is separate from the atmospheric release dose model. The surface water model is based much more on measured data than is the atmospheric model. However, its structure is modular (see Figure 3.2), in a fashion similar to that for the atmospheric release model.

Unlike data for the early atmospheric releases, detailed effluent data are available for the releases from the operating production reactors during the period 1964-1966. In many instances, these data were available on a daily or weekly basis. This information was used directly as source term input to the surface water transport calculation without recourse to modeling. Thus, estimation of surface water concentration from Hanford releases in the mid-1960s was straightforward. A simple routing model was applied to the effluent data, accounting for dilution in the time-varying flow of the

TABLE 3.5. Anticipated Parameter Distribution Types for Module 6

| Parameter Distribution | Type of Data Input |
|---|---|
| E1 | Uniform |
| E2 | Uniform |
| $DF_S$ | Constant |
| $DF_G$ | Constant |
| $DF_{Ha}$, $DF_{Ia}$ | Lognormal |
| $BR_a$ | Constant |
| K | Constant |
| $D_{Sm}$ | Calculated histogram |
| $D_{Gm}$ | Calculated histogram |
| $D_{Hm}$ | Calculated histogram |
| $RY_{ma}$ | Triangular |
| $RP_{ma}$ | Triangular |
| $ff_{va}$ | Triangular |
| $ff_{pa}$ | Triangular |
| $ff_{ma}$ | Triangular |
| Month-of-Harvest | Fixed |
| Holdup Times | Constant |
| $f_o$, $f_1$, $f_2$ | Delta functions, Phase I<br>Sum = 1.0 for specific |
| $D_{Iv}$ | Calculated histogram |
| $D_{Ip}$ | Calculated histogram |
| $D_{Im}$ | Calculated histogram |

river as well as decay for the various associated travel times of radionuclides to the locations of interest. The results of this model compare excellently to the measured values. The variability in the surface water estimates is derived from the upper and lower measured values found for each radionuclide at each sampling location and time. This database provides the input to the surface water dose model. With limited exceptions (e.g., FFTF visitor's center), ground water at the Hanford Site is not now and has not been used for any purposes by members of the general offsite public. Based on current understanding, radionuclide sources within the 200 Area did not contribute significantly to concentra-tions in the Columbia River until the early 1970s. Because of the proximity of the 100 and 300 Areas to the river, operations in these areas may have contributed more radionuclides to the river via the groundwater pathway. These additions are accounted for in the monitoring data and, thus, add to the variability of the estimates for Phase I.

The various stretches of the river can be conveniently associated with the census divisions used in the atmospheric release dose model. This is because the census tracts tend to use geographical divisions, such as tributaries to the Columbia River, as dividing lines. A memo from B. A. Napier defining the stretches of the river in relation to the census divisions is provided as Appendix F.

### 3.2.1. Modular Approach

As described above, modeling is not required for surface water concentrations. However, the measured data include parameterization of uncertainty, which must be included in the subsequent steps of the calculation. This includes monitored data for fish caught in the Columbia River. Fish concentration data have also been extensively monitored, and calculations are necessary only for interpolation between measurements. The availability of fish concentration data is reflected in the logic diagram for Module 1 of the surface water code (see Figure 3.2). Fish concentrations are calculated only if such data are not available from the database. A bioaccumulation model is to be used.

Module 2 is used simply to account for the quantities of fish that were caught at various locations of the river and consumed. It is similar in

concept to the milk distribution model described in Section 3.1.4, but the input is from a database from the Demographics, Agriculture, and Food Habits Task.

Module 3 accounts for the fact that drinking water is almost entirely processed prior to human consumption, and that processing can remove radionuclides found in the untreated river water. At this time, it has not been decided whether or not to include irrigated foods as an explicit exposure pathway, or whether it is of sufficiently minor importance that a simple "transfer factor" approach may be adequate. Additional sensitivity studies with simpler models will be performed before the final structure is determined.

Module 4 parallels Module 5 of the atmospheric release model. Calculations are required for both reference and specific individuals. The age groups, lifestyles, and dose factors are the same as those defined for the atmospheric release model.

### 3.2.2 Models and Parameters

The equations to be used in the surface water model are listed with Module 6 in Appendix A. The structure is similar to the more complex model described for atmospheric releases, but the equations are generally much simpler. The anticipated parameter distributions are listed in Table 3.6.

TABLE 3.6. Anticipated Parameter Distributions for the Surface Water Release Model

| Parameter Distribution | Type of Data Input |
|---|---|
| $W_{ml}$ | Triangular |
| $B^{Tm}$ | Triangular |
| $CF1_{mst}$ | Calculated histogram |
| $fL_{st}$ | Triangular |
| $CF2_{mst}$ | Calculated histogram |
| DWCF | Uniform |
| tw | Triangular |
| $DW_{ml}$ | Calculated histogram |
| $DF_{la}$ | Lognormal |
| $R^F_{amT}$ | Triangular |
| $R^W_{aml}$ | Triangular |
| E3 | Uniform |
| E4 | Uniform |
| $DF_w$ | Constant |
| $D_{FISH,a,l}$ | Calculated histogram |
| $D_{WATER,a,l}$ | Calculated histogram |
| $D_{SWIM,a,l}$ | Calculated histogram |
| $D_{BOAT,a,l}$ | Calculated histogram |

## 4.0 REFERENCES

American Society of Mechanical Engineers (ASME). 1986. Quality Assurance Program Requirements for Nuclear Facilities. ANSI/ASME NQA-1, American National Standards Institute, New York, New York.

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Napier, B. A. 1989. Selection of Dominant Radionuclides for Phase I of the Hanford Environmental Dose Reconstruction Project. PNL-7231 HEDR, Pacific Northwest Laboratory, Richland, Washington.

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APPENDIX A

EQUATIONS FOR SYSTEM DESIGN MODULES

## Module 1

EQUATIONS FOR CALCULATION OF

- AIR CONCENTRATION - $\chi_m$
- AVERAGE DEPOSITION RATE - $\dot{d}_m$
- END-OF-MONTH SOIL CONCENTRATION - $d_m$
  (for each location)

$$\chi_m = \left(\chi/Q'_m\right) \cdot Q'_m$$

$$\dot{d}_m = Q'_m \cdot \left(\dot{d}/Q'_m\right)$$

$$d_m = Q'_m \cdot \left(d/Q'_m\right) + d_{m-1}\, e^{-\lambda_r t}$$

$Q'_m$ = Ci/month

$\chi/Q'_m$ = Ci -sec/$m^3$ per Ci/month

$\dot{d}/Q'_m$ = Ci/$m^2$ -sec per Ci/month

$d/Q'_m$ = Ci/$m^2$ per Ci/month at end of month

$\chi_m$ = time-integrated air concentration, Ci -sec/$m^3$ *

$\dot{d}_m$ = average deposition rate, Ci/$m^2$ -sec

$d_m$ = month end soil concentration, Ci/$m^2$ *

t = 1 month

* Alternatively from Monitoring Data

## Module 2

EQUATIONS FOR CALCULATION OF
•VEGETATION CONCENTRATION
(at production, for each location l & vegetation type T)

$$C_{leaf,m} = Tp\left[\frac{{}^{*}d_m\, r_m}{Y_m}\left(\frac{1-e^{-(\lambda r+\lambda w)t}}{\lambda r+\lambda w}\right)\right]+\frac{C_{m-1}\, e^{-(\lambda r+\lambda w)t}}{Y_m/Y_{m-1}}$$

$$C_{root,\,m} = \frac{d_m\, B_v}{P}$$

$$C_m = C_{leaf,m} + C_{root,m}$$

$r_m = 1-e^{-kY_m}$; interception fraction
k = function of plant type

$Y_m$ = Biomass for month m for this plant type, kg/m$^2$
from a file (need to account for harvesting)
(will be function of growing season: function of location)

$\lambda r$, $\lambda w$ = radiological & weathering decay constants, day$^{-1}$

t = number of days in current month

P = soil surface density ~ 240 kg/m$^2$

$B_v$ = concentration ratio for plant type

Note: if plant cut or harvested in month $m_{-1}$, then $Cm_{-1}/(Y_m/Y_{m-1})$ term should go to zero

$T_p$ = leave-to-edible-part translocation; $T_p$ = 1.0 for pasture & leafy vegetation, alfalfa, ensilage, sagebrush

*$C_m$ alternatively from monitoring data

Module 3

## EQUATION FOR CALCULATION OF ANIMAL PRODUCT CONCENTRATIONS (AT PRODUCTION FOR EACH LOCATION AND MONTH)

For each nuclide r and each animal product:
For each location l and month m, compute:

$$A_{ml} = \sum_{j=1}^{m} \sum_{k=1}^{L} \sum_{t=1}^{T} f_{jkt}^{ml} \cdot QF_t^{ml} \cdot C_{jkt} \cdot FM \cdot e^{-\lambda_r (m-j)}$$

- $\sum_{t=1}^{T}$ — Over all feed types
- $\sum_{k=1}^{L}$ — Over all locations that supply feed to location l
- $\sum_{j=1}^{m}$ — Over all months prior to and including current month m

m = current month (when feed was eaten by animal)
l = current location (where feed was eaten by animal)
L = total number of locations (census divisions) in study area
T = total number of feed types
j = month in which feed was harvested
k = location where feed was grown and harvested

$A_{ml}$ = nuclide concentration in animal product produced at location l during month m (Ci/l milk or Ci/kg meat and eggs). Calculated histogram.

$f_{jkt}^{ml}$ = fraction of feed of type t eaten by animal at location l during month m that was harvested at location k during month j (from feed source/transport data). The sum of these fractions over all j and k for a given feed type t for the current location l and month m must equal 1.0. Triangular distribution.

$QF_t^{ml}$ = quantity of feed of type t that animal at location l eats during month m (kg/day dry weight). This is from the data on distribution of feeding regimes to census divisions (Ward/Darwin/Beck). Triangular distribution.

$C_{jkt}$ = radionuclide concentration (Ci/kg) in feed of type t harvested in month j at location k (from Module 2). Calculated histogram.

FM = intake-to-product transfer factor, days/l milk or days/kg meat or eggs. Triangular distribution.

$\lambda_r$ = radioactive decay constant for nuclide r ($months^{-1}$).
= 0.693/(half-life$_r$). Constant.

(m-j) = decay correction time for feeds not consumed fresh (months).

EQUATIONS FOR CALCULATION OF
•MILK CONCENTRATION AT CONSUMPTION
(for each month m and location *L*)

1) Backyard Cow:

$$M\Phi_{mL} = A_{mL}\, e^{-\lambda_r t h_1}$$

2) Specific Creamery

$$MA_{cm} = \sum_{L=1}^{L} f_L^C A_{mL}$$

$$M1_{cm} = MA_{cm} e^{-\lambda_r t h_2}$$

3) Grocery Milk at location *L*

$$M2_{mL} = \sum_{C=1}^{C} F_C^L MA_{cm}\, e^{-\lambda_r t h_3}$$

$M\Phi_{mL}$ = Ci/l from family cow at consumption in location *L*

$MA_{cm}$ = Ci/*L* at specific creamery C at accumulation (no decay)

$M1_{cm}$ = Ci/l from specific creamery C at consumption

$M2_{mL}$ = Ci/l from groceries at location *L* at consumption

$t_1$ = generic holdup, milking-to-consumption; family cow

$t_2$ = generic holdup, milking-to-consumption; creamery

$t_3$ = generic holdup, milking-to-consumption; grocery

$f_L^C$ = fraction of milk at creamery C from source location *L*

$F_C^L$ = fraction of milk at groceries in location *L* from creamery C

$A_{mL}$ = milk concentration at production, Ci/l, at location l for month m

Module 6

EQUATIONS FOR CALCULATION OF

- SUBMERSION DOSE
- GROUNDSHINE DOSE
- INHALATION DOSE

1) Air submersion doses, by month at location l for lifestyle or specific

$$D_{sm} = \chi_{ml} \cdot E1 \cdot DF_S \cdot K$$

E1 = exposure time, hr/month for lifestyle or specific

$DF_S$ = submersion dose rate factor, rem/hr per $Ci/m^3$

K = constant unit conversion, mo/sec

2) Groundshine doses, by month at location l for 1.Lifestyle or specific

$$D_{Gm} = d_{me} \cdot E2 \cdot DF_G$$

E2 = exposure time, hr/month

$DF_G$ = groundshine dose rate factor, rem/hr per $Ci/m^2$

3) Inhalation doses, by month at location l for lifestyle or specific

$$D_{Hm} = \chi_{ml} \cdot E1 \cdot [DF_{Ha} \cdot BR_a] \cdot K$$

$DF_{Ha}$ = inhalation dose factor, rem/Ci by age group a

$BR_a$ = breathing rate for age group a, $m^3/hr$

Module 6 (contd)

EQUATIONS FOR CALCULATION OF

- INGESTION DOSE

1) Vegetables, for each vegetable type, age group, lifestyle, location

$$D_{iv\,al} = DF_{1a}\, R^{v}_{ma}\, [ff_{vm}\, C_{ml} + (1 - ff_{vm})\, C_{HI} e^{-\lambda r(H-m)}]$$

2) Meat and eggs, for each age group, lifestyle, location

$$D_{Ip} = DF_{1a}\, R^{p}_{ma}\, [ff_{pm}\, A_{ml} + (1 - ff_{pm})\, A_{m-h,1} e^{-\lambda r(H-m)}]$$

3) Milk

$$D_{IM} = DF_{1a}\, R^{M}_{ma}\, [ff_{Mm}\, \{M\emptyset_{m} \cdot f_0 + M1 \cdot f_1 + M2 \cdot f_2\}] +$$

$$+ (1 - ff_{Mm})\, \{M\emptyset_{M-H} \cdot f_0 + M1_{M-H} \cdot f_1 + M2_{M-H} \cdot f_2\}]$$

$R_{a,m}$ - ingestion rate, kg/month, for each age group (also probably lifestyle)

$ff_v$, $ff_p$, $ff_m$ = fresh fraction

$DF_{1,a}$ = dose factor, rem/Ci, by age group

$f_0, f_1, f_2$ = fractions of milk for each source (probably delta function)

SURFACE WATER MODULES

EQUATIONS FOR CALCULATION OF

- FISH CONCENTRATION
- DRINKING WATER CONSUMPTION

1) At catch, if not using measured values, for each of Ted's "River stretches," l, for each month, for each fish type

$$CF1m_{ast} = W_{ml} \cdot B_{Tm}$$

$W_{ms}$ = water concentration at river location s for month m, Ci/l

$B^{Tm}$ = bioaccumulation factor for fish type T for month m (under development by Ted)

2) At consumption

$$CF2_{mLT} = \sum_{1}^{s} f_{st}^{L} \cdot CF1_{mst}$$

$L_{st}^{L}$ = fraction of fish of type T consumed at location L caught at river stretch s (this is the "fish transport model")

3) Drinking water

$$DW_{ml} = W_{ml} \cdot DWCF \cdot e^{-\lambda r tw}$$

DWCF = drinking water cleanup factor, fraction removed by treatment facilities

tw = time in drinking water distribution system

Surface Water Modules

- FISH CONSUMPTION DOSE
- DRINKING WATER DOSE
- SWIMMING/BOATING DOSES

1) FISH CONSUMPTION, by age group, lifestyle, etc., at location L

$$D_{Fish,a,L} = \sum_{I}^{I} R^{F}_{amT} \cdot CF2_{mLT} \cdot DF_{Ia}$$

2) DRINKING WATER, by age group

$$D_{water,a,L} = R^{F}_{amL} \cdot DF_{Ia} \cdot DW_{mi}$$

3) SWIMMING

$$D_{swim,a,L} = E3_{mA} \cdot W_{mL} \cdot DF_{w}$$

$E3_m$ = exposure time, hr/month spent swimming, a function of age and lifestyle

$DF_w$ = swimming dose factor rem/hr per Ci/L

4) BOATING

$$D_{boat,a,L} = E4_{ma} \cdot W_{mL} \cdot DF_{w}/2$$

$E4_{ma}$ = exposure time boating, hr/month, a function of age and lifestyle

APPENDIX B

# TECHNIQUES FOR SELECTING REALIZATIONS FROM ARBITRARY DISTRIBUTIONS

# ALGORITHMS FOR THE GENERATION OF SAMPLES FROM SELECTED PROBABILITY DISTRIBUTIONS

by

A. M. Liebetrau

January 15, 1990

Hanford Environmental Dose Reconstruction Project

Pacific Northwest Laboratory
Richland, WA 99352

## 1.0 SUMMARY AND INTRODUCTION

The purpose of this report is to document algorithms for generating samples from the probability distributions that are being, or may be, used in the calculation of dose estimates and uncertainties. Algorithms are presented for generating realizations of random variables with the following distributions:

- $U(a,b)$ -- a uniform distribution over the interval $(a,b)$, $a < b$
- $LU(\alpha,\beta)$ -- a loguniform distribution over the interval $(\alpha,\beta)$, $\alpha < \beta$
- $T(a,b,c)$ -- a triangular distribution over the interval $(a,c)$ with mode at $b$, $a \leq b \leq c$
- $N(\mu,\sigma^2)$ -- a normal (Gaussian) distribution with mean $\mu$ and variance $\sigma^2$
- $LN(\theta,\tau^2)$ -- a lognormal distribution with mean $\theta$ and variance $\tau^2$.

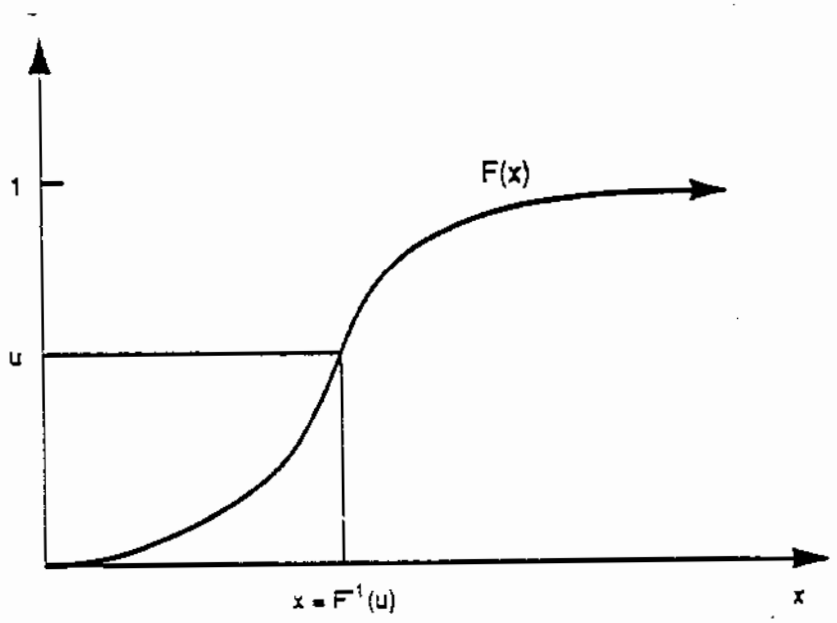
Each algorithm requires the generation of random numbers or values from a $U(0,1)$ distribution. It is anticipated that (pseudo) random numbers will be generated using currently available system routines. Because random numbers are crucial to the generation of realizations from any distribution, an alternative algorithm is presented in Section 4.0 for generating (pseudo) random numbers in case the system random number generator proves unacceptable for some reason.

## 2.0 GENERAL METHODS FOR UNIVARIATE DISTRIBUTIONS

A fundamental method that theoretically works for any univariate distribution is the Inversion Method. This method, which requires the inversion of the cumulative distribution function (cdf), is based on the following theorem of probability (see Mood, Graybill, and Boes 1974, p. 202):

> If X is a random variable with cumulative distribution function F, then the random variable U, defined by U = F(X), has a uniform distribution over the interval (0,1).

In practice, realizations are obtained by generating a pseudo-random number u (a realization of a U(0,1) random variable), setting this number equal to U in the above theorem, and solving for X. For each realization u, this procedure yields the realization $x = F^{-1}(u)$ of the random variable X. The Inversion Method is shown schematically in Figure 1. The utility of the




R8912159.8

FIGURE 1. The Inversion Method of Generating Realizations from the Cumulative Distribution Function F: x is the realization that corresponds to the random number u.

Inversion Method is limited by the difficulty of obtaining $F^{-1}$; consequently, alternative methods are preferable for many distributions whose cdfs are difficult to invert. The Inversion Method is used to generate realizations from uniform and triangular distributions.

> Technical Note: If F is not continuous, then there exist values of u for which $F^{-1}(u)$ is not well defined. In this case, x should be taken as the largest value to $x_0$ such that $F(x) \leq u$, i.e., $x_0 = \sup x\ F(x) \leq u$.

A second method for generating realizations of specified distributions is by means of transformations. If Y is obtained by transformation from the variable X, say $Y = g(X)$, then realizations of Y can be obtained by applying the transformation g to realizations of X. Transformations are used to generate loguniform variates from uniform variates and lognormal variates from normal variates. Transformations may also be used to generate U(a,b) variates from U(0,1) variates and $N(\mu,\sigma^2)$ variates from N(0,1) variates.

In addition to the two general methods identified above, special methods exist that are efficient for specific distributions. The Box-Muller algorithm given in Section 3.4 is a special method for the generation of standard normal variables [e.g., N(0,1) variables].

The algorithms obtained by applying the methods in this section to the distributions listed in Section 1.0 are given in Section 3.0. A good overview of methods for generation of realizations from univariate distributions is given in Chapter 2 of Johnson (1987); a more extensive discussion is found in Chapter 5 of Bratley, Fox, and Schrage (1983).

## 3.0 ALGORITHMS FOR SELECTED DISTRIBUTIONS

### 3.1 The Uniform Distribution

The Inversion Method is used to obtain U(a,b) variates from pseudo-random variates. If X has a U(a,b) distribution, then the cdf of X is

$$F_U(x) = \begin{cases} 0, & x \le a \\ (x - a)/(b - a), & a \le x \le b \\ 1, & x \ge b \end{cases}$$

In the interval $a < x < b$, $F_U(x) = (x - a)/(b - a)$, so $F_U^{-1}$ is given by

$$x = F_U(x)\ (b - a) + a$$

Therefore, we obtain the following algorithm for generating a realization x from a U(a,b) distribution.

#### Algorithm

Step 1. Generate a pseudo-random number u from the U(0,1) distribution.

Step 2. Compute $x = u\ (b - a) + a$.

#### References

Iman and Shortencarier (1984, p. 18)
Mood, Graybill, and Boes (1974, p. 105)
Any standard statistics textbook.

### 3.2 The Loguniform Distribution

Log uniform variates are obtained by transforming uniform variates. By definition, the random variable Y has a loguniform distribution over the interval $(\alpha, \beta)$, $\alpha < \beta$, $\alpha > 0$, $\beta > 0$, if, and only if, the random variable $X = \ln Y$ has a uniform distribution over the interval (a,b), where $a = \ln \alpha$ and $b = \ln \beta$. From this definition, it follows that

$$F_U(x) = (x - \ln \alpha)/(\ln \beta - \ln \alpha)$$

or

$$x = F_U(x)(\ln \beta - \ln \alpha) + \ln \alpha$$

for $\ln \alpha \le x \le \ln \beta$. Therefore, we obtain the following algorithm for generating a realization x from a $LU(\alpha, \beta)$ distribution.

Algorithm

Step 1. Generate a pseudo-random number u from a U(0,1) distribution.

Step 2. Compute $y = \exp[u(\ln \beta - \ln \alpha) + \ln \alpha]$.

Reference

Imar and Shortencarier (1984, p. 19)

## 3.3 The Triangular Distribution

The Inversion Method is used to obtain realizations from a triangular distribution. If X has a triangular distribution over the interval (a,c) with mode b, then the cdf of X is

$$F_T(x) = \begin{cases} 0, & x \le a \\ (x - a)^2 / [(c - a)(b - a)], & a \le x \le b \\ \dfrac{b - a}{c - a} - \dfrac{(x + b - 2c)(x - b)}{(c - a)(c - b)}, & b \le x \le c \\ 1, & x \ge c \end{cases}$$

Note that at $x = b$, $F_T(x) = F_T(b) = (b - a)/(c - a)$. Inverting $F_T(x)$ yields the following algorithm for generating a realization x from a triangular distribution with parameters a, b, and c, $a \le b \le c$.

Algorithm

Step 1. Generate a pseudo-random number u from a U(0,1) distribution.

Step 2. If $u \le (b - a)/(c - a)$

Set $u = F_T(x) = (x - a)^2/[(c - a)(b - a)]$

Compute $x = a + [u(c - a)(b - a)]^{1/2}$

Step 3. Otherwise,

$$\text{Set } u = F_T(x) = \frac{b - a}{c - a} - \frac{(x + b - 2c)(x - b)}{(c - a)(c - b)}$$

$$\text{Compute: } x = c - [(b - c)^2 + (b - a)(c - b) - u(c - a)(c - b)]^{1/2}$$

References

Iman and Shortencarier (1984, p. 20)
Johnson and Kotz (1970)

## 3.4 The Normal Distribution

The inverse of the cdf of a normally distributed random variable X cannot be expressed in closed form, so the inversion method is not the method of choice for generating normal variates. The method used to generate normal variates, which is due to Box and Muller (1958), involves transformation of a pair of pseudo-random numbers to obtain a pair of standard normal variates. These are further transformed to obtain a pair of realizations from a normal distribution with mean $\mu$ and variance $\sigma^2$.

The Box-Muller algorithm is an efficient method for generating simple random samples of normal variates, but it may not be as efficient for Latin Hypercube Sampling, which involves partitioning the range of the simulated variables. To generate normal variates using Latin Hypercube Sampling, it is desirable to use an algorithm that generates specified percentage points of a normal distribution. The algorithm cited below, due to Beasley and Springer (1977), is used for this purpose.

The Box-Muller Algorithm

Step 1. Generate independent pseudo-random numbers $u_1$ and $u_2$ from the U(0,1) distribution.

Step 2. Compute

$$g_1 = (-2 \ln u_1)^{1/2} \cos(2\pi u_2)$$

$$g_2 = (-2 \ln u_1)^{1/2} \sin(2\pi u_2)$$

Step 3. Compute

$$x_1 = \sigma g_1 + \mu$$

$$x_2 = \sigma g_2 + \mu$$

The quantities $x_1$ and $x_2$ are independent realizations from a normal distribution with mean $\mu$ and variance $\sigma^2$.

Step 4. (optional) If

$$y_1 = g_1$$

$$y_2 = \rho g_1 + (1-\rho^2)^{1/2} g_2$$

are computed for some $\rho$, $-1 \le \rho \le 1$, then $y_1$ and $y_2$ are realizations from a standard bivariate ($\mu_1 = 0$, $\mu_2 = 0$, $\sigma_1^2 = 1$, $\sigma_2^2 = 1$) normal distribution with correlation coefficient $\rho$.

References

Box and Muller (1958)
Abramowitz and Stegun (1970, p. 953)
Johnson (1987, p. 29)

Algorithm for Computing Percentage Points of the Normal Distribution

Algorithm AS III, due to Beasley and Springer (1977), is used to calculate percentage points of the normal distribution in connection with Latin Hypercube Sampling methods. The algorithm is fast, numerically accurate, and portable without modification. FORTRAN code for implementing Algorithm AS III is given in the reference cited.

## 3.5 The Lognormal Distribution

Log normal variates are obtained by transferring normal variates. By definition, the random variable Y has a lognormal distribution with mean $\Theta$ and variance $\tau^2$ if, and only if, the random variable $X = \ln Y$ has a normal distribution with mean $\mu$ and variance $\sigma^2$, where

$$\mu = \ln \left[ \Theta^2 \Big/ \sqrt{\Theta^2 + \tau^2} \right] \quad \text{and} \quad \sigma^2 = \ln \left[ (\Theta^2 + \tau^2) / \Theta^2 \right] \qquad (1)$$

This definition yields the following algorithm for generating a realization y from a lognormal distribution with mean $\Theta$ and variance $\tau^2$.

Algorithm

Step 1. Generate a realization x from a normal distribution with mean $\mu$ and variance $\sigma^2$, where $\mu$ and $\sigma^2$ are computed using Equation (1) above. (See algorithms in Section 3.4 for generating normal realizations.)

Step 2. Compute $y = \exp(x)$. Then y is a realization from a lognormal distribution with mean $\Theta$ and variance $\tau^2$.

References

Iman and Shortencarier (1984 p. 17)
Crow and Shimizu (1988)

## 4.0 THE GENERATION OF PSEUDO-RANDOM NUMBERS

Each algorithm in Section 3.0 requires the generation of values from a U(0,1) distribution. It is anticipated that the pseudo-random number generator available on the PNL VAX network will prove adequate for HEDR Project dose calculations and related uncertainty analyses. In case the system generator proves inadequate for some reason, and for the sake of completeness, a pseudo-random number generator is given here. The selected generator is due to Wichmann and Hill (1982) and produces U(0,1) realizations by combining the results of three multiplicative congruential generators. The algorithm is short, reasonably fast, statistically sound, and machine independent. A FORTRAN implementation is given below. On machines that use only 23 bits for representation of the fractional part of a real number, it is possible for this algorithm to produce exact zeros because of rounding error; see McLeod (1985) for a discussion of this problem and possible modifications. An extensive discussion of uniform random number generators, including the algorithm presented here, is found in Chapter 6 of Bratley, Fox, and Schrage (1983).

### Algorithm AS 183 (Wichmann and Hill)

```
      REAL FUNCTION RANDOM(L)
C
C        ALGORITHM AS 183  APPL. STATIST. (1982) VOL.31, P.188
C
C        RETURNS A PSEUDO-RANDOM NUMBER RECTANGULARLY DISTRIBUTED
         BETWEEN 0 AND1.
C
C        IX, IY AND IZ SHOULD BE SET TO INTEGER VALUES BETWEEN
C        1 AND 30000 BEFORE FIRST ENTRY.
C
C        INTEGER ARITHMETIC UP TO 30323 IS REQUIRED.
C
      COMMON /RAND/ IX, IY, IZ
      IX = 171 * MOD(IX, 177) - 2  * (IX / 177)
      IY = 172 * MOD(IY, 176) - 35 * (IY / 176)
      IZ = 170 * MOD(IZ, 178) - 63 * (IZ / 178)
C
      IF (IX .LT. 0) IX = IX + 30269
      IF (IY .LT. 0) IY = IY + 30307
      IF (IZ .LT. 0) IZ = IZ + 30323
C
C        IF INTEGER ARITHMETIC UP TO 5212632 IS AVAILABLE,
C        THE PRECEDING 6 STATEMENTS MAY BE REPLACED BY
C
C        IX = MOD(171 * IX, 30269)
C        IY = MOD(172 * IY, 30307)
C        IZ = MOD(170 * IZ, 30323)
C
C        ON SOME MACHINES, THIS MAY SLIGHTLY INCREASE
C        THE SPEED. THE RESULTS WILL BE IDENTICAL.
C
      RANDOM = AMOD(FLOAT(IX) / 30269.0 + FLOAT(IY) / 30307.0 +
     $               FLOAT(IZ) / 30323.0, 1.0)
      RETURN
      END
```

## 5.0 REFERENCES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APPENDIX C

METHODS OF STORING AND RETRIEVING DATA FROM HISTOGRAMS

Battelle
Pacific Northwest Laboratories

Project Number _____

Internal Distribution

BS Dennis
RO Gilbert
HA Haerer
BA Napier
B Sagar
File/LB

Date June 26, 1989

To JT Caplinger

From AM Liebetrau

Subject Algorithm for Input of and Generation of Realizations from Cumulative Distribution Functions

The estimation of dose estimate uncertainties will involve simulating realizations of probability distributions. The distributions may be theoretical (i.e., expressed in a functional form) or empirical (estimated from real data or generated by simulation from a hypothetical distribution). The distributions may be used to describe the distribution of input parameters to the dose model or the variability of submodel output variable(s).

The following algorithm can be used to approximate a given distribution function regardless of whether it is theoretical or empirical. The notation used in Eq. (1) below is illustrated in the attached figure.

Step (a): Divide the range of the distribution into k intervals. For Phase I calculations, a maximum of k = 20 intervals will be used.

Step (b): The interval boundaries (denoted by x's) and the cumulative probabilities (denoted by h's) associated with the right-hand endpoints of the k intervals are:

$$(x_0, h_0 = 0), (x_1, h_1), (x_2, h_2), \ldots, (x_{k-1}, h_{k-1}), (x_k, h_k = 1) \quad (1)$$

Where $x_0$ is the minimum value of the variable and $x_h$ is the maximum value.

The intervals defined by Eq. (1) defined a k-segment piecewise linear approximation to the actual input distribution. A maximum of k = 20 intervals will be used for Phase I calculation. A smaller value of k may be used in cases where an adequate approximation to the actual input distribution does not require 20 intervals. Note that when the distribution is expressed in cumulative form, both the x's and the h's are nondecreasing sequences of numbers. It is convenient to choose the representation in Eq. (1) so that either the x's or the h's are equally spaced. For the Phase I study, we will use equal spacing of the x's.

After a distribution such as that in Step (b) has been assigned to a particular input variable, then realization of the variable may be generated from the assigned distribution as follows:

Step 1: Generate a pseudo-random number, from the uniform distribution over the interval (0,1)). Denote the value of this number by h, where $0 < h < 1$.

Step 2: Determine the index i, i = 1, 2, ..., k, such that $h_{i-1} < h < h_i$.

Step 3: Compute $$x = x_{i-1} + \frac{h - h_{i-1}}{h_i - h_{i-1}} (x_i - x_{i-1}) \qquad (2)$$

The quantity x obtained by (2) is the realization of a random variable x whose cdf is given by (1). Steps 1-3 can be repeated, as necessary, to generate the desired number of realizations from the given distribution.

AML/slc

APPENDIX D

HANDLING ATMOSPHERIC DEPOSITION AND INTERCEPTION BY VEGETATION

Battelle
Pacific Northwest Laboratories

Project Number HEDR

Internal Distribution

| | |
|---|---|
| DA Cataldo | JK Soldat |
| DM Beck | JV Ramsdell |
| CL Bruneau | RE Rhoads |
| JM Callaway | JG Stephan |
| MD Freshley | DL Strenge |
| RO Gilbert | WH Walters |
| SP Gydesen | RK Woodruff |
| HA Haerer | Project Office |
| LG Morgan | File/LS |

Date April 26, 1989

To Distribution

From Bruce Napier

Subject Recommendation for Treating Radionuclide Deposition and Interception on Vegetation on Phase 1

## INTRODUCTION

Evaluation of the atmospheric transport and deposition of radionuclides on soil and vegetation is one of the major undertakings of the HEDR project. The initial sensitivity studies, as mentioned in the September 1988 Workplan to the TSP, performed by Dennis Strenge and Bruce Napier for the iodine air-cow-milk pathway, indicated that the parameterization of deposition and vegetation uptake was one of the most important to the final result. In addition, the demarcation between the Environmental Transport Task and the Environmental Pathways and Dose Estimates Task comes at the point of deposition. Van Ramsdell and I have had many discussions on the appropriate method of doing this and have reached a working agreement.

Deposition and interception have been widely studied. They seem to be correlated with atmospheric conditions (such as wind speed, turbulence), type of surface (measured in terms of a "friction velocity" or a "surface roughness"), as well as with type and state of vegetation. Most studies have attempted to lump many parameters into a "deposition velocity" (e.g., Heinemann and Vogt 1980). Often, the deposition velocity also includes the interception fraction (i.e., $v_g$ is deposition onto grass rather than onto the soil).

## DISCUSSION

The original Hanford model for deposition/interception incorporated a "deposition velocity" term with a constant interception fraction (Soldat and Harr 1971). Combined with a feed-to-milk transfer factor, this model provided a fairly accurate prediction of milk concentrations for the Hanford environment. Recent results of the Biospheric Model Validation Study (BIOMOVS), presented at the VII Workshop in Tokai, Japan, November 7-10, 1988, but yet unpublished, indicate that this formulation tends to underpredict the concentrations on the grass, but to overpredict the transfer from grass to milk, and therefore the final answer is in the right range. The observation of underprediction of deposition/interception is repeated by Pinder, McLeod, and Adriano (1989). The current Hanford model (Napier et al. 1988) uses a variable interception fraction that is a function of vegetation biomass. The interception fraction is based on the model of Chamberlain (1970). It generally results in a higher value of interception than the older constant fraction. The Chamberlain model is an empirical fit to a large amount of data, relating to both iodine and particulate radionuclides.

Chamberlain's approach is a filtration model of the form $r = 1 - e^{-\mu B}$, where r is the interception fraction, $\mu$ is an empirical constant, and B is the biomass. The constant $\mu$ and the variable B are usually defined to be in terms of dry biomass.

I performed a review of current modeling approaches to the problem of deposition/interception. Sehmel (1984) provides an extensive overview of deposition velocities, but does not differentiate between deposition on soils and surfaces and on vegetation (which is important because deposition velocities onto vegetation may incorporate an interception fraction implicitly). The IAEA Safety Series 57 (1982) suggests that for forage, the quotient of the interception fraction and the dry weight of the biomass be held a constant, and for food crops that the interception fraction be held at a constant value of 0.20. Use of a constant value of the quotient was investigated by the Nevada dose reconstruction and used in the Nevada "Sheep Study." Holding the quotient of interception to biomass, a constant is equivalent to using a series expansion of the Chamberlain model truncated at the first term - it gives roughly equivalent results for low biomass. The IAEA position is a restatement of the recommendations given in several Oak Ridge National Laboratory documents (e.g., Hoffman and Baes 1979, Miller et al. 1980). The newer ORNL code TERRA (Baes et al. 1985) uses the Chamberlain formulation for interception by hay and pasture grasses, and an ad hoc variant with the same mathematical form for other vegetation. The British code FOOD-MARC (Linsley, Simmonds, and Haywood 1982) uses a constant interception fraction approach. The German code ECOSYS (Prohl, Friedland, and Paretzke 1985) uses the Chamberlain formulation, in particular for iodine. The PATHWAY model used by the ORERP study (Whicker and Kirchner 1987) uses the Chamberlain interception fraction model. The most recent literature on the topic by Pinder (Pinder, Ciravolo, and Bowling 1988; Pinder, McLeod, and Adriano 1989) also recommend the Chamberlain formulation, with very minor revisions to the empirical constants. It appears that, over the past decade, most researchers have determined that the Chamberlain filtration approach provides the most adequate method of predicting the interception fraction.

Recently declassified Hanford information from early 1946 indicates that the concentrations of radioiodine measured on vegetation from Hanford releases varies from species to species by about a factor of eight (all measurements were done on the basis of activity per unit mass as collected - i.e., without drying). One-gram samples were spread on a surface and counted. Dry grass and weeds were found to be more active (per unit mass as collected) than live vegetation. Reproducibility of these measurements was said to be about plus or minus 30% (Healy 1946). This indicates to me that if these had been normalized to dry weight, the variability would have been less. A model using the interception fraction described by Chamberlain and corrected for the moisture content of the vegetation as a function of time of year would give a variability the same as seen in these original Hanford measurements. (Chamberlain (1970) also reports a variable weathering half-time, one that is longer in the winter. This seems also to be supported in the Hanford measurements.)

## CONCLUSIONS

We propose to use a two-part description of deposition and interception. The total flux of radioactive material out of the passing atmospheric puff is needed by Van Ramsdell in the atmospheric dispersion model to maintain a mass balance and properly account for plume depletion. Van proposes to use a model that accounts for atmospheric conditions and radionuclide properties (particulate vs. noble gas vs. iodine) to provide the net wet and dry flux out of the plume. I propose to use the Chamberlain filtration model to account for interception of this flux on the vegetation. This two-part approach will allow convenient data transfer between the tasks. The approach is essentially the same as that used for data transfer in the ORERP project.

The model for interception fraction will be made variable as a function of plant biomass and moisture content, which means it will be a function of crop type and time of year. This model should explain most of the variability seen in the historical environmental measurements.

Additional sensitivity studies will be possible once this system becomes operational. This will allow us to investigate whether wind-tunnel experiments with iodine-131 or field experiments with iodine-129 from PUREX will add appreciable data to our study in the next fiscal year.

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APPENDIX E

## HANDLING CORRELATIONS IN COMPLEMENTARY FRACTIONS

Battelle
Pacific Northwest Laboratories

Project Number HEDR

Internal Distribution

JW Brothers
RO Gilbert
HA Haerer
AM Liebetrau
B Sagar
DL Strenge
Project Office
File/LB

Date August 18, 1989

To Distribution

From Bruce Napier

Subject Handling Correlations in Complementary Fractions

## INTRODUCTION

In several of the calculations to be performed for the HEDR Phase 1 analyses, a series of fractions must be selected from input distributions. Each of these fractions has its own distribution. The results of the selection process of the fractions must, however, sum to one, which implies a correlation structure. A technique is needed to handle the correlations between the various fractions.

## DISCUSSION

Several options are available. We could use a simple rule to adjust the randomly drawn fractions, or we could draw the fractions from a multivariate distribution with an assumed correlation structure.

In general, the fractions are being generated via expert opinion. There is considerable uncertainty about many of them. No information is currently available on correlations between the constituent parts of the sum desired, other than that it is constrained to add to unity. The structure of the proposed computer implementation also does not lend itself to incorporating large correlation matrices.

The question of how to handle these correlations was discussed by Bruce Napier, Al Liebetrau, Dick Gilbert, and Budhi Sagar at a meeting on July 31, 1989.

## CONCLUSIONS

It was concluded that for Phase 1, at least, a simple adjustment rule would be adequate, given the lack of strong information on correlations. The various fractions should be drawn independently from their distributions, and then the sum of the results should be used to normalize each value so that the total then adds to one.

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APPENDIX F

CORRESPONDENCE BETWEEN COLUMBIA RIVER LOCATION
AND HEDR CENSUS SUBDIVISION

Battelle
Pacific Northwest Laboratories

Project Number HEDR

Internal Distribution

HA Haerer
TM Poston
MC Richmond
Project Office
File/LB

Date August 17, 1989

To DM Beck

From SA Napier

Subject Correspondence Between Columbia River Location and HEDR Census Subdivision Grid Points

## INTRODUCTION

Much of the Phase 1 effort has gone into defining parameters to use for the atmospheric dispersion portions of the HEDR calculations. Proportionally less effort has been expended on the surface water pathways. However, definition of the various locations of potential exposure to the river or to river-related products (water, fish, irrigated foods) is also necessary.

## DISCUSSION

Ted Poston, who was asked to accumulate and evaluate data on radionuclide concentrations of fish in the Columbia River for 1964-1966, devised a convention for collecting data based on sampling locations. These areas are (memo, T. M. Poston to Distribution, June 12, 1989, "Location of Fish Sampling Sites"):

| Site | Approximate River Mile |
|---|---|
| Priest Rapids | 390 |
| Hanford | 365 |
| Coyote Rapids | 383 |
| Ringold | 354 |
| Richland | 345 |
| Island View | 335 |
| Burbank | 322 |
| McNary | 294 |

The first three of these locations are inside of the Hanford Site, and thus of minimal importance for public exposure considerations. The others, however, are stretches of the river for which public access is available.

## CONCLUSIONS

I have compared Ted's river stretches to our HEDR census subdivisions on the map. There is a very convenient correspondence for the publicly available locations, as follows:

| Site | HEDR Census Subdivision |
|---|---|
| Ringold | FR4 |
| Richland | BE7, FR5 |
| Island View | BE3, FR3 |
| Burbank | WA3, BE4 |
| McNary | BE8, UM4 |

Note that each stretch of the river touches two subdivisions, one on either side, if some minor overlaps are ignored. (The Benton County side of the Ringold stretch is still Hanford Site). Given the inexact nature of the selections, this would seem to be reasonable.

These divisions should be used for the transport, demography, and dose calculations required for Phase 1.

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# APPENDIX C

## TABULATION OF BIOMASS AND INTERCEPTION FRACTION

# APPENDIX C

## TABULATION OF BIOMASS AND INTERCEPTION FRACTION

This appendix includes the monthly biomass (Y) used for each vegetation type, and the resultant interception fraction (r).

| Plant Type | |
|---|---|
| 1 | Leafy Vegetables |
| 2 | Other Vegetables |
| 3 | Grain |
| | Meat: Grain |
| | Poultry & Eggs: Grain |
| 4 | Fruit |
| 5 | Meat: Forage/Hay |
| | Milk: Hay |
| 6 | Milk: Fresh Forage |
| 7 | Milk: Ensilage |
| 8 | Sagebrush |

Biomass (dry weight) ($kg/m^2$)

| Plant Type | Month 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | .04 | .1 | .2 | .2 | .2 | .16 | .1 | | |
| 2 | | | | .05 | .25 | .4 | .5 | .5 | .4 | .25 | | |
| 3 | | | .014 | .029 | .058 | .086 | .115 | .144 | .072 | | | |
| 4 | .27 | .27 | .27 | .324 | .378 | .54 | .54 | .54 | .432 | .324 | .27 | .27 |
| 5 | | | .05 | .1 | .15 | .15 | .15 | .15 | .15 | | | |
| 6 | .03 | .03 | .06 | .15 | .27 | .27 | .27 | .27 | .24 | .15 | .06 | .03 |
| 7 | | | | .03 | .09 | .15 | .21 | .3 | .15 | | | |
| 8 | .01 | .02 | .03 | .04 | .04 | .04 | .01 | .01 | .01 | .01 | .01 | .01 |

Interception Fraction

| Plant | Month 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | .11 | .252 | .44 | .44 | .44 | .371 | .252 | | |
| 2 | | | | .165 | .593 | .763 | .835 | .835 | .763 | .593 | | |
| 3 | | | .041 | .08 | .154 | .222 | .284 | .341 | .188 | | | |
| 4 | .622 | .622 | .622 | .689 | .744 | .857 | .857 | .857 | .789 | .689 | .622 | .622 |
| 5 | | | .135 | .252 | .353 | .353 | .353 | .353 | .353 | | | |
| 6 | .083 | .083 | .16 | .353 | .543 | .543 | .543 | .543 | .501 | .353 | .16 | .083 |
| 7 | | | | .083 | .23 | .353 | .456 | .581 | .353 | | | |
| 8 | .035 | .069 | .102 | .134 | .134 | .134 | .035 | .035 | .035 | .035 | .035 | .035 |

# APPENDIX D

## DOSES BY CENSUS DIVISION, AGE GROUP, YEAR, AND EXPOSURE PATHWAY

# APPENDIX D

## DOSES BY CENSUS DIVISION, AGE GROUP, YEAR, AND EXPOSURE PATHWAY

The following 98 tables present summaries of the thyroid doses calculated for Phase I of the HEDR Project. All doses presented in these tables are in units of thyroid dose (rad) [essentially equivalent to thyroid dose (rem)]. Each table presents the results of calculations for a single census division. The census divisions are illustrated in Figure 2.5. Within each census division, the results are presented as annual summaries for 1945, 1946, and 1947 and as the cumulative dose that would have been received by an individual who lived in the division over the entire 3 years.

Doses are presented by exposure pathway. Those labelled "External" include contributions from air submersion and from material deposited on the ground. The doses labelled "Inhalation" are from breathing the contaminated air at the given location for the whole year. Doses from consumption of cow's milk are presented for a number of possible situations, including milk from four potential feeding regimes for family ("backyard") cows and two for commercial sources. The feeding regimes, which are defined in the main report, are the following:

> Feeding Regime 1 (BYCow Regime 1): A diet consisting of grain, stored alfalfa hay, fresh irrigated pasture, and ensilage, similar to that of commercial dairy farms.
>
> Feeding Regime 2 (BYCow Regime 2): A diet consisting of grain, stored alfalfa hay, and fresh irrigated pasture, similar to that of commercial dairy farms.
>
> Feeding Regime 3 (BYCow Regime 3): A diet consisting of grain and alfalfa hay only, with no fresh pasture, similar to that of small family farms without irrigation.
>
> Feeding Regime 4 (BYCow Regime 4): A diet consisting of grain and grass hay only, similar to that of small family farms without irrigation.

Commercial milk consisted of two sources, rural and urban. Milk collected by various creameries was redistributed to grocery stores, thus making commercially available milk at any one location a potential blend from

many sources. To illustrate the model capabilities, doses from milk available in rural groceries were calculated for each census division. For a few locations that were essentially entirely urban, doses from milk available in larger stores were also calculated.

Not all of these sources are listed for each census division. If a source was not considered to be applicable (e.g., milk from irrigated pasture in divisions in which irrigation was not practiced in the mid-1940s), no entry is shown.

Doses presented for consumption of fruits and vegetables are based on the assumption that the entire diet of fresh fruit and vegetables was supplied by local sources (i.e., sources from within the subject census division). This is a highly conservative assumption for all people except those with large private gardens.

Doses are presented for two age groups, infant and adult. Infants range in age from birth to 1 year old. Adults are assumed to be more than 20 years old.

For both groups, only doses to males were estimated, because the only differences between males and females dosimetrically is that their consumption rates for the various food types differ and that males tend to eat somewhat more than females.

The complete calculations performed for Phase I generated distributions of doses for each of the categories described above. The fifth percentile, median (fiftieth percentile), and ninety-fifth percentile thyroid doses from each distribution are presented in the tables. Because of the nature of the Monte Carlo calculation process, the uncertainty in doses outside of these ranges is large enough to invalidate their usefulnesses. The fifth and ninety-fifth percentiles define a range in which ninety percent of the potentially exposed population would fall, and are best used for comparative purposes.

Adams County Census Division 01

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.013 | 0.000 | 0.001 | 0.008 |
| 1945 | Inhalation | 0.009 | 0.035 | 0.193 | 0.008 | 0.027 | 0.178 |
| 1945 | Milk from BYCow Regime 3 | 0.020 | 0.183 | 1.924 | 0.001 | 0.015 | 0.169 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.019 | 0.584 | 0.000 | 0.002 | 0.051 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945 | Fruit and Vegetables* | 0.315 | 1.515 | 9.747 | 0.248 | 1.092 | 6.379 |
| 1946 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1946 | Inhalation | 0.002 | 0.007 | 0.034 | 0.002 | 0.005 | 0.027 |
| 1946 | Milk from BYCow Regime 3 | 0.002 | 0.024 | 0.249 | 0.000 | 0.002 | 0.019 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.005 | 0.082 | 0.000 | 0.000 | 0.006 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1946 | Fruit and Vegetables* | 0.045 | 0.220 | 1.172 | 0.035 | 0.151 | 1.059 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.001 | 0.002 | 0.009 | 0.001 | 0.002 | 0.006 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.006 | 0.065 | 0.000 | 0.001 | 0.006 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.035 | 0.000 | 0.000 | 0.004 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.008 | 0.041 | 0.246 | 0.007 | 0.031 | 0.193 |
| 1945-1947 | External | 0.001 | 0.002 | 0.015 | 0.001 | 0.002 | 0.011 |
| 1945-1947 | Inhalation | 0.018 | 0.050 | 0.221 | 0.014 | 0.038 | 0.197 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.053 | 0.270 | 2.635 | 0.003 | 0.022 | 0.218 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.006 | 0.048 | 0.721 | 0.000 | 0.004 | 0.055 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945-1947 | Fruit and Vegetables* | 0.602 | 1.989 | 11.065 | 0.451 | 1.480 | 6.816 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Adams County Census Division 02 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.004 | 0.000 | 0.001 | 0.004 |
| 1945 | Inhalation | 0.012 | 0.044 | 0.230 | 0.010 | 0.035 | 0.170 |
| 1945 | Milk from BYCow Regime 3 | 0.029 | 0.227 | 1.693 | 0.002 | 0.018 | 0.139 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.029 | 0.802 | 0.000 | 0.003 | 0.045 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945 | Fruit and Vegetables* | 0.445 | 1.865 | 10.162 | 0.327 | 1.282 | 6.979 |
| 1946 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1946 | Inhalation | 0.003 | 0.009 | 0.052 | 0.002 | 0.007 | 0.039 |
| 1946 | Milk from BYCow Regime 3 | 0.003 | 0.033 | 0.287 | 0.000 | 0.002 | 0.023 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.004 | 0.132 | 0.000 | 0.000 | 0.006 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1946 | Fruit and Vegetables* | 0.061 | 0.258 | 1.576 | 0.045 | 0.193 | 1.351 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.001 | 0.003 | 0.026 | 0.001 | 0.002 | 0.015 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.007 | 0.076 | 0.000 | 0.001 | 0.010 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.029 | 0.000 | 0.000 | 0.002 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.010 | 0.047 | 0.269 | 0.010 | 0.042 | 0.233 |
| 1945-1947 | External | 0.001 | 0.002 | 0.006 | 0.001 | 0.002 | 0.006 |
| 1945-1947 | Inhalation | 0.025 | 0.067 | 0.343 | 0.020 | 0.051 | 0.238 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.062 | 0.314 | 1.861 | 0.005 | 0.025 | 0.165 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.007 | 0.058 | 0.711 | 0.001 | 0.005 | 0.045 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945-1947 | Fruit and Vegetables* | 0.786 | 2.520 | 11.398 | 0.570 | 1.741 | 7.837 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Adams County Census Division 03 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.002 | 0.007 | 0.001 | 0.002 | 0.007 |
| 1945 | Inhalation | 0.016 | 0.055 | 0.263 | 0.014 | 0.045 | 0.185 |
| 1945 | Milk from BYCow Regime 3 | 0.033 | 0.296 | 2.708 | 0.002 | 0.025 | 0.222 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.044 | 0.773 | 0.000 | 0.003 | 0.045 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945 | Fruit and Vegetables* | 0.503 | 2.143 | 12.455 | 0.361 | 1.617 | 8.816 |
| 1946 | External | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.005 |
| 1946 | Inhalation | 0.004 | 0.013 | 0.153 | 0.003 | 0.010 | 0.127 |
| 1946 | Milk from BYCow Regime 3 | 0.003 | 0.030 | 0.252 | 0.000 | 0.003 | 0.028 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.006 | 0.071 | 0.000 | 0.000 | 0.011 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1946 | Fruit and Vegetables* | 0.068 | 0.278 | 1.747 | 0.051 | 0.215 | 1.092 |
| 1947 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.003 |
| 1947 | Inhalation | 0.001 | 0.004 | 0.077 | 0.001 | 0.003 | 0.064 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.006 | 0.105 | 0.000 | 0.001 | 0.010 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.050 | 0.000 | 0.000 | 0.002 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.012 | 0.053 | 0.263 | 0.009 | 0.042 | 0.265 |
| 1945-1947 | External | 0.001 | 0.003 | 0.020 | 0.001 | 0.003 | 0.015 |
| 1945-1947 | Inhalation | 0.033 | 0.089 | 0.571 | 0.027 | 0.073 | 0.454 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.071 | 0.399 | 3.214 | 0.006 | 0.034 | 0.191 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.009 | 0.081 | 0.946 | 0.001 | 0.005 | 0.042 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945-1947 | Fruit and Vegetables* | 0.860 | 2.753 | 12.956 | 0.658 | 2.091 | 10.355 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Adams County Census Division 04 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.002 | 0.006 | 0.001 | 0.002 | 0.006 |
| 1945 | Inhalation | 0.024 | 0.076 | 0.279 | 0.021 | 0.059 | 0.250 |
| 1945 | Milk from BYCow Regime 3 | 0.045 | 0.437 | 4.126 | 0.003 | 0.030 | 0.286 |
| 1945 | Milk from BYCow Regime 4 | 0.004 | 0.068 | 1.216 | 0.000 | 0.005 | 0.182 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945 | Fruit and Vegetables* | 0.795 | 3.199 | 15.669 | 0.576 | 2.106 | 10.009 |
| 1946 | External | 0.000 | 0.001 | 0.003 | 0.000 | 0.000 | 0.002 |
| 1946 | Inhalation | 0.005 | 0.017 | 0.105 | 0.005 | 0.013 | 0.079 |
| 1946 | Milk from BYCow Regime 3 | 0.005 | 0.048 | 0.455 | 0.000 | 0.004 | 0.034 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.011 | 0.262 | 0.000 | 0.001 | 0.012 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1946 | Fruit and Vegetables* | 0.097 | 0.453 | 2.430 | 0.080 | 0.319 | 1.852 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.001 | 0.005 | 0.058 | 0.001 | 0.004 | 0.039 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.015 | 0.156 | 0.000 | 0.001 | 0.011 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.004 | 0.128 | 0.000 | 0.000 | 0.006 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.019 | 0.080 | 0.426 | 0.016 | 0.065 | 0.280 |
| 1945-1947 | External | 0.002 | 0.003 | 0.009 | 0.002 | 0.003 | 0.009 |
| 1945-1947 | Inhalation | 0.047 | 0.117 | 0.435 | 0.038 | 0.090 | 0.361 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.112 | 0.618 | 4.711 | 0.008 | 0.041 | 0.289 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.012 | 0.125 | 1.510 | 0.001 | 0.008 | 0.129 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945-1947 | Fruit and Vegetables* | 1.318 | 4.083 | 16.465 | 0.976 | 2.791 | 11.932 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Adams County Census Division 05

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.002 | 0.008 | 0.001 | 0.002 | 0.007 |
| 1945 | Inhalation | 0.022 | 0.077 | 0.361 | 0.019 | 0.060 | 0.249 |
| 1945 | Milk from BYCow Regime 3 | 0.055 | 0.435 | 4.135 | 0.003 | 0.029 | 0.263 |
| 1945 | Milk from BYCow Regime 4 | 0.003 | 0.087 | 1.319 | 0.000 | 0.006 | 0.087 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945 | Fruit and Vegetables* | 0.847 | 3.271 | 16.307 | 0.605 | 2.345 | 11.214 |
| 1946 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.002 |
| 1946 | Inhalation | 0.005 | 0.016 | 0.069 | 0.004 | 0.013 | 0.060 |
| 1946 | Milk from BYCow Regime 3 | 0.006 | 0.061 | 0.541 | 0.001 | 0.004 | 0.044 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.008 | 0.277 | 0.000 | 0.001 | 0.011 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1946 | Fruit and Vegetables* | 0.122 | 0.483 | 2.340 | 0.089 | 0.344 | 1.743 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.001 | 0.005 | 0.020 | 0.001 | 0.004 | 0.016 |
| 1947 | Milk from BYCow Regime 3 | 0.002 | 0.014 | 0.171 | 0.000 | 0.001 | 0.010 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.062 | 0.000 | 0.000 | 0.007 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.020 | 0.081 | 0.445 | 0.017 | 0.069 | 0.378 |
| 1945-1947 | External | 0.001 | 0.003 | 0.009 | 0.001 | 0.003 | 0.010 |
| 1945-1947 | Inhalation | 0.044 | 0.107 | 0.397 | 0.035 | 0.084 | 0.313 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.116 | 0.595 | 3.809 | 0.009 | 0.041 | 0.325 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.015 | 0.134 | 1.543 | 0.001 | 0.009 | 0.090 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945-1947 | Fruit and Vegetables* | 1.467 | 4.388 | 17.541 | 1.096 | 3.147 | 12.623 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Adams County Census Division 06 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.002 | 0.008 | 0.001 | 0.002 | 0.007 |
| 1945 | Inhalation | 0.019 | 0.065 | 0.909 | 0.017 | 0.053 | 0.485 |
| 1945 | Milk from BYCow Regime 3 | 0.046 | 0.378 | 2.715 | 0.003 | 0.024 | 0.259 |
| 1945 | Milk from BYCow Regime 4 | 0.003 | 0.067 | 1.414 | 0.000 | 0.004 | 0.120 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945 | Fruit and Vegetables* | 0.682 | 2.492 | 10.393 | 0.481 | 1.839 | 9.242 |
| 1946 | External | 0.000 | 0.000 | 0.006 | 0.000 | 0.000 | 0.006 |
| 1946 | Inhalation | 0.004 | 0.014 | 0.380 | 0.004 | 0.011 | 0.176 |
| 1946 | Milk from BYCow Regime 3 | 0.006 | 0.043 | 0.363 | 0.000 | 0.003 | 0.023 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.009 | 0.079 | 0.000 | 0.001 | 0.014 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1946 | Fruit and Vegetables* | 0.089 | 0.349 | 1.709 | 0.067 | 0.268 | 1.228 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.001 | 0.004 | 0.039 | 0.001 | 0.003 | 0.030 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.010 | 0.105 | 0.000 | 0.001 | 0.011 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.061 | 0.000 | 0.000 | 0.003 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.016 | 0.069 | 0.315 | 0.014 | 0.056 | 0.255 |
| 1945-1947 | External | 0.001 | 0.003 | 0.020 | 0.001 | 0.003 | 0.022 |
| 1945-1947 | Inhalation | 0.038 | 0.106 | 1.669 | 0.029 | 0.079 | 1.239 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.098 | 0.498 | 3.113 | 0.007 | 0.037 | 0.208 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.013 | 0.114 | 1.386 | 0.001 | 0.008 | 0.140 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945-1947 | Fruit and Vegetables* | 1.140 | 3.237 | 11.544 | 0.801 | 2.351 | 9.728 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Adams County Census Division 07

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.002 | 0.006 | 0.001 | 0.001 | 0.006 |
| 1945 | Inhalation | 0.017 | 0.057 | 0.301 | 0.014 | 0.045 | 0.210 |
| 1945 | Milk from BYCow Regime 3 | 0.042 | 0.363 | 2.967 | 0.003 | 0.034 | 0.295 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.056 | 1.093 | 0.000 | 0.004 | 0.113 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945 | Fruit and Vegetables* | 0.568 | 2.284 | 11.073 | 0.474 | 1.752 | 8.828 |
| 1946 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.003 |
| 1946 | Inhalation | 0.004 | 0.013 | 0.087 | 0.003 | 0.009 | 0.077 |
| 1946 | Milk from BYCow Regime 3 | 0.006 | 0.040 | 0.369 | 0.000 | 0.005 | 0.030 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.007 | 0.139 | 0.000 | 0.001 | 0.017 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1946 | Fruit and Vegetables* | 0.083 | 0.324 | 1.671 | 0.065 | 0.264 | 1.300 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.001 | 0.004 | 0.045 | 0.001 | 0.003 | 0.037 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.009 | 0.103 | 0.000 | 0.001 | 0.007 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.076 | 0.000 | 0.000 | 0.004 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.014 | 0.058 | 0.311 | 0.012 | 0.047 | 0.220 |
| 1945-1947 | External | 0.001 | 0.002 | 0.010 | 0.001 | 0.002 | 0.011 |
| 1945-1947 | Inhalation | 0.033 | 0.086 | 0.479 | 0.028 | 0.070 | 0.450 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.108 | 0.495 | 3.408 | 0.008 | 0.046 | 0.328 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.010 | 0.101 | 1.259 | 0.001 | 0.007 | 0.107 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945-1947 | Fruit and Vegetables* | 1.019 | 2.933 | 11.638 | 0.773 | 2.312 | 9.886 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Adams County Census Division 08

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.002 | 0.009 | 0.001 | 0.002 | 0.007 |
| 1945 | Inhalation | 0.026 | 0.080 | 0.334 | 0.021 | 0.062 | 0.222 |
| 1945 | Milk from BYCow Regime 3 | 0.051 | 0.531 | 4.599 | 0.004 | 0.042 | 0.360 |
| 1945 | Milk from BYCow Regime 4 | 0.002 | 0.065 | 1.280 | 0.000 | 0.004 | 0.124 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945 | Fruit and Vegetables* | 0.877 | 3.521 | 16.646 | 0.694 | 2.618 | 12.736 |
| 1946 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1946 | Inhalation | 0.006 | 0.017 | 0.079 | 0.005 | 0.013 | 0.051 |
| 1946 | Milk from BYCow Regime 3 | 0.008 | 0.075 | 0.582 | 0.001 | 0.005 | 0.076 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.016 | 0.360 | 0.000 | 0.001 | 0.034 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1946 | Fruit and Vegetables* | 0.130 | 0.509 | 2.412 | 0.096 | 0.379 | 1.830 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.002 | 0.005 | 0.024 | 0.001 | 0.004 | 0.017 |
| 1947 | Milk from BYCow Regime 3 | 0.002 | 0.014 | 0.118 | 0.000 | 0.001 | 0.014 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.004 | 0.039 | 0.000 | 0.000 | 0.011 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.023 | 0.091 | 0.430 | 0.019 | 0.072 | 0.323 |
| 1945-1947 | External | 0.002 | 0.003 | 0.010 | 0.002 | 0.003 | 0.009 |
| 1945-1947 | Inhalation | 0.048 | 0.114 | 0.400 | 0.040 | 0.088 | 0.254 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.121 | 0.686 | 5.993 | 0.012 | 0.056 | 0.374 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.016 | 0.145 | 1.761 | 0.002 | 0.012 | 0.160 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945-1947 | Fruit and Vegetables* | 1.511 | 4.441 | 18.424 | 1.214 | 3.313 | 13.689 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Adams County Census Division 09 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.004 | 0.013 | 0.002 | 0.004 | 0.013 |
| 1945 | Inhalation | 0.048 | 0.153 | 0.627 | 0.041 | 0.115 | 0.404 |
| 1945 | Milk from BYCow Regime 3 | 0.108 | 1.131 | 8.098 | 0.007 | 0.069 | 0.589 |
| 1945 | Milk from BYCow Regime 4 | 0.003 | 0.130 | 3.143 | 0.000 | 0.012 | 0.188 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945 | Fruit and Vegetables* | 1.691 | 6.302 | 28.201 | 1.263 | 4.993 | 26.944 |
| 1946 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1946 | Inhalation | 0.011 | 0.031 | 0.124 | 0.009 | 0.025 | 0.078 |
| 1946 | Milk from BYCow Regime 3 | 0.014 | 0.107 | 1.200 | 0.001 | 0.009 | 0.086 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.019 | 0.391 | 0.000 | 0.001 | 0.025 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1946 | Fruit and Vegetables* | 0.214 | 0.853 | 4.349 | 0.171 | 0.653 | 2.879 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.003 | 0.008 | 0.034 | 0.002 | 0.007 | 0.025 |
| 1947 | Milk from BYCow Regime 3 | 0.003 | 0.028 | 0.193 | 0.000 | 0.002 | 0.024 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.008 | 0.220 | 0.000 | 0.001 | 0.019 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.043 | 0.171 | 0.798 | 0.034 | 0.133 | 0.734 |
| 1945-1947 | External | 0.003 | 0.006 | 0.014 | 0.003 | 0.006 | 0.014 |
| 1945-1947 | Inhalation | 0.087 | 0.210 | 0.715 | 0.072 | 0.160 | 0.462 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.259 | 1.357 | 8.473 | 0.019 | 0.104 | 0.683 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.025 | 0.273 | 2.629 | 0.002 | 0.020 | 0.201 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1945-1947 | Fruit and Vegetables* | 2.793 | 8.182 | 30.641 | 2.078 | 6.234 | 28.223 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Adams County Census Division 10 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.003 | 0.007 | 0.031 | 0.003 | 0.007 | 0.033 |
| 1945 | Inhalation | 0.076 | 0.246 | 1.420 | 0.066 | 0.201 | 0.992 |
| 1945 | Milk from BYCow Regime 3 | 0.147 | 1.459 | 15.088 | 0.013 | 0.113 | 1.046 |
| 1945 | Milk from BYCow Regime 4 | 0.007 | 0.182 | 2.832 | 0.001 | 0.019 | 0.465 |
| 1945 | Commercial Milk (Rural) | 0.304 | 1.932 | 18.166 | 0.024 | 0.183 | 2.096 |
| 1945 | Fruit and Vegetables* | 2.644 | 10.695 | 48.307 | 2.035 | 7.538 | 38.742 |
| 1946 | External | 0.001 | 0.002 | 0.007 | 0.001 | 0.002 | 0.007 |
| 1946 | Inhalation | 0.018 | 0.055 | 0.292 | 0.015 | 0.044 | 0.171 |
| 1946 | Milk from BYCow Regime 3 | 0.019 | 0.158 | 2.457 | 0.001 | 0.013 | 0.126 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.027 | 0.554 | 0.000 | 0.002 | 0.039 |
| 1946 | Commercial Milk (Rural) | 0.060 | 0.365 | 3.131 | 0.004 | 0.025 | 0.218 |
| 1946 | Fruit and Vegetables* | 0.330 | 1.424 | 7.152 | 0.255 | 1.023 | 5.262 |
| 1947 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1947 | Inhalation | 0.005 | 0.016 | 0.073 | 0.004 | 0.012 | 0.049 |
| 1947 | Milk from BYCow Regime 3 | 0.004 | 0.037 | 0.347 | 0.000 | 0.003 | 0.037 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.012 | 0.225 | 0.000 | 0.001 | 0.017 |
| 1947 | Commercial Milk (Rural) | 0.016 | 0.151 | 2.024 | 0.001 | 0.011 | 0.122 |
| 1947 | Fruit and Vegetables* | 0.061 | 0.252 | 1.249 | 0.052 | 0.203 | 0.988 |
| 1945-1947 | External | 0.005 | 0.010 | 0.033 | 0.005 | 0.011 | 0.042 |
| 1945-1947 | Inhalation | 0.150 | 0.367 | 1.775 | 0.121 | 0.285 | 1.359 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.413 | 2.063 | 16.663 | 0.030 | 0.150 | 1.060 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.043 | 0.357 | 3.840 | 0.004 | 0.034 | 0.527 |
| 1945-1947 | Commercial Milk (Rural) | 0.781 | 3.202 | 20.397 | 0.061 | 0.255 | 2.644 |
| 1945-1947 | Fruit and Vegetables* | 4.371 | 13.406 | 51.376 | 3.314 | 9.742 | 42.054 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Benton County Census Division 01

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.008 | 0.020 | 0.061 | 0.008 | 0.020 | 0.064 |
| 1945 | Inhalation | 0.176 | 0.575 | 2.879 | 0.153 | 0.483 | 2.062 |
| 1945 | Milk from BYCow Regime 1 | 15.754 | 103.117 | 680.336 | 1.159 | 7.091 | 58.231 |
| 1945 | Milk from BYCow Regime 2 | 13.506 | 84.308 | 543.274 | 1.019 | 8.109 | 63.145 |
| 1945 | Milk from BYCow Regime 3 | 0.242 | 2.566 | 29.954 | 0.031 | 0.224 | 1.401 |
| 1945 | Milk from BYCow Regime 4 | 0.038 | 0.463 | 9.705 | 0.009 | 0.084 | 1.114 |
| 1945 | Commercial Milk (Rural) | 22.267 | 111.559 | 404.105 | 1.607 | 8.090 | 29.233 |
| 1945 | Fruit and Vegetables* | 6.075 | 26.054 | 113.725 | 4.314 | 16.713 | 76.452 |
| 1946 | External | 0.002 | 0.005 | 0.014 | 0.002 | 0.005 | 0.014 |
| 1946 | Inhalation | 0.048 | 0.142 | 0.564 | 0.039 | 0.117 | 0.453 |
| 1946 | Milk from BYCow Regime 1 | 2.434 | 12.841 | 63.721 | 0.155 | 1.053 | 6.400 |
| 1946 | Milk from BYCow Regime 2 | 2.186 | 13.127 | 77.639 | 0.147 | 1.017 | 8.203 |
| 1946 | Milk from BYCow Regime 3 | 0.042 | 0.346 | 3.264 | 0.005 | 0.038 | 0.321 |
| 1946 | Milk from BYCow Regime 4 | 0.007 | 0.077 | 2.490 | 0.001 | 0.010 | 0.085 |
| 1946 | Commercial Milk (Rural) | 3.492 | 14.095 | 56.267 | 0.264 | 1.179 | 5.984 |
| 1946 | Fruit and Vegetables* | 0.844 | 3.809 | 20.784 | 0.651 | 2.333 | 11.573 |
| 1947 | External | 0.001 | 0.001 | 0.004 | 0.001 | 0.002 | 0.005 |
| 1947 | Inhalation | 0.013 | 0.042 | 0.203 | 0.011 | 0.034 | 0.156 |
| 1947 | Milk from BYCow Regime 1 | 0.612 | 3.769 | 23.360 | 0.045 | 0.335 | 1.858 |
| 1947 | Milk from BYCow Regime 2 | 0.731 | 3.928 | 22.779 | 0.042 | 0.248 | 1.768 |
| 1947 | Milk from BYCow Regime 3 | 0.015 | 0.122 | 1.686 | 0.002 | 0.011 | 0.119 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.021 | 0.462 | 0.000 | 0.003 | 0.031 |
| 1947 | Commercial Milk (Rural) | 0.922 | 3.717 | 18.114 | 0.078 | 0.360 | 1.083 |
| 1947 | Fruit and Vegetables* | 0.155 | 0.615 | 3.186 | 0.125 | 0.460 | 2.524 |
| 1945-1947 | External | 0.014 | 0.028 | 0.075 | 0.014 | 0.028 | 0.070 |
| 1945-1947 | Inhalation | 0.353 | 0.874 | 3.248 | 0.302 | 0.690 | 2.373 |
| 1945-1947 | Milk from BYCow Regime 1 | 34.298 | 129.080 | 686.048 | 2.593 | 9.864 | 66.659 |
| 1945-1947 | Milk from BYCow Regime 2 | 30.082 | 120.983 | 582.833 | 2.385 | 11.045 | 65.364 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.809 | 4.085 | 33.200 | 0.080 | 0.308 | 1.722 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.125 | 0.922 | 8.570 | 0.026 | 0.121 | 1.156 |
| 1945-1947 | Commercial Milk (Rural) | 39.607 | 134.590 | 408.022 | 2.915 | 9.836 | 32.936 |
| 1945-1947 | Fruit and Vegetables* | 10.938 | 34.556 | 130.957 | 7.714 | 21.680 | 88.812 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Benton County Census Division 03 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.013 | 0.031 | 0.088 | 0.014 | 0.030 | 0.082 |
| 1945 | Inhalation | 0.339 | 0.961 | 3.633 | 0.281 | 0.757 | 2.561 |
| 1945 | Milk from BYCow Regime 1 | 24.844 | 155.935 | 673.061 | 2.147 | 13.903 | 66.469 |
| 1945 | Milk from BYCow Regime 2 | 23.609 | 142.973 | 728.004 | 2.046 | 11.869 | 68.538 |
| 1945 | Milk from BYCow Regime 3 | 0.324 | 3.675 | 44.586 | 0.047 | 0.402 | 3.842 |
| 1945 | Milk from BYCow Regime 4 | 0.040 | 0.620 | 18.188 | 0.012 | 0.106 | 1.421 |
| 1945 | Commercial Milk (Rural) | 34.816 | 164.178 | 635.036 | 2.467 | 12.169 | 43.033 |
| 1945 | Commercial Milk (Urban) | 57.488 | 197.874 | 784.783 | 2.504 | 11.096 | 43.829 |
| 1945 | Fruit and Vegetables* | 9.362 | 37.595 | 178.622 | 7.110 | 25.507 | 107.973 |
| 1946 | External | 0.004 | 0.008 | 0.018 | 0.004 | 0.008 | 0.017 |
| 1946 | Inhalation | 0.089 | 0.243 | 0.878 | 0.078 | 0.191 | 0.620 |
| 1946 | Milk from BYCow Regime 1 | 4.235 | 22.610 | 138.124 | 0.382 | 1.824 | 9.589 |
| 1946 | Milk from BYCow Regime 2 | 3.328 | 23.280 | 153.316 | 0.265 | 2.077 | 12.161 |
| 1946 | Milk from BYCow Regime 3 | 0.082 | 0.655 | 5.892 | 0.009 | 0.060 | 0.656 |
| 1946 | Milk from BYCow Regime 4 | 0.008 | 0.128 | 1.898 | 0.002 | 0.017 | 0.181 |
| 1946 | Commercial Milk (Rural) | 5.360 | 23.079 | 77.478 | 0.508 | 2.102 | 8.772 |
| 1946 | Commercial Milk (Urban) | 7.517 | 30.543 | 113.219 | 0.354 | 1.636 | 7.847 |
| 1946 | Fruit and Vegetables* | 1.374 | 5.448 | 24.817 | 1.006 | 3.565 | 15.161 |
| 1947 | External | 0.001 | 0.002 | 0.006 | 0.001 | 0.002 | 0.007 |
| 1947 | Inhalation | 0.024 | 0.073 | 0.311 | 0.021 | 0.058 | 0.230 |
| 1947 | Milk from BYCow Regime 1 | 1.164 | 6.961 | 36.487 | 0.109 | 0.541 | 3.063 |
| 1947 | Milk from BYCow Regime 2 | 1.243 | 5.800 | 29.880 | 0.102 | 0.527 | 3.020 |
| 1947 | Milk from BYCow Regime 3 | 0.023 | 0.203 | 2.071 | 0.002 | 0.014 | 0.115 |
| 1947 | Milk from BYCow Regime 4 | 0.002 | 0.034 | 0.463 | 0.000 | 0.004 | 0.056 |
| 1947 | Commercial Milk (Rural) | 1.110 | 3.757 | 14.305 | 0.088 | 0.357 | 1.293 |
| 1947 | Commercial Milk (Urban) | 1.246 | 4.932 | 19.199 | 0.071 | 0.284 | 1.232 |
| 1947 | Fruit and Vegetables* | 0.240 | 0.910 | 4.248 | 0.181 | 0.683 | 3.664 |
| 1945-1947 | External | 0.023 | 0.043 | 0.101 | 0.023 | 0.043 | 0.095 |
| 1945-1947 | Inhalation | 0.651 | 1.447 | 4.343 | 0.516 | 1.096 | 3.090 |
| 1945-1947 | Milk from BYCow Regime 1 | 61.070 | 209.050 | 762.789 | 4.315 | 16.782 | 74.443 |
| 1945-1947 | Milk from BYCow Regime 2 | 51.399 | 198.004 | 871.563 | 4.667 | 17.986 | 71.910 |
| 1945-1947 | Milk from BYCow Regime 3 | 1.203 | 6.602 | 46.031 | 0.123 | 0.581 | 4.047 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.179 | 1.155 | 16.402 | 0.033 | 0.164 | 1.314 |
| 1945-1947 | Commercial Milk (Rural) | 58.645 | 205.878 | 671.565 | 4.948 | 16.378 | 49.524 |
| 1945-1947 | Commercial Milk (Urban) | 93.894 | 258.026 | 951.247 | 4.416 | 14.354 | 50.263 |
| 1945-1947 | Fruit and Vegetables* | 15.761 | 48.403 | 189.696 | 11.516 | 31.629 | 114.674 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Benton County Census Division 04

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.010 | 0.022 | 0.064 | 0.010 | 0.021 | 0.064 |
| 1945 | Inhalation | 0.235 | 0.689 | 2.475 | 0.203 | 0.530 | 1.788 |
| 1945 | Milk from BYCow Regime 1 | 23.622 | 118.840 | 674.846 | 1.655 | 10.404 | 75.012 |
| 1945 | Milk from BYCow Regime 2 | 15.793 | 107.019 | 879.343 | 1.165 | 8.039 | 44.703 |
| 1945 | Milk from BYCow Regime 3 | 0.295 | 3.346 | 32.937 | 0.043 | 0.323 | 2.690 |
| 1945 | Milk from BYCow Regime 4 | 0.052 | 0.644 | 10.428 | 0.010 | 0.093 | 0.697 |
| 1945 | Commercial Milk (Rural) | 40.113 | 163.258 | 789.131 | 2.696 | 12.644 | 42.393 |
| 1945 | Fruit and Vegetables* | 7.388 | 28.204 | 156.356 | 5.504 | 19.778 | 92.052 |
| 1946 | External | 0.003 | 0.005 | 0.013 | 0.003 | 0.005 | 0.012 |
| 1946 | Inhalation | 0.063 | 0.171 | 0.554 | 0.055 | 0.134 | 0.425 |
| 1946 | Milk from BYCow Regime 1 | 2.901 | 18.733 | 113.505 | 0.301 | 1.558 | 9.512 |
| 1946 | Milk from BYCow Regime 2 | 2.589 | 18.615 | 110.582 | 0.213 | 1.248 | 8.376 |
| 1946 | Milk from BYCow Regime 3 | 0.071 | 0.481 | 3.869 | 0.006 | 0.038 | 0.342 |
| 1946 | Milk from BYCow Regime 4 | 0.006 | 0.073 | 1.933 | 0.002 | 0.015 | 0.134 |
| 1946 | Commercial Milk (Rural) | 5.448 | 23.795 | 102.257 | 0.455 | 2.139 | 7.712 |
| 1946 | Fruit and Vegetables* | 1.029 | 4.185 | 21.420 | 0.734 | 2.705 | 12.630 |
| 1947 | External | 0.001 | 0.002 | 0.004 | 0.001 | 0.002 | 0.004 |
| 1947 | Inhalation | 0.018 | 0.052 | 0.199 | 0.014 | 0.040 | 0.151 |
| 1947 | Milk from BYCow Regime 1 | 1.217 | 5.960 | 30.861 | 0.060 | 0.381 | 2.563 |
| 1947 | Milk from BYCow Regime 2 | 0.975 | 5.149 | 31.163 | 0.065 | 0.433 | 2.606 |
| 1947 | Milk from BYCow Regime 3 | 0.020 | 0.167 | 1.382 | 0.002 | 0.016 | 0.187 |
| 1947 | Milk from BYCow Regime 4 | 0.002 | 0.027 | 0.572 | 0.001 | 0.004 | 0.030 |
| 1947 | Commercial Milk (Rural) | 1.584 | 7.632 | 26.798 | 0.131 | 0.522 | 2.178 |
| 1947 | Fruit and Vegetables* | 0.182 | 0.751 | 3.571 | 0.141 | 0.525 | 2.306 |
| 1945-1947 | External | 0.017 | 0.031 | 0.073 | 0.017 | 0.029 | 0.073 |
| 1945-1947 | Inhalation | 0.446 | 0.992 | 2.852 | 0.372 | 0.762 | 2.054 |
| 1945-1947 | Milk from BYCow Regime 1 | 47.261 | 160.407 | 744.781 | 3.113 | 12.769 | 67.653 |
| 1945-1947 | Milk from BYCow Regime 2 | 39.700 | 155.017 | 818.839 | 3.079 | 11.781 | 52.725 |
| 1945-1947 | Milk from BYCow Regime 3 | 1.023 | 5.012 | 41.012 | 0.100 | 0.458 | 2.651 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.157 | 1.257 | 13.523 | 0.031 | 0.139 | 0.949 |
| 1945-1947 | Commercial Milk (Rural) | 72.826 | 206.692 | 763.043 | 5.689 | 17.402 | 50.394 |
| 1945-1947 | Fruit and Vegetables* | 12.677 | 36.859 | 158.245 | 9.029 | 25.381 | 104.336 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Benton County Census Division 05

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.008 | 0.069 | 0.002 | 0.008 | 0.073 |
| 1945 | Inhalation | 0.049 | 0.219 | 2.764 | 0.039 | 0.160 | 2.429 |
| 1945 | Milk from BYCow Regime 1 | 4.453 | 34.044 | 216.915 | 0.431 | 2.622 | 21.662 |
| 1945 | Milk from BYCow Regime 2 | 4.425 | 30.925 | 252.496 | 0.426 | 2.764 | 18.609 |
| 1945 | Milk from BYCow Regime 3 | 0.107 | 0.962 | 12.458 | 0.010 | 0.091 | 0.933 |
| 1945 | Milk from BYCow Regime 4 | 0.018 | 0.337 | 7.724 | 0.003 | 0.036 | 0.429 |
| 1945 | Commercial Milk (Rural) | 3.629 | 24.064 | 174.369 | 0.288 | 2.041 | 11.176 |
| 1945 | Fruit and Vegetables* | 2.062 | 9.760 | 69.625 | 1.678 | 6.715 | 36.701 |
| 1946 | External | 0.001 | 0.002 | 0.015 | 0.001 | 0.002 | 0.015 |
| 1946 | Inhalation | 0.012 | 0.049 | 0.453 | 0.010 | 0.039 | 0.335 |
| 1946 | Milk from BYCow Regime 1 | 0.622 | 4.330 | 37.128 | 0.072 | 0.512 | 3.484 |
| 1946 | Milk from BYCow Regime 2 | 0.771 | 5.933 | 38.881 | 0.045 | 0.337 | 2.561 |
| 1946 | Milk from BYCow Regime 3 | 0.013 | 0.131 | 1.253 | 0.002 | 0.013 | 0.095 |
| 1946 | Milk from BYCow Regime 4 | 0.002 | 0.043 | 0.837 | 0.000 | 0.005 | 0.086 |
| 1946 | Commercial Milk (Rural) | 0.617 | 3.812 | 27.947 | 0.042 | 0.280 | 1.813 |
| 1946 | Fruit and Vegetables* | 0.298 | 1.277 | 6.736 | 0.239 | 0.946 | 4.497 |
| 1947 | External | 0.000 | 0.001 | 0.004 | 0.000 | 0.001 | 0.004 |
| 1947 | Inhalation | 0.003 | 0.014 | 0.138 | 0.003 | 0.012 | 0.128 |
| 1947 | Milk from BYCow Regime 1 | 0.213 | 1.437 | 8.879 | 0.013 | 0.102 | 0.656 |
| 1947 | Milk from BYCow Regime 2 | 0.232 | 1.444 | 9.383 | 0.014 | 0.092 | 0.711 |
| 1947 | Milk from BYCow Regime 3 | 0.004 | 0.049 | 0.672 | 0.000 | 0.004 | 0.038 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.007 | 0.191 | 0.000 | 0.001 | 0.015 |
| 1947 | Commercial Milk (Rural) | 0.170 | 1.048 | 5.913 | 0.012 | 0.080 | 0.609 |
| 1947 | Fruit and Vegetables* | 0.056 | 0.249 | 1.442 | 0.043 | 0.184 | 1.071 |
| 1945-1947 | External | 0.005 | 0.012 | 0.084 | 0.005 | 0.012 | 0.094 |
| 1945-1947 | Inhalation | 0.111 | 0.367 | 3.500 | 0.088 | 0.277 | 3.774 |
| 1945-1947 | Milk from BYCow Regime 1 | 11.337 | 48.974 | 261.390 | 0.902 | 3.565 | 26.247 |
| 1945-1947 | Milk from BYCow Regime 2 | 11.019 | 45.306 | 312.118 | 0.841 | 3.528 | 17.465 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.252 | 1.425 | 11.867 | 0.029 | 0.129 | 1.053 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.062 | 0.551 | 6.049 | 0.009 | 0.055 | 0.541 |
| 1945-1947 | Commercial Milk (Rural) | 8.969 | 35.999 | 177.290 | 0.669 | 2.946 | 11.309 |
| 1945-1947 | Fruit and Vegetables* | 3.890 | 12.554 | 70.261 | 2.877 | 8.556 | 39.053 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Benton County Census Division 06

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.004 | 0.027 | 0.001 | 0.004 | 0.019 |
| 1945 | Inhalation | 0.024 | 0.102 | 0.871 | 0.020 | 0.079 | 0.890 |
| 1945 | Milk from BYCow Regime 1 | 3.233 | 21.456 | 144.883 | 0.170 | 1.413 | 8.516 |
| 1945 | Milk from BYCow Regime 2 | 3.009 | 20.621 | 137.078 | 0.213 | 1.575 | 11.451 |
| 1945 | Milk from BYCow Regime 3 | 0.056 | 0.526 | 7.256 | 0.007 | 0.056 | 0.529 |
| 1945 | Milk from BYCow Regime 4 | 0.015 | 0.179 | 3.082 | 0.003 | 0.031 | 0.470 |
| 1945 | Commercial Milk (Rural) | 3.480 | 29.072 | 192.386 | 0.263 | 1.968 | 15.150 |
| 1945 | Commercial Milk (Urban) | 6.871 | 35.292 | 242.167 | 0.382 | 1.894 | 9.648 |
| 1945 | Fruit and Vegetables* | 1.208 | 5.482 | 33.012 | 0.940 | 3.703 | 17.112 |
| 1946 | External | 0.000 | 0.001 | 0.005 | 0.000 | 0.001 | 0.005 |
| 1946 | Inhalation | 0.005 | 0.023 | 0.357 | 0.005 | 0.018 | 0.261 |
| 1946 | Milk from BYCow Regime 1 | 0.546 | 3.460 | 28.656 | 0.037 | 0.248 | 1.719 |
| 1946 | Milk from BYCow Regime 2 | 0.374 | 2.635 | 29.077 | 0.028 | 0.208 | 1.827 |
| 1946 | Milk from BYCow Regime 3 | 0.009 | 0.097 | 0.774 | 0.001 | 0.009 | 0.105 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.024 | 0.455 | 0.000 | 0.003 | 0.041 |
| 1946 | Commercial Milk (Rural) | 0.543 | 3.680 | 21.787 | 0.041 | 0.281 | 2.085 |
| 1946 | Commercial Milk (Urban) | 0.888 | 3.811 | 20.539 | 0.051 | 0.232 | 1.173 |
| 1946 | Fruit and Vegetables* | 0.169 | 0.828 | 5.241 | 0.134 | 0.519 | 2.439 |
| 1947 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.002 |
| 1947 | Inhalation | 0.002 | 0.007 | 0.088 | 0.001 | 0.006 | 0.047 |
| 1947 | Milk from BYCow Regime 1 | 0.137 | 0.870 | 7.242 | 0.009 | 0.058 | 0.383 |
| 1947 | Milk from BYCow Regime 2 | 0.103 | 0.662 | 3.615 | 0.010 | 0.068 | 0.429 |
| 1947 | Milk from BYCow Regime 3 | 0.003 | 0.027 | 0.272 | 0.000 | 0.003 | 0.028 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.005 | 0.125 | 0.000 | 0.001 | 0.006 |
| 1947 | Commercial Milk (Rural) | 0.181 | 1.014 | 5.556 | 0.014 | 0.076 | 0.395 |
| 1947 | Commercial Milk (Urban) | 0.309 | 1.177 | 5.585 | 0.012 | 0.060 | 0.293 |
| 1947 | Fruit and Vegetables* | 0.029 | 0.136 | 0.754 | 0.027 | 0.104 | 0.595 |
| 1945-1947 | External | 0.002 | 0.006 | 0.037 | 0.002 | 0.006 | 0.025 |
| 1945-1947 | Inhalation | 0.052 | 0.171 | 1.627 | 0.043 | 0.135 | 1.408 |
| 1945-1947 | Milk from BYCow Regime 1 | 8.392 | 33.246 | 154.022 | 0.506 | 2.020 | 10.071 |
| 1945-1947 | Milk from BYCow Regime 2 | 7.149 | 29.403 | 143.653 | 0.492 | 2.388 | 11.891 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.172 | 0.842 | 5.923 | 0.019 | 0.084 | 0.552 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.037 | 0.296 | 3.138 | 0.007 | 0.043 | 0.428 |
| 1945-1947 | Commercial Milk (Rural) | 8.888 | 36.856 | 203.842 | 0.629 | 2.711 | 17.017 |
| 1945-1947 | Commercial Milk (Urban) | 13.704 | 44.302 | 214.933 | 0.707 | 2.573 | 9.925 |
| 1945-1947 | Fruit and Vegetables* | 2.246 | 7.419 | 36.907 | 1.628 | 4.888 | 19.913 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Benton County Census Division 07 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.023 | 0.050 | 0.140 | 0.023 | 0.050 | 0.130 |
| 1945 | Inhalation | 0.586 | 1.746 | 6.506 | 0.485 | 1.350 | 4.606 |
| 1945 | Milk from BYCow Regime 1 | 45.343 | 249.192 | 1534.472 | 3.705 | 21.827 | 121.847 |
| 1945 | Milk from BYCow Regime 2 | 42.776 | 279.042 | 1541.111 | 3.029 | 20.153 | 123.607 |
| 1945 | Milk from BYCow Regime 3 | 0.471 | 6.062 | 43.702 | 0.047 | 0.481 | 6.309 |
| 1945 | Milk from BYCow Regime 4 | 0.046 | 1.375 | 29.080 | 0.005 | 0.110 | 2.216 |
| 1945 | Commercial Milk (Rural) | 3.091 | 18.571 | 144.203 | 0.244 | 1.449 | 12.883 |
| 1945 | Commercial Milk (Urban) | 4.234 | 25.530 | 214.052 | 0.221 | 1.327 | 9.877 |
| 1945 | Fruit and Vegetables* | 16.345 | 66.668 | 271.969 | 12.191 | 44.116 | 189.410 |
| 1946 | External | 0.006 | 0.013 | 0.029 | 0.006 | 0.013 | 0.030 |
| 1946 | Inhalation | 0.149 | 0.407 | 1.472 | 0.123 | 0.320 | 0.971 |
| 1946 | Milk from BYCow Regime 1 | 9.572 | 45.894 | 249.715 | 0.641 | 3.646 | 22.179 |
| 1946 | Milk from BYCow Regime 2 | 7.522 | 40.327 | 258.398 | 0.477 | 3.211 | 16.929 |
| 1946 | Milk from BYCow Regime 3 | 0.125 | 1.300 | 9.963 | 0.009 | 0.086 | 0.863 |
| 1946 | Milk from BYCow Regime 4 | 0.003 | 0.131 | 2.649 | 0.001 | 0.014 | 0.251 |
| 1946 | Commercial Milk (Rural) | 0.378 | 2.675 | 20.518 | 0.040 | 0.224 | 1.445 |
| 1946 | Commercial Milk (Urban) | 0.467 | 3.116 | 23.933 | 0.030 | 0.188 | 1.269 |
| 1946 | Fruit and Vegetables* | 2.297 | 9.249 | 45.558 | 1.846 | 6.722 | 29.014 |
| 1947 | External | 0.002 | 0.004 | 0.011 | 0.002 | 0.004 | 0.010 |
| 1947 | Inhalation | 0.041 | 0.128 | 0.501 | 0.033 | 0.095 | 0.357 |
| 1947 | Milk from BYCow Regime 1 | 2.232 | 12.110 | 53.403 | 0.152 | 0.809 | 4.731 |
| 1947 | Milk from BYCow Regime 2 | 2.161 | 11.258 | 83.979 | 0.187 | 0.917 | 5.707 |
| 1947 | Milk from BYCow Regime 3 | 0.034 | 0.336 | 2.830 | 0.002 | 0.028 | 0.440 |
| 1947 | Milk from BYCow Regime 4 | 0.002 | 0.037 | 1.432 | 0.000 | 0.004 | 0.087 |
| 1947 | Commercial Milk (Rural) | 0.094 | 0.623 | 3.999 | 0.010 | 0.061 | 0.333 |
| 1947 | Commercial Milk (Urban) | 0.162 | 0.952 | 6.634 | 0.006 | 0.044 | 0.308 |
| 1947 | Fruit and Vegetables* | 0.401 | 1.535 | 6.524 | 0.309 | 1.166 | 6.057 |
| 1945-1947 | External | 0.039 | 0.071 | 0.162 | 0.040 | 0.072 | 0.160 |
| 1945-1947 | Inhalation | 1.100 | 2.446 | 7.196 | 0.925 | 1.918 | 5.678 |
| 1945-1947 | Milk from BYCow Regime 1 | 104.553 | 351.325 | 1644.674 | 7.640 | 32.213 | 119.260 |
| 1945-1947 | Milk from BYCow Regime 2 | 102.946 | 394.415 | 1736.697 | 8.035 | 27.229 | 118.270 |
| 1945-1947 | Milk from BYCow Regime 3 | 1.700 | 9.381 | 53.725 | 0.147 | 0.890 | 6.395 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.235 | 2.093 | 29.064 | 0.020 | 0.165 | 2.711 |
| 1945-1947 | Commercial Milk (Rural) | 6.661 | 27.837 | 153.569 | 0.489 | 1.933 | 11.035 |
| 1945-1947 | Commercial Milk (Urban) | 8.832 | 34.978 | 207.718 | 0.505 | 1.829 | 9.811 |
| 1945-1947 | Fruit and Vegetables* | 28.255 | 87.078 | 291.353 | 20.751 | 59.809 | 208.838 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Benton County Census Division 08 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.008 | 0.056 | 0.002 | 0.007 | 0.051 |
| 1945 | Inhalation | 0.041 | 0.199 | 2.349 | 0.036 | 0.155 | 1.703 |
| 1945 | Milk from BYCow Regime 1 | 4.953 | 29.450 | 267.620 | 0.359 | 2.494 | 24.562 |
| 1945 | Milk from BYCow Regime 2 | 3.500 | 35.725 | 247.072 | 0.302 | 2.145 | 17.678 |
| 1945 | Milk from BYCow Regime 3 | 0.086 | 0.821 | 7.350 | 0.018 | 0.106 | 1.150 |
| 1945 | Milk from BYCow Regime 4 | 0.021 | 0.204 | 2.508 | 0.006 | 0.046 | 0.352 |
| 1945 | Commercial Milk (Rural) | 27.700 | 113.484 | 425.294 | 2.356 | 8.927 | 33.606 |
| 1945 | Fruit and Vegetables* | 1.743 | 8.936 | 63.115 | 1.353 | 6.007 | 42.032 |
| 1946 | External | 0.001 | 0.002 | 0.039 | 0.001 | 0.002 | 0.040 |
| 1946 | Inhalation | 0.010 | 0.052 | 0.881 | 0.008 | 0.041 | 0.853 |
| 1946 | Milk from BYCow Regime 1 | 0.664 | 4.556 | 38.117 | 0.053 | 0.363 | 3.100 |
| 1946 | Milk from BYCow Regime 2 | 0.645 | 4.697 | 30.920 | 0.040 | 0.340 | 4.053 |
| 1946 | Milk from BYCow Regime 3 | 0.018 | 0.102 | 1.566 | 0.003 | 0.016 | 0.101 |
| 1946 | Milk from BYCow Regime 4 | 0.002 | 0.023 | 0.330 | 0.001 | 0.006 | 0.047 |
| 1946 | Commercial Milk (Rural) | 3.498 | 15.798 | 58.670 | 0.281 | 1.261 | 5.352 |
| 1946 | Fruit and Vegetables* | 0.239 | 1.201 | 8.921 | 0.202 | 0.848 | 6.341 |
| 1947 | External | 0.000 | 0.001 | 0.009 | 0.000 | 0.001 | 0.009 |
| 1947 | Inhalation | 0.003 | 0.014 | 0.345 | 0.002 | 0.011 | 0.260 |
| 1947 | Milk from BYCow Regime 1 | 0.205 | 1.416 | 14.924 | 0.015 | 0.103 | 0.687 |
| 1947 | Milk from BYCow Regime 2 | 0.222 | 1.613 | 11.422 | 0.016 | 0.101 | 0.757 |
| 1947 | Milk from BYCow Regime 3 | 0.005 | 0.043 | 0.435 | 0.001 | 0.005 | 0.041 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.008 | 0.216 | 0.000 | 0.002 | 0.018 |
| 1947 | Commercial Milk (Rural) | 1.010 | 3.964 | 14.307 | 0.098 | 0.386 | 1.456 |
| 1947 | Fruit and Vegetables* | 0.047 | 0.235 | 1.614 | 0.037 | 0.158 | 0.840 |
| 1945-1947 | External | 0.005 | 0.014 | 0.121 | 0.005 | 0.014 | 0.104 |
| 1945-1947 | Inhalation | 0.104 | 0.385 | 4.219 | 0.083 | 0.290 | 3.339 |
| 1945-1947 | Milk from BYCow Regime 1 | 9.702 | 44.688 | 272.649 | 0.860 | 3.716 | 28.949 |
| 1945-1947 | Milk from BYCow Regime 2 | 10.438 | 49.242 | 309.909 | 0.722 | 3.549 | 23.983 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.257 | 1.208 | 8.074 | 0.039 | 0.151 | 1.062 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.050 | 0.313 | 3.484 | 0.015 | 0.068 | 0.488 |
| 1945-1947 | Commercial Milk (Rural) | 47.322 | 151.999 | 448.543 | 3.411 | 12.017 | 38.380 |
| 1945-1947 | Fruit and Vegetables* | 3.378 | 11.838 | 70.449 | 2.372 | 7.859 | 41.852 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Benton County Census Division 09 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.011 | 0.026 | 0.074 | 0.011 | 0.027 | 0.078 |
| 1945 | Inhalation | 0.250 | 0.767 | 3.051 | 0.216 | 0.613 | 2.065 |
| 1945 | Milk from BYCow Regime 1 | 23.050 | 135.586 | 764.820 | 1.783 | 10.459 | 66.468 |
| 1945 | Milk from BYCow Regime 2 | 16.875 | 117.308 | 897.344 | 1.669 | 11.040 | 64.134 |
| 1945 | Milk from BYCow Regime 3 | 0.388 | 3.769 | 44.207 | 0.040 | 0.311 | 4.799 |
| 1945 | Milk from BYCow Regime 4 | 0.032 | 0.475 | 8.816 | 0.009 | 0.096 | 1.597 |
| 1945 | Commercial Milk (Rural) | 24.314 | 105.245 | 353.268 | 1.835 | 8.421 | 27.601 |
| 1945 | Fruit and Vegetables* | 8.176 | 31.164 | 145.561 | 6.064 | 20.958 | 108.301 |
| 1946 | External | 0.003 | 0.007 | 0.018 | 0.003 | 0.007 | 0.017 |
| 1946 | Inhalation | 0.070 | 0.206 | 0.769 | 0.057 | 0.156 | 0.571 |
| 1946 | Milk from BYCow Regime 1 | 3.398 | 19.124 | 86.741 | 0.249 | 1.538 | 10.852 |
| 1946 | Milk from BYCow Regime 2 | 2.509 | 15.652 | 91.264 | 0.228 | 1.222 | 6.401 |
| 1946 | Milk from BYCow Regime 3 | 0.069 | 0.587 | 3.633 | 0.009 | 0.060 | 0.389 |
| 1946 | Milk from BYCow Regime 4 | 0.004 | 0.072 | 1.637 | 0.001 | 0.008 | 0.144 |
| 1946 | Commercial Milk (Rural) | 3.390 | 13.980 | 65.364 | 0.296 | 1.164 | 5.126 |
| 1946 | Fruit and Vegetables* | 1.054 | 4.318 | 24.687 | 0.779 | 2.868 | 13.745 |
| 1947 | External | 0.001 | 0.002 | 0.006 | 0.001 | 0.002 | 0.006 |
| 1947 | Inhalation | 0.019 | 0.062 | 0.275 | 0.016 | 0.048 | 0.224 |
| 1947 | Milk from BYCow Regime 1 | 0.866 | 5.497 | 30.918 | 0.073 | 0.425 | 2.583 |
| 1947 | Milk from BYCow Regime 2 | 1.154 | 5.888 | 26.838 | 0.076 | 0.463 | 3.005 |
| 1947 | Milk from BYCow Regime 3 | 0.021 | 0.183 | 2.347 | 0.002 | 0.013 | 0.114 |
| 1947 | Milk from BYCow Regime 4 | 0.002 | 0.021 | 0.393 | 0.000 | 0.003 | 0.025 |
| 1947 | Commercial Milk (Rural) | 0.976 | 3.779 | 16.494 | 0.082 | 0.311 | 1.271 |
| 1947 | Fruit and Vegetables* | 0.195 | 0.791 | 4.182 | 0.153 | 0.599 | 2.945 |
| 1945-1947 | External | 0.020 | 0.037 | 0.088 | 0.020 | 0.037 | 0.088 |
| 1945-1947 | Inhalation | 0.520 | 1.172 | 3.680 | 0.430 | 0.921 | 2.400 |
| 1945-1947 | Milk from BYCow Regime 1 | 52.895 | 177.231 | 799.446 | 3.908 | 14.764 | 74.948 |
| 1945-1947 | Milk from BYCow Regime 2 | 39.879 | 155.621 | 855.390 | 3.516 | 13.922 | 65.614 |
| 1945-1947 | Milk from BYCow Regime 3 | 1.047 | 5.575 | 46.314 | 0.102 | 0.504 | 5.658 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.125 | 0.932 | 10.642 | 0.024 | 0.133 | 1.780 |
| 1945-1947 | Commercial Milk (Rural) | 44.487 | 128.426 | 402.016 | 3.339 | 9.970 | 29.298 |
| 1945-1947 | Fruit and Vegetables* | 13.694 | 41.529 | 165.356 | 9.552 | 27.762 | 113.728 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Franklin County Census Division 01

| Year | Dose Pathway | Infant Dose Percentiles 5th | Infant Dose Percentiles 50th | Infant Dose Percentiles 95th | Adult Dose Percentiles 5th | Adult Dose Percentiles 50th | Adult Dose Percentiles 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.007 | 0.017 | 0.065 | 0.007 | 0.018 | 0.077 |
| 1945 | Inhalation | 0.173 | 0.609 | 2.690 | 0.153 | 0.469 | 2.168 |
| 1945 | Milk from BYCow Regime 1 | 23.853 | 128.773 | 839.428 | 1.381 | 8.588 | 60.387 |
| 1945 | Milk from BYCow Regime 2 | 20.105 | 135.794 | 1345.038 | 1.515 | 9.753 | 64.399 |
| 1945 | Milk from BYCow Regime 3 | 0.253 | 2.624 | 26.866 | 0.044 | 0.370 | 4.563 |
| 1945 | Milk from BYCow Regime 4 | 0.037 | 0.610 | 15.987 | 0.010 | 0.081 | 1.450 |
| 1945 | Commercial Milk (Rural) | 33.650 | 143.702 | 614.072 | 2.196 | 10.246 | 37.712 |
| 1945 | Fruit and Vegetables* | 5.945 | 26.154 | 156.054 | 4.748 | 19.380 | 95.810 |
| 1946 | External | 0.002 | 0.004 | 0.012 | 0.002 | 0.004 | 0.013 |
| 1946 | Inhalation | 0.040 | 0.131 | 0.546 | 0.034 | 0.105 | 0.432 |
| 1946 | Milk from BYCow Regime 1 | 2.883 | 19.866 | 113.619 | 0.216 | 1.305 | 9.891 |
| 1946 | Milk from BYCow Regime 2 | 3.019 | 15.965 | 105.023 | 0.256 | 1.628 | 10.064 |
| 1946 | Milk from BYCow Regime 3 | 0.097 | 0.811 | 8.992 | 0.006 | 0.050 | 0.627 |
| 1946 | Milk from BYCow Regime 4 | 0.006 | 0.107 | 2.885 | 0.001 | 0.014 | 0.130 |
| 1946 | Commercial Milk (Rural) | 4.946 | 19.389 | 79.231 | 0.388 | 2.000 | 7.946 |
| 1946 | Fruit and Vegetables* | 0.843 | 3.727 | 18.550 | 0.632 | 2.720 | 14.891 |
| 1947 | External | 0.000 | 0.001 | 0.004 | 0.000 | 0.001 | 0.004 |
| 1947 | Inhalation | 0.011 | 0.036 | 0.149 | 0.009 | 0.030 | 0.136 |
| 1947 | Milk from BYCow Regime 1 | 1.097 | 5.995 | 46.817 | 0.065 | 0.499 | 3.854 |
| 1947 | Milk from BYCow Regime 2 | 0.804 | 5.407 | 42.348 | 0.086 | 0.463 | 3.055 |
| 1947 | Milk from BYCow Regime 3 | 0.014 | 0.156 | 1.626 | 0.002 | 0.020 | 0.198 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.024 | 0.687 | 0.000 | 0.004 | 0.043 |
| 1947 | Commercial Milk (Rural) | 0.986 | 3.878 | 16.794 | 0.077 | 0.306 | 1.428 |
| 1947 | Fruit and Vegetables* | 0.146 | 0.587 | 3.065 | 0.119 | 0.513 | 3.123 |
| 1945-1947 | External | 0.012 | 0.024 | 0.068 | 0.012 | 0.025 | 0.081 |
| 1945-1947 | Inhalation | 0.337 | 0.848 | 2.922 | 0.280 | 0.677 | 2.463 |
| 1945-1947 | Milk from BYCow Regime 1 | 46.362 | 165.192 | 876.968 | 2.856 | 12.948 | 64.661 |
| 1945-1947 | Milk from BYCow Regime 2 | 45.290 | 199.758 | 1273.091 | 3.503 | 13.817 | 75.442 |
| 1945-1947 | Milk from BYCow Regime 3 | 1.084 | 5.792 | 30.559 | 0.116 | 0.563 | 4.347 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.146 | 1.310 | 20.443 | 0.027 | 0.134 | 1.562 |
| 1945-1947 | Commercial Milk (Rural) | 58.363 | 188.820 | 673.472 | 4.561 | 14.016 | 42.183 |
| 1945-1947 | Fruit and Vegetables* | 11.172 | 34.620 | 158.591 | 8.480 | 24.522 | 101.622 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Franklin County Census Division 02 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.004 | 0.010 | 0.040 | 0.004 | 0.010 | 0.035 |
| 1945 | Inhalation | 0.093 | 0.325 | 1.590 | 0.081 | 0.263 | 1.128 |
| 1945 | Milk from BYCow Regime 3 | 0.197 | 2.026 | 21.237 | 0.019 | 0.222 | 3.468 |
| 1945 | Milk from BYCow Regime 4 | 0.018 | 0.298 | 4.923 | 0.006 | 0.056 | 1.057 |
| 1945 | Commercial Milk (Rural) | 9.906 | 45.510 | 184.056 | 0.880 | 4.115 | 21.481 |
| 1945 | Fruit and Vegetables* | 3.754 | 16.422 | 78.970 | 2.926 | 12.080 | 67.357 |
| 1946 | External | 0.001 | 0.002 | 0.007 | 0.001 | 0.002 | 0.008 |
| 1946 | Inhalation | 0.020 | 0.066 | 0.324 | 0.018 | 0.055 | 0.222 |
| 1946 | Milk from BYCow Regime 3 | 0.037 | 0.434 | 3.762 | 0.004 | 0.030 | 0.240 |
| 1946 | Milk from BYCow Regime 4 | 0.002 | 0.038 | 0.855 | 0.001 | 0.006 | 0.089 |
| 1946 | Commercial Milk (Rural) | 1.626 | 6.928 | 28.314 | 0.133 | 0.545 | 2.256 |
| 1946 | Fruit and Vegetables* | 0.531 | 2.415 | 13.332 | 0.440 | 1.685 | 8.043 |
| 1947 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1947 | Inhalation | 0.005 | 0.020 | 0.101 | 0.005 | 0.015 | 0.068 |
| 1947 | Milk from BYCow Regime 3 | 0.012 | 0.116 | 1.313 | 0.001 | 0.008 | 0.099 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.015 | 0.409 | 0.000 | 0.002 | 0.030 |
| 1947 | Commercial Milk (Rural) | 0.483 | 1.827 | 7.229 | 0.041 | 0.178 | 0.568 |
| 1947 | Fruit and Vegetables* | 0.098 | 0.444 | 2.761 | 0.077 | 0.349 | 2.072 |
| 1945-1947 | External | 0.006 | 0.013 | 0.046 | 0.007 | 0.014 | 0.040 |
| 1945-1947 | Inhalation | 0.178 | 0.470 | 1.772 | 0.144 | 0.364 | 1.309 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.573 | 3.382 | 25.509 | 0.061 | 0.352 | 3.991 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.066 | 0.573 | 5.979 | 0.016 | 0.083 | 1.232 |
| 1945-1947 | Commercial Milk (Rural) | 20.056 | 61.141 | 196.976 | 1.760 | 5.129 | 21.712 |
| 1945-1947 | Fruit and Vegetables* | 6.605 | 21.450 | 84.197 | 4.863 | 16.009 | 79.858 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Franklin County Census Division 03

| Year | Dose Pathway | Infant Dose Percentiles 5th | Infant Dose Percentiles 50th | Infant Dose Percentiles 95th | Adult Dose Percentiles 5th | Adult Dose Percentiles 50th | Adult Dose Percentiles 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.015 | 0.032 | 0.088 | 0.015 | 0.033 | 0.090 |
| 1945 | Inhalation | 0.374 | 1.081 | 4.230 | 0.301 | 0.813 | 2.838 |
| 1945 | Milk from BYCow Regime 1 | 39.156 | 182.593 | 1217.709 | 2.423 | 13.672 | 62.261 |
| 1945 | Milk from BYCow Regime 2 | 27.879 | 157.105 | 1124.925 | 2.338 | 14.088 | 76.111 |
| 1945 | Milk from BYCow Regime 3 | 0.393 | 4.255 | 54.666 | 0.040 | 0.393 | 4.310 |
| 1945 | Milk from BYCow Regime 4 | 0.025 | 0.814 | 23.656 | 0.002 | 0.056 | 0.950 |
| 1945 | Commercial Milk (Urban) | 56.500 | 212.253 | 730.926 | 2.478 | 10.254 | 48.438 |
| 1945 | Fruit and Vegetables* | 12.165 | 46.837 | 224.091 | 8.484 | 30.558 | 126.382 |
| 1946 | External | 0.004 | 0.008 | 0.020 | 0.004 | 0.008 | 0.020 |
| 1946 | Inhalation | 0.098 | 0.266 | 1.034 | 0.082 | 0.208 | 0.584 |
| 1946 | Milk from BYCow Regime 1 | 5.512 | 34.069 | 229.638 | 0.399 | 2.422 | 16.837 |
| 1946 | Milk from BYCow Regime 2 | 4.618 | 25.165 | 154.045 | 0.381 | 2.132 | 12.535 |
| 1946 | Milk from BYCow Regime 3 | 0.084 | 0.729 | 6.330 | 0.007 | 0.060 | 0.503 |
| 1946 | Milk from BYCow Regime 4 | 0.002 | 0.111 | 2.437 | 0.000 | 0.008 | 0.173 |
| 1946 | Commercial Milk (Urban) | 7.430 | 28.855 | 117.648 | 0.353 | 1.646 | 8.554 |
| 1946 | Fruit and Vegetables* | 1.518 | 5.990 | 24.728 | 1.147 | 4.217 | 19.557 |
| 1947 | External | 0.001 | 0.002 | 0.006 | 0.001 | 0.002 | 0.007 |
| 1947 | Inhalation | 0.026 | 0.078 | 0.314 | 0.021 | 0.058 | 0.217 |
| 1947 | Milk from BYCow Regime 1 | 1.674 | 8.572 | 43.299 | 0.106 | 0.634 | 3.855 |
| 1947 | Milk from BYCow Regime 2 | 1.588 | 8.346 | 38.561 | 0.125 | 0.579 | 3.443 |
| 1947 | Milk from BYCow Regime 3 | 0.028 | 0.267 | 3.133 | 0.003 | 0.022 | 0.184 |
| 1947 | Milk from BYCow Regime 4 | 0.002 | 0.039 | 0.988 | 0.000 | 0.004 | 0.063 |
| 1947 | Commercial Milk (Rural) | 0.657 | 2.659 | 12.310 | 0.051 | 0.220 | 0.715 |
| 1947 | Commercial Milk (Urban) | 1.134 | 4.145 | 13.744 | 0.056 | 0.255 | 0.837 |
| 1947 | Fruit and Vegetables* | 0.286 | 1.151 | 5.948 | 0.227 | 0.871 | 4.283 |
| 1945-1947 | External | 0.026 | 0.045 | 0.096 | 0.026 | 0.046 | 0.098 |
| 1945-1947 | Inhalation | 0.727 | 1.581 | 5.212 | 0.562 | 1.148 | 3.176 |
| 1945-1947 | Milk from BYCow Regime 1 | 77.675 | 263.617 | 1277.392 | 5.805 | 20.979 | 67.161 |
| 1945-1947 | Milk from BYCow Regime 2 | 65.547 | 218.268 | 1347.190 | 5.392 | 20.411 | 87.008 |
| 1945-1947 | Milk from BYCow Regime 3 | 1.424 | 7.440 | 52.244 | 0.114 | 0.588 | 4.291 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.153 | 1.656 | 26.942 | 0.015 | 0.114 | 1.215 |
| 1945-1947 | Commercial Milk (Rural) | 0.672 | 2.660 | 11.335 | 0.045 | 0.219 | 0.871 |
| 1945-1947 | Commercial Milk (Urban) | 75.320 | 269.119 | 811.781 | 4.757 | 13.320 | 48.518 |
| 1945-1947 | Fruit and Vegetables* | 20.272 | 58.196 | 226.816 | 14.039 | 38.670 | 135.084 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Franklin County Census Division 04 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.017 | 0.041 | 0.124 | 0.017 | 0.041 | 0.124 |
| 1945 | Inhalation | 0.448 | 1.443 | 6.205 | 0.345 | 1.025 | 4.133 |
| 1945 | Milk from BYCow Regime 1 | 53.667 | 374.062 | 2333.612 | 4.228 | 24.537 | 158.372 |
| 1945 | Milk from BYCow Regime 2 | 44.880 | 331.324 | 2422.336 | 3.748 | 25.599 | 184.824 |
| 1945 | Milk from BYCow Regime 3 | 1.022 | 11.383 | 96.287 | 0.065 | 0.626 | 5.527 |
| 1945 | Milk from BYCow Regime 4 | 0.032 | 1.245 | 46.328 | 0.009 | 0.123 | 1.631 |
| 1945 | Commercial Milk (Rural) | 11.220 | 57.517 | 271.159 | 1.019 | 5.062 | 24.984 |
| 1945 | Fruit and Vegetables* | 16.127 | 68.403 | 376.078 | 12.065 | 45.992 | 225.894 |
| 1946 | External | 0.004 | 0.009 | 0.022 | 0.004 | 0.009 | 0.022 |
| 1946 | Inhalation | 0.092 | 0.281 | 1.039 | 0.080 | 0.222 | 0.773 |
| 1946 | Milk from BYCow Regime 1 | 7.633 | 47.328 | 330.601 | 0.540 | 3.507 | 22.859 |
| 1946 | Milk from BYCow Regime 2 | 6.614 | 42.366 | 263.523 | 0.447 | 3.494 | 24.484 |
| 1946 | Milk from BYCow Regime 3 | 0.173 | 1.643 | 12.614 | 0.014 | 0.127 | 1.403 |
| 1946 | Milk from BYCow Regime 4 | 0.005 | 0.149 | 5.372 | 0.001 | 0.017 | 0.361 |
| 1946 | Commercial Milk (Rural) | 1.655 | 7.502 | 37.542 | 0.156 | 0.702 | 2.904 |
| 1946 | Fruit and Vegetables* | 2.089 | 9.310 | 55.574 | 1.626 | 6.717 | 39.140 |
| 1947 | External | 0.001 | 0.003 | 0.008 | 0.001 | 0.003 | 0.007 |
| 1947 | Inhalation | 0.025 | 0.079 | 0.364 | 0.022 | 0.061 | 0.236 |
| 1947 | Milk from BYCow Regime 1 | 2.184 | 12.616 | 77.950 | 0.149 | 0.996 | 6.078 |
| 1947 | Milk from BYCow Regime 2 | 2.627 | 13.387 | 103.772 | 0.182 | 1.208 | 6.921 |
| 1947 | Milk from BYCow Regime 3 | 0.035 | 0.359 | 4.146 | 0.003 | 0.031 | 0.368 |
| 1947 | Milk from BYCow Regime 4 | 0.003 | 0.054 | 1.149 | 0.001 | 0.006 | 0.112 |
| 1947 | Commercial Milk (Rural) | 0.599 | 2.472 | 10.913 | 0.048 | 0.183 | 0.638 |
| 1947 | Fruit and Vegetables* | 0.380 | 1.604 | 9.495 | 0.322 | 1.291 | 7.443 |
| 1945-1947 | External | 0.029 | 0.055 | 0.137 | 0.028 | 0.054 | 0.139 |
| 1945-1947 | Inhalation | 0.809 | 1.967 | 6.746 | 0.628 | 1.432 | 4.500 |
| 1945-1947 | Milk from BYCow Regime 1 | 119.807 | 537.761 | 2947.060 | 8.591 | 34.404 | 185.385 |
| 1945-1947 | Milk from BYCow Regime 2 | 124.682 | 464.733 | 2746.339 | 9.219 | 34.859 | 179.974 |
| 1945-1947 | Milk from BYCow Regime 3 | 2.834 | 14.662 | 100.953 | 0.201 | 1.126 | 8.415 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.239 | 2.542 | 25.229 | 0.036 | 0.221 | 1.709 |
| 1945-1947 | Commercial Milk (Rural) | 21.683 | 74.580 | 258.258 | 1.950 | 5.865 | 26.162 |
| 1945-1947 | Fruit and Vegetables* | 28.345 | 90.045 | 423.116 | 20.686 | 61.266 | 242.647 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Franklin County Census Division 05 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.026 | 0.056 | 0.144 | 0.026 | 0.057 | 0.149 |
| 1945 | Inhalation | 0.638 | 1.943 | 7.163 | 0.544 | 1.457 | 5.011 |
| 1945 | Milk from BYCow Regime 1 | 65.276 | 310.059 | 1868.696 | 4.553 | 33.424 | 220.642 |
| 1945 | Milk from BYCow Regime 2 | 63.081 | 364.338 | 1838.439 | 3.776 | 25.794 | 192.846 |
| 1945 | Milk from BYCow Regime 3 | 1.182 | 10.664 | 101.203 | 0.089 | 0.931 | 8.386 |
| 1945 | Milk from BYCow Regime 4 | 0.073 | 2.126 | 38.254 | 0.009 | 0.169 | 2.674 |
| 1945 | Commercial Milk (Rural) | 15.122 | 61.327 | 229.403 | 1.116 | 4.632 | 18.827 |
| 1945 | Fruit and Vegetables* | 22.199 | 92.155 | 454.014 | 16.708 | 58.348 | 240.638 |
| 1946 | External | 0.006 | 0.013 | 0.029 | 0.006 | 0.013 | 0.032 |
| 1946 | Inhalation | 0.146 | 0.389 | 1.361 | 0.127 | 0.317 | 1.001 |
| 1946 | Milk from BYCow Regime 1 | 10.379 | 57.979 | 400.299 | 0.764 | 3.892 | 24.505 |
| 1946 | Milk from BYCow Regime 2 | 8.793 | 60.526 | 284.780 | 0.756 | 4.517 | 27.974 |
| 1946 | Milk from BYCow Regime 3 | 0.199 | 1.577 | 12.136 | 0.016 | 0.141 | 1.397 |
| 1946 | Milk from BYCow Regime 4 | 0.014 | 0.307 | 5.720 | 0.002 | 0.021 | 0.388 |
| 1946 | Commercial Milk (Rural) | 2.071 | 8.570 | 35.549 | 0.170 | 0.685 | 2.811 |
| 1946 | Fruit and Vegetables* | 3.266 | 12.867 | 66.262 | 2.365 | 8.706 | 40.089 |
| 1947 | External | 0.002 | 0.004 | 0.010 | 0.002 | 0.004 | 0.010 |
| 1947 | Inhalation | 0.039 | 0.118 | 0.479 | 0.036 | 0.090 | 0.331 |
| 1947 | Milk from BYCow Regime 1 | 2.614 | 16.322 | 81.725 | 0.233 | 1.431 | 8.715 |
| 1947 | Milk from BYCow Regime 2 | 2.852 | 15.118 | 72.671 | 0.185 | 1.100 | 8.371 |
| 1947 | Milk from BYCow Regime 3 | 0.054 | 0.479 | 4.288 | 0.005 | 0.045 | 0.443 |
| 1947 | Milk from BYCow Regime 4 | 0.003 | 0.054 | 0.921 | 0.000 | 0.007 | 0.142 |
| 1947 | Commercial Milk (Rural) | 0.511 | 2.176 | 6.229 | 0.051 | 0.193 | 0.629 |
| 1947 | Fruit and Vegetables* | 0.505 | 2.120 | 12.000 | 0.416 | 1.511 | 6.796 |
| 1945-1947 | External | 0.043 | 0.077 | 0.163 | 0.043 | 0.077 | 0.173 |
| 1945-1947 | Inhalation | 1.168 | 2.631 | 8.287 | 0.929 | 2.023 | 5.704 |
| 1945-1947 | Milk from BYCow Regime 1 | 124.362 | 461.842 | 2038.864 | 9.956 | 44.946 | 229.134 |
| 1945-1947 | Milk from BYCow Regime 2 | 140.578 | 507.568 | 1817.477 | 10.102 | 38.215 | 205.350 |
| 1945-1947 | Milk from BYCow Regime 3 | 3.948 | 16.069 | 102.952 | 0.255 | 1.322 | 10.294 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.390 | 4.067 | 41.989 | 0.035 | 0.272 | 3.030 |
| 1945-1947 | Commercial Milk (Rural) | 25.755 | 84.905 | 245.912 | 1.823 | 5.381 | 19.237 |
| 1945-1947 | Fruit and Vegetables* | 37.188 | 118.455 | 487.382 | 27.761 | 73.975 | 251.070 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Grant County Census Division 01

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.011 | 0.000 | 0.001 | 0.013 |
| 1945 | Inhalation | 0.004 | 0.018 | 0.432 | 0.004 | 0.015 | 0.203 |
| 1945 | Milk from BYCow Regime 3 | 0.006 | 0.082 | 0.760 | 0.000 | 0.005 | 0.087 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.015 | 0.281 | 0.000 | 0.001 | 0.020 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.005 | 0.071 | 0.000 | 0.000 | 0.006 |
| 1945 | Fruit and Vegetables* | 0.136 | 0.697 | 9.384 | 0.097 | 0.491 | 4.511 |
| 1946 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.002 |
| 1946 | Inhalation | 0.001 | 0.004 | 0.045 | 0.001 | 0.003 | 0.034 |
| 1946 | Milk from BYCow Regime 3 | 0.001 | 0.010 | 0.200 | 0.000 | 0.001 | 0.008 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.026 | 0.000 | 0.000 | 0.002 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.001 | 0.009 | 0.000 | 0.000 | 0.001 |
| 1946 | Fruit and Vegetables* | 0.018 | 0.102 | 0.944 | 0.014 | 0.067 | 0.743 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.008 | 0.000 | 0.001 | 0.007 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.004 | 0.045 | 0.000 | 0.000 | 0.007 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.012 | 0.000 | 0.000 | 0.001 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.006 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.003 | 0.019 | 0.211 | 0.003 | 0.013 | 0.151 |
| 1945-1947 | External | 0.000 | 0.001 | 0.017 | 0.000 | 0.001 | 0.020 |
| 1945-1947 | Inhalation | 0.009 | 0.029 | 0.426 | 0.008 | 0.024 | 0.239 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.021 | 0.122 | 0.760 | 0.002 | 0.009 | 0.085 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.002 | 0.025 | 0.359 | 0.000 | 0.002 | 0.022 |
| 1945-1947 | Commercial Milk (Rural) | 0.001 | 0.010 | 0.093 | 0.000 | 0.001 | 0.006 |
| 1945-1947 | Fruit and Vegetables* | 0.258 | 0.996 | 10.762 | 0.190 | 0.687 | 5.208 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Grant County Census Division 02 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.011 | 0.000 | 0.001 | 0.010 |
| 1945 | Inhalation | 0.004 | 0.017 | 0.275 | 0.003 | 0.014 | 0.380 |
| 1945 | Milk from BYCow Regime 3 | 0.006 | 0.072 | 0.985 | 0.000 | 0.005 | 0.061 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.006 | 0.132 | 0.000 | 0.001 | 0.018 |
| 1945 | Commercial Milk (Rural) | 0.001 | 0.006 | 0.093 | 0.000 | 0.000 | 0.006 |
| 1945 | Fruit and Vegetables* | 0.139 | 0.715 | 7.414 | 0.097 | 0.504 | 6.548 |
| 1946 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.004 |
| 1946 | Inhalation | 0.001 | 0.004 | 0.053 | 0.001 | 0.003 | 0.033 |
| 1946 | Milk from BYCow Regime 3 | 0.001 | 0.009 | 0.141 | 0.000 | 0.001 | 0.009 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.017 | 0.000 | 0.000 | 0.002 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.001 | 0.015 | 0.000 | 0.000 | 0.001 |
| 1946 | Fruit and Vegetables* | 0.018 | 0.106 | 1.674 | 0.013 | 0.071 | 1.086 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.010 | 0.000 | 0.001 | 0.006 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.023 | 0.000 | 0.000 | 0.001 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.008 | 0.000 | 0.000 | 0.001 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.003 | 0.017 | 0.197 | 0.003 | 0.013 | 0.110 |
| 1945-1947 | External | 0.000 | 0.001 | 0.019 | 0.000 | 0.001 | 0.013 |
| 1945-1947 | Inhalation | 0.009 | 0.030 | 0.366 | 0.007 | 0.023 | 0.390 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.019 | 0.106 | 1.103 | 0.001 | 0.007 | 0.068 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.001 | 0.014 | 0.135 | 0.000 | 0.001 | 0.024 |
| 1945-1947 | Commercial Milk (Rural) | 0.002 | 0.010 | 0.095 | 0.000 | 0.001 | 0.008 |
| 1945-1947 | Fruit and Vegetables* | 0.269 | 1.041 | 10.869 | 0.189 | 0.708 | 8.198 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Grant County Census Division 03 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.010 | 0.000 | 0.001 | 0.009 |
| 1945 | Inhalation | 0.008 | 0.030 | 0.248 | 0.006 | 0.022 | 0.165 |
| 1945 | Milk from BYCow Regime 3 | 0.020 | 0.162 | 1.492 | 0.001 | 0.008 | 0.098 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.016 | 0.484 | 0.000 | 0.002 | 0.035 |
| 1945 | Commercial Milk (Rural) | 0.004 | 0.039 | 0.558 | 0.000 | 0.004 | 0.071 |
| 1945 | Fruit and Vegetables* | 0.255 | 1.294 | 10.966 | 0.186 | 0.784 | 5.348 |
| 1946 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.002 |
| 1946 | Inhalation | 0.002 | 0.007 | 0.047 | 0.002 | 0.005 | 0.040 |
| 1946 | Milk from BYCow Regime 3 | 0.002 | 0.019 | 0.162 | 0.000 | 0.001 | 0.010 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.054 | 0.000 | 0.000 | 0.005 |
| 1946 | Commercial Milk (Rural) | 0.001 | 0.006 | 0.059 | 0.000 | 0.000 | 0.008 |
| 1946 | Fruit and Vegetables* | 0.034 | 0.161 | 1.203 | 0.026 | 0.106 | 0.642 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.001 | 0.002 | 0.028 | 0.000 | 0.002 | 0.017 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.004 | 0.036 | 0.000 | 0.000 | 0.002 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.009 | 0.000 | 0.000 | 0.001 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.003 | 0.024 | 0.000 | 0.000 | 0.002 |
| 1947 | Fruit and Vegetables* | 0.006 | 0.027 | 0.144 | 0.005 | 0.019 | 0.100 |
| 1945-1947 | External | 0.001 | 0.002 | 0.013 | 0.001 | 0.002 | 0.015 |
| 1945-1947 | Inhalation | 0.017 | 0.048 | 0.316 | 0.014 | 0.037 | 0.266 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.039 | 0.212 | 1.713 | 0.002 | 0.012 | 0.095 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.003 | 0.029 | 0.434 | 0.000 | 0.003 | 0.040 |
| 1945-1947 | Commercial Milk (Rural) | 0.013 | 0.065 | 0.756 | 0.001 | 0.006 | 0.083 |
| 1945-1947 | Fruit and Vegetables* | 0.443 | 1.689 | 11.907 | 0.333 | 1.056 | 5.890 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Grant County Census Division 04

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.002 | 0.007 | 0.001 | 0.002 | 0.007 |
| 1945 | Inhalation | 0.017 | 0.058 | 0.333 | 0.014 | 0.045 | 0.224 |
| 1945 | Milk from BYCow Regime 3 | 0.031 | 0.274 | 1.712 | 0.003 | 0.027 | 0.214 |
| 1945 | Milk from BYCow Regime 4 | 0.002 | 0.041 | 0.578 | 0.000 | 0.006 | 0.086 |
| 1945 | Commercial Milk (Rural) | 0.413 | 3.337 | 51.820 | 0.027 | 0.201 | 3.155 |
| 1945 | Fruit and Vegetables* | 0.520 | 2.331 | 13.461 | 0.387 | 1.681 | 9.100 |
| 1946 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.004 |
| 1946 | Inhalation | 0.004 | 0.014 | 0.105 | 0.003 | 0.011 | 0.093 |
| 1946 | Milk from BYCow Regime 3 | 0.004 | 0.033 | 0.315 | 0.000 | 0.003 | 0.025 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.006 | 0.096 | 0.000 | 0.001 | 0.011 |
| 1946 | Commercial Milk (Rural) | 0.070 | 0.485 | 3.597 | 0.008 | 0.046 | 0.324 |
| 1946 | Fruit and Vegetables* | 0.077 | 0.332 | 1.770 | 0.053 | 0.219 | 1.235 |
| 1947 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.002 |
| 1947 | Inhalation | 0.001 | 0.004 | 0.042 | 0.001 | 0.003 | 0.034 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.007 | 0.067 | 0.000 | 0.001 | 0.006 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.043 | 0.000 | 0.000 | 0.004 |
| 1947 | Commercial Milk (Rural) | 0.029 | 0.224 | 4.637 | 0.002 | 0.016 | 0.211 |
| 1947 | Fruit and Vegetables* | 0.012 | 0.054 | 0.275 | 0.010 | 0.042 | 0.247 |
| 1945-1947 | External | 0.001 | 0.003 | 0.012 | 0.001 | 0.003 | 0.013 |
| 1945-1947 | Inhalation | 0.034 | 0.094 | 0.572 | 0.028 | 0.073 | 0.505 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.083 | 0.383 | 1.938 | 0.007 | 0.034 | 0.240 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.009 | 0.075 | 0.726 | 0.001 | 0.009 | 0.082 |
| 1945-1947 | Commercial Milk (Rural) | 1.181 | 5.184 | 58.745 | 0.082 | 0.374 | 3.677 |
| 1945-1947 | Fruit and Vegetables* | 0.903 | 2.990 | 14.677 | 0.685 | 2.074 | 9.633 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Grant County Census Division 05

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.002 | 0.007 | 0.001 | 0.002 | 0.007 |
| 1945 | Inhalation | 0.018 | 0.060 | 0.269 | 0.014 | 0.045 | 0.218 |
| 1945 | Milk from BYCow Regime 3 | 0.028 | 0.260 | 2.901 | 0.002 | 0.019 | 0.281 |
| 1945 | Milk from BYCow Regime 4 | 0.002 | 0.032 | 0.721 | 0.000 | 0.005 | 0.097 |
| 1945 | Commercial Milk (Rural) | 0.211 | 1.408 | 16.194 | 0.016 | 0.135 | 1.146 |
| 1945 | Fruit and Vegetables* | 0.519 | 2.249 | 12.451 | 0.393 | 1.676 | 8.952 |
| 1946 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.003 |
| 1946 | Inhalation | 0.004 | 0.012 | 0.068 | 0.003 | 0.010 | 0.046 |
| 1946 | Milk from BYCow Regime 3 | 0.003 | 0.037 | 0.542 | 0.000 | 0.003 | 0.036 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.005 | 0.136 | 0.000 | 0.001 | 0.009 |
| 1946 | Commercial Milk (Rural) | 0.045 | 0.306 | 3.507 | 0.003 | 0.024 | 0.295 |
| 1946 | Fruit and Vegetables* | 0.072 | 0.325 | 2.004 | 0.060 | 0.256 | 1.514 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.001 | 0.003 | 0.028 | 0.001 | 0.003 | 0.016 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.017 | 0.137 | 0.000 | 0.001 | 0.017 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.025 | 0.000 | 0.000 | 0.004 |
| 1947 | Commercial Milk (Rural) | 0.015 | 0.122 | 1.191 | 0.001 | 0.008 | 0.092 |
| 1947 | Fruit and Vegetables* | 0.013 | 0.053 | 0.289 | 0.010 | 0.044 | 0.276 |
| 1945-1947 | External | 0.001 | 0.003 | 0.016 | 0.001 | 0.003 | 0.012 |
| 1945-1947 | Inhalation | 0.032 | 0.088 | 0.398 | 0.026 | 0.067 | 0.306 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.074 | 0.350 | 2.899 | 0.007 | 0.031 | 0.311 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.006 | 0.063 | 0.777 | 0.001 | 0.009 | 0.106 |
| 1945-1947 | Commercial Milk (Rural) | 0.623 | 2.340 | 22.711 | 0.046 | 0.211 | 1.435 |
| 1945-1947 | Fruit and Vegetables* | 0.888 | 3.028 | 13.779 | 0.709 | 2.244 | 9.822 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Grant County Census Division 06

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.002 | 0.032 | 0.001 | 0.002 | 0.034 |
| 1945 | Inhalation | 0.012 | 0.058 | 0.848 | 0.009 | 0.045 | 0.535 |
| 1945 | Milk from BYCow Regime 3 | 0.020 | 0.219 | 2.075 | 0.002 | 0.018 | 0.221 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.026 | 0.984 | 0.000 | 0.003 | 0.064 |
| 1945 | Commercial Milk (Rural) | 0.191 | 1.630 | 24.615 | 0.013 | 0.112 | 1.232 |
| 1945 | Fruit and Vegetables* | 0.393 | 1.902 | 11.925 | 0.309 | 1.363 | 8.568 |
| 1946 | External | 0.000 | 0.001 | 0.010 | 0.000 | 0.001 | 0.010 |
| 1946 | Inhalation | 0.003 | 0.012 | 0.264 | 0.002 | 0.010 | 0.180 |
| 1946 | Milk from BYCow Regime 3 | 0.003 | 0.039 | 0.445 | 0.000 | 0.004 | 0.050 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.004 | 0.152 | 0.000 | 0.001 | 0.014 |
| 1946 | Commercial Milk (Rural) | 0.049 | 0.399 | 4.597 | 0.005 | 0.030 | 0.609 |
| 1946 | Fruit and Vegetables* | 0.055 | 0.293 | 2.112 | 0.042 | 0.211 | 1.468 |
| 1947 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.002 |
| 1947 | Inhalation | 0.001 | 0.004 | 0.072 | 0.001 | 0.003 | 0.049 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.011 | 0.117 | 0.000 | 0.001 | 0.015 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.023 | 0.000 | 0.000 | 0.003 |
| 1947 | Commercial Milk (Rural) | 0.018 | 0.119 | 1.358 | 0.001 | 0.008 | 0.082 |
| 1947 | Fruit and Vegetables* | 0.011 | 0.054 | 0.343 | 0.009 | 0.040 | 0.247 |
| 1945-1947 | External | 0.001 | 0.004 | 0.056 | 0.001 | 0.004 | 0.053 |
| 1945-1947 | Inhalation | 0.026 | 0.102 | 1.202 | 0.022 | 0.080 | 0.946 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.078 | 0.388 | 2.268 | 0.006 | 0.034 | 0.267 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.006 | 0.050 | 1.200 | 0.001 | 0.006 | 0.062 |
| 1945-1947 | Commercial Milk (Rural) | 0.609 | 3.076 | 24.058 | 0.048 | 0.219 | 2.007 |
| 1945-1947 | Fruit and Vegetables* | 0.770 | 2.627 | 12.572 | 0.574 | 1.953 | 9.885 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Grant County Census Division 07

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.003 | 0.010 | 0.001 | 0.003 | 0.010 |
| 1945 | Inhalation | 0.037 | 0.119 | 0.512 | 0.031 | 0.090 | 0.327 |
| 1945 | Milk from BYCow Regime 3 | 0.064 | 0.507 | 3.053 | 0.005 | 0.037 | 0.349 |
| 1945 | Milk from BYCow Regime 4 | 0.003 | 0.091 | 1.653 | 0.001 | 0.010 | 0.145 |
| 1945 | Commercial Milk (Rural) | 0.383 | 2.796 | 65.906 | 0.029 | 0.244 | 4.317 |
| 1945 | Fruit and Vegetables* | 1.119 | 4.616 | 21.965 | 0.821 | 3.126 | 14.215 |
| 1946 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1946 | Inhalation | 0.008 | 0.025 | 0.101 | 0.007 | 0.019 | 0.069 |
| 1946 | Milk from BYCow Regime 3 | 0.008 | 0.078 | 1.026 | 0.001 | 0.006 | 0.048 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.014 | 0.232 | 0.000 | 0.002 | 0.033 |
| 1946 | Commercial Milk (Rural) | 0.102 | 0.669 | 4.711 | 0.008 | 0.055 | 0.755 |
| 1946 | Fruit and Vegetables* | 0.163 | 0.613 | 3.111 | 0.117 | 0.455 | 2.311 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.002 | 0.007 | 0.032 | 0.002 | 0.006 | 0.025 |
| 1947 | Milk from BYCow Regime 3 | 0.002 | 0.018 | 0.175 | 0.000 | 0.001 | 0.009 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.004 | 0.072 | 0.000 | 0.000 | 0.009 |
| 1947 | Commercial Milk (Rural) | 0.029 | 0.199 | 3.128 | 0.002 | 0.016 | 0.226 |
| 1947 | Fruit and Vegetables* | 0.028 | 0.113 | 0.542 | 0.021 | 0.081 | 0.409 |
| 1945-1947 | External | 0.002 | 0.005 | 0.012 | 0.003 | 0.005 | 0.012 |
| 1945-1947 | Inhalation | 0.069 | 0.166 | 0.578 | 0.058 | 0.126 | 0.346 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.157 | 0.834 | 3.415 | 0.014 | 0.057 | 0.405 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.021 | 0.150 | 1.715 | 0.002 | 0.016 | 0.180 |
| 1945-1947 | Commercial Milk (Rural) | 1.321 | 5.502 | 86.814 | 0.087 | 0.432 | 4.832 |
| 1945-1947 | Fruit and Vegetables* | 1.899 | 5.887 | 24.432 | 1.335 | 4.123 | 14.867 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Grant County Census Division 08 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.002 | 0.008 | 0.001 | 0.002 | 0.008 |
| 1945 | Inhalation | 0.020 | 0.064 | 0.296 | 0.017 | 0.052 | 0.256 |
| 1945 | Milk from BYCow Regime 3 | 0.038 | 0.349 | 2.933 | 0.004 | 0.030 | 0.306 |
| 1945 | Milk from BYCow Regime 4 | 0.004 | 0.054 | 0.947 | 0.000 | 0.005 | 0.094 |
| 1945 | Commercial Milk (Rural) | 0.425 | 2.958 | 35.517 | 0.031 | 0.322 | 3.661 |
| 1945 | Fruit and Vegetables* | 0.636 | 2.514 | 12.588 | 0.465 | 1.811 | 10.178 |
| 1946 | External | 0.000 | 0.001 | 0.005 | 0.000 | 0.001 | 0.006 |
| 1946 | Inhalation | 0.004 | 0.015 | 0.096 | 0.004 | 0.012 | 0.064 |
| 1946 | Milk from BYCow Regime 3 | 0.005 | 0.043 | 0.316 | 0.000 | 0.003 | 0.032 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.007 | 0.241 | 0.000 | 0.001 | 0.016 |
| 1946 | Commercial Milk (Rural) | 0.101 | 0.669 | 5.994 | 0.006 | 0.051 | 0.695 |
| 1946 | Fruit and Vegetables* | 0.073 | 0.350 | 1.942 | 0.063 | 0.238 | 1.455 |
| 1947 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.001 | 0.005 | 0.054 | 0.001 | 0.003 | 0.029 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.010 | 0.089 | 0.000 | 0.001 | 0.008 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.037 | 0.000 | 0.000 | 0.006 |
| 1947 | Commercial Milk (Rural) | 0.032 | 0.211 | 2.586 | 0.003 | 0.018 | 0.118 |
| 1947 | Fruit and Vegetables* | 0.014 | 0.061 | 0.332 | 0.012 | 0.047 | 0.261 |
| 1945-1947 | External | 0.001 | 0.003 | 0.016 | 0.001 | 0.003 | 0.016 |
| 1945-1947 | Inhalation | 0.038 | 0.099 | 0.472 | 0.033 | 0.079 | 0.485 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.090 | 0.452 | 3.118 | 0.008 | 0.038 | 0.285 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.011 | 0.083 | 0.942 | 0.001 | 0.009 | 0.084 |
| 1945-1947 | Commercial Milk (Rural) | 1.160 | 5.833 | 36.823 | 0.105 | 0.516 | 3.647 |
| 1945-1947 | Fruit and Vegetables* | 1.070 | 3.275 | 14.151 | 0.779 | 2.358 | 11.693 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Grant County Census Division 09

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.004 | 0.013 | 0.002 | 0.004 | 0.013 |
| 1945 | Inhalation | 0.045 | 0.138 | 0.509 | 0.038 | 0.109 | 0.370 |
| 1945 | Milk from BYCow Regime 3 | 0.084 | 0.622 | 5.619 | 0.006 | 0.057 | 0.514 |
| 1945 | Milk from BYCow Regime 4 | 0.005 | 0.112 | 1.916 | 0.001 | 0.015 | 0.377 |
| 1945 | Commercial Milk (Rural) | 0.442 | 2.675 | 43.515 | 0.034 | 0.278 | 2.283 |
| 1945 | Fruit and Vegetables* | 1.427 | 6.006 | 30.233 | 1.004 | 3.857 | 16.758 |
| 1946 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.011 | 0.031 | 0.120 | 0.009 | 0.025 | 0.083 |
| 1946 | Milk from BYCow Regime 3 | 0.011 | 0.105 | 0.899 | 0.001 | 0.008 | 0.081 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.018 | 0.483 | 0.000 | 0.002 | 0.030 |
| 1946 | Commercial Milk (Rural) | 0.104 | 0.720 | 8.238 | 0.007 | 0.046 | 0.447 |
| 1946 | Fruit and Vegetables* | 0.179 | 0.764 | 4.022 | 0.144 | 0.574 | 3.052 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.003 | 0.010 | 0.039 | 0.003 | 0.008 | 0.028 |
| 1947 | Milk from BYCow Regime 3 | 0.003 | 0.026 | 0.294 | 0.000 | 0.002 | 0.019 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.008 | 0.114 | 0.000 | 0.001 | 0.011 |
| 1947 | Commercial Milk (Rural) | 0.033 | 0.216 | 1.597 | 0.002 | 0.015 | 0.240 |
| 1947 | Fruit and Vegetables* | 0.032 | 0.145 | 0.715 | 0.026 | 0.104 | 0.511 |
| 1945-1947 | External | 0.003 | 0.006 | 0.015 | 0.003 | 0.006 | 0.016 |
| 1945-1947 | Inhalation | 0.084 | 0.194 | 0.621 | 0.071 | 0.156 | 0.442 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.216 | 0.944 | 5.585 | 0.016 | 0.083 | 0.523 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.026 | 0.222 | 2.235 | 0.003 | 0.023 | 0.326 |
| 1945-1947 | Commercial Milk (Rural) | 1.315 | 5.901 | 62.769 | 0.089 | 0.402 | 3.239 |
| 1945-1947 | Fruit and Vegetables* | 2.429 | 7.658 | 33.417 | 1.747 | 4.966 | 18.862 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Grant County Census Division 10 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.004 | 0.013 | 0.002 | 0.004 | 0.013 |
| 1945 | Inhalation | 0.050 | 0.152 | 0.573 | 0.043 | 0.127 | 0.459 |
| 1945 | Milk from BYCow Regime 3 | 0.092 | 0.810 | 7.646 | 0.008 | 0.088 | 0.874 |
| 1945 | Milk from BYCow Regime 4 | 0.007 | 0.147 | 2.759 | 0.001 | 0.011 | 0.341 |
| 1945 | Commercial Milk (Rural) | 0.312 | 2.691 | 33.174 | 0.033 | 0.295 | 3.762 |
| 1945 | Fruit and Vegetables* | 1.521 | 6.608 | 31.873 | 1.175 | 4.661 | 22.520 |
| 1946 | External | 0.000 | 0.001 | 0.003 | 0.000 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.011 | 0.033 | 0.121 | 0.010 | 0.026 | 0.086 |
| 1946 | Milk from BYCow Regime 3 | 0.010 | 0.095 | 0.858 | 0.001 | 0.009 | 0.068 |
| 1946 | Milk from BYCow Regime 4 | 0.002 | 0.027 | 0.395 | 0.000 | 0.002 | 0.032 |
| 1946 | Commercial Milk (Rural) | 0.096 | 0.649 | 6.398 | 0.009 | 0.050 | 0.823 |
| 1946 | Fruit and Vegetables* | 0.211 | 0.941 | 5.019 | 0.171 | 0.661 | 3.410 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.003 | 0.010 | 0.048 | 0.003 | 0.008 | 0.031 |
| 1947 | Milk from BYCow Regime 3 | 0.002 | 0.024 | 0.182 | 0.000 | 0.002 | 0.020 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.007 | 0.212 | 0.000 | 0.001 | 0.010 |
| 1947 | Commercial Milk (Rural) | 0.033 | 0.226 | 3.334 | 0.002 | 0.021 | 0.319 |
| 1947 | Fruit and Vegetables* | 0.039 | 0.148 | 0.784 | 0.030 | 0.117 | 0.572 |
| 1945-1947 | External | 0.003 | 0.006 | 0.015 | 0.003 | 0.006 | 0.015 |
| 1945-1947 | Inhalation | 0.095 | 0.216 | 0.617 | 0.076 | 0.176 | 0.502 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.196 | 1.041 | 7.493 | 0.020 | 0.113 | 0.811 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.030 | 0.264 | 3.172 | 0.003 | 0.023 | 0.350 |
| 1945-1947 | Commercial Milk (Rural) | 1.248 | 5.413 | 38.784 | 0.092 | 0.463 | 5.282 |
| 1945-1947 | Fruit and Vegetables* | 2.608 | 8.567 | 35.592 | 1.993 | 6.066 | 24.910 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Grant County Census Division 11

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.005 | 0.041 | 0.002 | 0.005 | 0.060 |
| 1945 | Inhalation | 0.039 | 0.172 | 2.022 | 0.034 | 0.139 | 1.528 |
| 1945 | Milk from BYCow Regime 3 | 0.065 | 0.691 | 10.404 | 0.005 | 0.053 | 0.544 |
| 1945 | Milk from BYCow Regime 4 | 0.005 | 0.101 | 1.739 | 0.001 | 0.008 | 0.191 |
| 1945 | Commercial Milk (Rural) | 0.381 | 3.260 | 85.456 | 0.035 | 0.231 | 2.106 |
| 1945 | Fruit and Vegetables* | 1.323 | 6.118 | 40.527 | 0.965 | 3.956 | 21.990 |
| 1946 | External | 0.000 | 0.001 | 0.014 | 0.000 | 0.001 | 0.011 |
| 1946 | Inhalation | 0.009 | 0.037 | 0.492 | 0.008 | 0.028 | 0.330 |
| 1946 | Milk from BYCow Regime 3 | 0.010 | 0.083 | 0.711 | 0.001 | 0.008 | 0.085 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.016 | 0.655 | 0.000 | 0.001 | 0.025 |
| 1946 | Commercial Milk (Rural) | 0.109 | 0.709 | 6.952 | 0.007 | 0.052 | 0.396 |
| 1946 | Fruit and Vegetables* | 0.199 | 0.841 | 4.642 | 0.145 | 0.608 | 3.261 |
| 1947 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.003 |
| 1947 | Inhalation | 0.002 | 0.010 | 0.095 | 0.002 | 0.008 | 0.067 |
| 1947 | Milk from BYCow Regime 3 | 0.002 | 0.023 | 0.294 | 0.000 | 0.002 | 0.018 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.006 | 0.164 | 0.000 | 0.001 | 0.016 |
| 1947 | Commercial Milk (Rural) | 0.031 | 0.216 | 2.144 | 0.002 | 0.016 | 0.238 |
| 1947 | Fruit and Vegetables* | 0.034 | 0.132 | 0.740 | 0.026 | 0.112 | 0.586 |
| 1945-1947 | External | 0.003 | 0.009 | 0.061 | 0.003 | 0.009 | 0.091 |
| 1945-1947 | Inhalation | 0.086 | 0.279 | 3.187 | 0.071 | 0.214 | 1.722 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.180 | 1.045 | 7.210 | 0.014 | 0.075 | 0.513 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.022 | 0.207 | 2.847 | 0.003 | 0.018 | 0.214 |
| 1945-1947 | Commercial Milk (Rural) | 1.189 | 5.888 | 55.505 | 0.101 | 0.388 | 2.295 |
| 1945-1947 | Fruit and Vegetables* | 2.562 | 8.247 | 44.048 | 1.724 | 5.311 | 22.643 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Grant County Census Division 12

| Year | Dose Pathway | Infant Dose Percentiles 5th | Infant Dose Percentiles 50th | Infant Dose Percentiles 95th | Adult Dose Percentiles 5th | Adult Dose Percentiles 50th | Adult Dose Percentiles 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.004 | 0.013 | 0.124 | 0.004 | 0.013 | 0.133 |
| 1945 | Inhalation | 0.099 | 0.404 | 4.833 | 0.079 | 0.313 | 2.724 |
| 1945 | Milk from BYCow Regime 3 | 0.125 | 1.143 | 13.638 | 0.012 | 0.122 | 1.222 |
| 1945 | Milk from BYCow Regime 4 | 0.006 | 0.165 | 6.362 | 0.001 | 0.021 | 0.505 |
| 1945 | Commercial Milk (Rural) | 0.360 | 2.717 | 41.997 | 0.032 | 0.237 | 3.949 |
| 1945 | Fruit and Vegetables* | 3.471 | 14.994 | 85.626 | 2.286 | 9.656 | 57.857 |
| 1946 | External | 0.001 | 0.004 | 0.039 | 0.001 | 0.004 | 0.065 |
| 1946 | Inhalation | 0.021 | 0.098 | 1.091 | 0.017 | 0.067 | 0.654 |
| 1946 | Milk from BYCow Regime 3 | 0.022 | 0.191 | 2.032 | 0.002 | 0.018 | 0.190 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.035 | 1.074 | 0.000 | 0.004 | 0.110 |
| 1946 | Commercial Milk (Rural) | 0.083 | 0.602 | 11.518 | 0.007 | 0.044 | 0.898 |
| 1946 | Fruit and Vegetables* | 0.436 | 2.004 | 12.494 | 0.359 | 1.454 | 7.879 |
| 1947 | External | 0.000 | 0.001 | 0.011 | 0.000 | 0.001 | 0.009 |
| 1947 | Inhalation | 0.006 | 0.027 | 0.267 | 0.005 | 0.020 | 0.215 |
| 1947 | Milk from BYCow Regime 3 | 0.005 | 0.050 | 0.723 | 0.000 | 0.005 | 0.074 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.011 | 0.283 | 0.000 | 0.001 | 0.032 |
| 1947 | Commercial Milk (Rural) | 0.031 | 0.243 | 3.230 | 0.002 | 0.018 | 0.255 |
| 1947 | Fruit and Vegetables* | 0.082 | 0.335 | 1.751 | 0.067 | 0.267 | 1.708 |
| 1945-1947 | External | 0.008 | 0.022 | 0.197 | 0.008 | 0.023 | 0.219 |
| 1945-1947 | Inhalation | 0.211 | 0.683 | 6.693 | 0.166 | 0.520 | 4.297 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.349 | 1.911 | 15.039 | 0.036 | 0.192 | 1.148 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.047 | 0.378 | 7.392 | 0.006 | 0.046 | 0.638 |
| 1945-1947 | Commercial Milk (Rural) | 1.158 | 6.140 | 54.325 | 0.086 | 0.415 | 5.200 |
| 1945-1947 | Fruit and Vegetables* | 6.046 | 19.098 | 91.842 | 4.190 | 12.784 | 63.472 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Grant County Census Division 13

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.009 | 0.029 | 0.261 | 0.009 | 0.031 | 0.349 |
| 1945 | Inhalation | 0.190 | 0.902 | 7.717 | 0.167 | 0.681 | 5.296 |
| 1945 | Milk from BYCow Regime 3 | 0.318 | 3.387 | 50.021 | 0.020 | 0.240 | 3.071 |
| 1945 | Milk from BYCow Regime 4 | 0.024 | 0.529 | 15.050 | 0.002 | 0.047 | 1.369 |
| 1945 | Commercial Milk (Rural) | 0.405 | 3.287 | 30.255 | 0.033 | 0.244 | 3.282 |
| 1945 | Fruit and Vegetables* | 7.580 | 33.758 | 205.059 | 5.160 | 22.095 | 126.201 |
| 1946 | External | 0.002 | 0.009 | 0.093 | 0.002 | 0.008 | 0.118 |
| 1946 | Inhalation | 0.048 | 0.212 | 1.791 | 0.041 | 0.161 | 1.175 |
| 1946 | Milk from BYCow Regime 3 | 0.046 | 0.456 | 3.914 | 0.003 | 0.037 | 0.316 |
| 1946 | Milk from BYCow Regime 4 | 0.003 | 0.064 | 1.668 | 0.000 | 0.006 | 0.180 |
| 1946 | Commercial Milk (Rural) | 0.089 | 0.660 | 6.875 | 0.008 | 0.053 | 0.378 |
| 1946 | Fruit and Vegetables* | 0.996 | 4.446 | 28.894 | 0.751 | 3.120 | 15.736 |
| 1947 | External | 0.001 | 0.002 | 0.023 | 0.001 | 0.002 | 0.023 |
| 1947 | Inhalation | 0.013 | 0.056 | 0.446 | 0.011 | 0.048 | 0.425 |
| 1947 | Milk from BYCow Regime 3 | 0.013 | 0.127 | 1.952 | 0.001 | 0.010 | 0.189 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.026 | 0.678 | 0.000 | 0.002 | 0.040 |
| 1947 | Commercial Milk (Rural) | 0.027 | 0.204 | 3.254 | 0.002 | 0.018 | 0.200 |
| 1947 | Fruit and Vegetables* | 0.171 | 0.728 | 3.550 | 0.140 | 0.547 | 3.090 |
| 1945-1947 | External | 0.019 | 0.052 | 0.441 | 0.019 | 0.053 | 0.643 |
| 1945-1947 | Inhalation | 0.457 | 1.448 | 10.711 | 0.353 | 1.092 | 7.270 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.897 | 4.833 | 42.150 | 0.068 | 0.411 | 3.248 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.090 | 1.039 | 15.251 | 0.009 | 0.077 | 1.007 |
| 1945-1947 | Commercial Milk (Rural) | 1.204 | 5.538 | 34.260 | 0.097 | 0.405 | 3.103 |
| 1945-1947 | Fruit and Vegetables* | 13.208 | 44.630 | 209.932 | 9.299 | 29.815 | 131.675 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Grant County Census Division 14 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.001 | 0.006 | 0.001 | 0.002 | 0.006 |
| 1945 | Inhalation | 0.015 | 0.051 | 0.252 | 0.012 | 0.041 | 0.171 |
| 1945 | Milk from BYCow Regime 3 | 0.013 | 0.236 | 4.329 | 0.002 | 0.020 | 0.392 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.031 | 0.619 | 0.000 | 0.002 | 0.080 |
| 1945 | Commercial Milk (Urban) | 0.348 | 1.987 | 20.417 | 0.014 | 0.117 | 1.389 |
| 1945 | Fruit and Vegetables* | 0.488 | 2.009 | 11.679 | 0.368 | 1.596 | 9.341 |
| 1946 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.003 |
| 1946 | Inhalation | 0.003 | 0.011 | 0.074 | 0.003 | 0.009 | 0.045 |
| 1946 | Milk from BYCow Regime 3 | 0.004 | 0.051 | 0.391 | 0.000 | 0.003 | 0.046 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.005 | 0.091 | 0.000 | 0.000 | 0.008 |
| 1946 | Commercial Milk (Urban) | 0.090 | 0.541 | 6.021 | 0.003 | 0.025 | 0.194 |
| 1946 | Fruit and Vegetables* | 0.067 | 0.292 | 1.719 | 0.050 | 0.211 | 1.003 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.001 | 0.003 | 0.022 | 0.001 | 0.003 | 0.018 |
| 1947 | Milk from BYCow Regime 3 | 0.002 | 0.014 | 0.173 | 0.000 | 0.001 | 0.013 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.060 | 0.000 | 0.000 | 0.004 |
| 1947 | Commercial Milk (Urban) | 0.019 | 0.163 | 2.242 | 0.001 | 0.010 | 0.142 |
| 1947 | Fruit and Vegetables* | 0.012 | 0.049 | 0.248 | 0.009 | 0.037 | 0.193 |
| 1945-1947 | External | 0.001 | 0.002 | 0.012 | 0.001 | 0.002 | 0.014 |
| 1945-1947 | Inhalation | 0.029 | 0.077 | 0.365 | 0.024 | 0.060 | 0.251 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.070 | 0.446 | 4.195 | 0.006 | 0.038 | 0.324 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.007 | 0.070 | 0.789 | 0.000 | 0.004 | 0.071 |
| 1945-1947 | Commercial Milk (Urban) | 0.888 | 3.729 | 21.803 | 0.049 | 0.213 | 1.469 |
| 1945-1947 | Fruit and Vegetables* | 0.840 | 2.635 | 12.278 | 0.660 | 1.987 | 9.336 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Kittitas County Census Division 01

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.003 | 0.063 | 0.000 | 0.003 | 0.048 |
| 1945 | Inhalation | 0.005 | 0.065 | 1.561 | 0.004 | 0.055 | 1.499 |
| 1945 | Milk from BYCow Regime 1 | 0.393 | 6.121 | 176.947 | 0.023 | 0.509 | 12.337 |
| 1945 | Milk from BYCow Regime 2 | 0.263 | 4.708 | 141.827 | 0.020 | 0.397 | 11.003 |
| 1945 | Milk from BYCow Regime 3 | 0.012 | 0.320 | 23.972 | 0.001 | 0.022 | 1.063 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.060 | 6.509 | 0.000 | 0.006 | 0.339 |
| 1945 | Commercial Milk (Rural) | 0.384 | 5.806 | 230.324 | 0.028 | 0.453 | 10.291 |
| 1945 | Fruit and Vegetables* | 0.239 | 2.261 | 44.772 | 0.175 | 1.671 | 45.310 |
| 1946 | External | 0.000 | 0.001 | 0.023 | 0.000 | 0.001 | 0.024 |
| 1946 | Inhalation | 0.001 | 0.017 | 0.700 | 0.001 | 0.014 | 0.475 |
| 1946 | Milk from BYCow Regime 1 | 0.066 | 1.023 | 36.425 | 0.005 | 0.084 | 2.574 |
| 1946 | Milk from BYCow Regime 2 | 0.063 | 0.740 | 38.198 | 0.004 | 0.096 | 3.046 |
| 1946 | Milk from BYCow Regime 3 | 0.002 | 0.031 | 0.624 | 0.000 | 0.003 | 0.114 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.008 | 0.203 | 0.000 | 0.001 | 0.023 |
| 1946 | Commercial Milk (Rural) | 0.067 | 0.787 | 11.189 | 0.005 | 0.056 | 3.077 |
| 1946 | Fruit and Vegetables* | 0.036 | 0.332 | 6.594 | 0.028 | 0.262 | 4.929 |
| 1947 | External | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.006 |
| 1947 | Inhalation | 0.000 | 0.005 | 0.178 | 0.000 | 0.004 | 0.156 |
| 1947 | Milk from BYCow Regime 1 | 0.017 | 0.272 | 7.387 | 0.002 | 0.027 | 0.550 |
| 1947 | Milk from BYCow Regime 2 | 0.022 | 0.440 | 8.971 | 0.001 | 0.023 | 0.516 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.005 | 0.101 | 0.000 | 0.001 | 0.012 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.076 | 0.000 | 0.000 | 0.005 |
| 1947 | Commercial Milk (Rural) | 0.016 | 0.210 | 5.222 | 0.001 | 0.017 | 0.334 |
| 1947 | Fruit and Vegetables* | 0.006 | 0.068 | 1.055 | 0.005 | 0.057 | 1.237 |
| 1945-1947 | External | 0.001 | 0.007 | 0.099 | 0.001 | 0.007 | 0.092 |
| 1945-1947 | Inhalation | 0.021 | 0.172 | 2.709 | 0.019 | 0.133 | 2.960 |
| 1945-1947 | Milk from BYCow Regime 1 | 1.522 | 12.937 | 259.068 | 0.124 | 1.151 | 17.635 |
| 1945-1947 | Milk from BYCow Regime 2 | 1.464 | 11.791 | 154.393 | 0.095 | 0.844 | 26.830 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.044 | 0.511 | 32.895 | 0.005 | 0.048 | 1.150 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.009 | 0.104 | 3.503 | 0.001 | 0.011 | 0.247 |
| 1945-1947 | Commercial Milk (Rural) | 1.252 | 9.693 | 238.984 | 0.113 | 0.724 | 10.109 |
| 1945-1947 | Fruit and Vegetables* | 0.677 | 4.029 | 55.936 | 0.487 | 2.940 | 51.341 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Kittitas County Census Division 02

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 0.019 |
| 1945 | Inhalation | 0.001 | 0.006 | 1.021 | 0.000 | 0.005 | 2.220 |
| 1945 | Milk from BYCow Regime 3 | 0.000 | 0.008 | 0.252 | 0.000 | 0.001 | 0.024 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.165 | 0.000 | 0.000 | 0.017 |
| 1945 | Commercial Milk (Rural) | 0.016 | 0.261 | 13.186 | 0.001 | 0.033 | 1.803 |
| 1945 | Fruit and Vegetables* | 0.012 | 0.149 | 11.913 | 0.010 | 0.106 | 5.777 |
| 1946 | External | 0.000 | 0.000 | 0.006 | 0.000 | 0.000 | 0.006 |
| 1946 | Inhalation | 0.000 | 0.002 | 0.614 | 0.000 | 0.001 | 0.421 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.186 | 0.000 | 0.000 | 0.010 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.017 | 0.000 | 0.000 | 0.003 |
| 1946 | Commercial Milk (Rural) | 0.003 | 0.063 | 1.571 | 0.000 | 0.005 | 0.344 |
| 1946 | Fruit and Vegetables* | 0.002 | 0.016 | 0.549 | 0.002 | 0.017 | 1.064 |
| 1947 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.004 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.228 | 0.000 | 0.001 | 0.146 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.000 | 0.102 | 0.000 | 0.000 | 0.012 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.011 | 0.000 | 0.000 | 0.001 |
| 1947 | Commercial Milk (Rural) | 0.001 | 0.014 | 1.598 | 0.000 | 0.001 | 0.256 |
| 1947 | Fruit and Vegetables* | 0.000 | 0.005 | 0.447 | 0.000 | 0.004 | 0.356 |
| 1945-1947 | External | 0.000 | 0.001 | 0.042 | 0.000 | 0.001 | 0.041 |
| 1945-1947 | Inhalation | 0.002 | 0.029 | 8.973 | 0.002 | 0.024 | 7.363 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.002 | 0.024 | 0.603 | 0.000 | 0.003 | 0.055 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.000 | 0.005 | 0.196 | 0.000 | 0.001 | 0.020 |
| 1945-1947 | Commercial Milk (Rural) | 0.078 | 0.793 | 18.024 | 0.007 | 0.085 | 2.589 |
| 1945-1947 | Fruit and Vegetables* | 0.037 | 0.287 | 15.439 | 0.029 | 0.244 | 9.713 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Kittitas County Census Division 03 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.014 |
| 1945 | Inhalation | 0.001 | 0.007 | 0.585 | 0.000 | 0.006 | 0.732 |
| 1945 | Milk from BYCow Regime 3 | 0.000 | 0.010 | 0.388 | 0.000 | 0.001 | 0.040 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.064 | 0.000 | 0.000 | 0.015 |
| 1945 | Commercial Milk (Rural) | 0.013 | 0.297 | 25.249 | 0.001 | 0.024 | 4.425 |
| 1945 | Fruit and Vegetables* | 0.011 | 0.134 | 8.906 | 0.010 | 0.117 | 8.457 |
| 1946 | External | 0.000 | 0.000 | 0.008 | 0.000 | 0.000 | 0.006 |
| 1946 | Inhalation | 0.000 | 0.002 | 0.580 | 0.000 | 0.002 | 0.570 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.100 | 0.000 | 0.000 | 0.017 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.016 | 0.000 | 0.000 | 0.002 |
| 1946 | Commercial Milk (Rural) | 0.004 | 0.053 | 1.931 | 0.000 | 0.004 | 0.204 |
| 1946 | Fruit and Vegetables* | 0.002 | 0.019 | 1.051 | 0.001 | 0.016 | 1.057 |
| 1947 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.003 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.672 | 0.000 | 0.001 | 0.178 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.000 | 0.034 | 0.000 | 0.000 | 0.008 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.001 |
| 1947 | Commercial Milk (Rural) | 0.001 | 0.014 | 6.985 | 0.000 | 0.001 | 0.095 |
| 1947 | Fruit and Vegetables* | 0.000 | 0.005 | 0.182 | 0.000 | 0.004 | 0.294 |
| 1945-1947 | External | 0.000 | 0.001 | 0.025 | 0.000 | 0.001 | 0.030 |
| 1945-1947 | Inhalation | 0.003 | 0.030 | 4.361 | 0.002 | 0.023 | 4.120 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.002 | 0.032 | 0.511 | 0.000 | 0.003 | 0.079 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.000 | 0.004 | 0.125 | 0.000 | 0.001 | 0.020 |
| 1945-1947 | Commercial Milk (Rural) | 0.089 | 0.793 | 41.945 | 0.006 | 0.068 | 5.510 |
| 1945-1947 | Fruit and Vegetables* | 0.034 | 0.257 | 11.868 | 0.029 | 0.257 | 13.112 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Kittitas County Census Division 04 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.011 | 0.000 | 0.001 | 0.012 |
| 1945 | Inhalation | 0.001 | 0.012 | 0.482 | 0.001 | 0.009 | 0.331 |
| 1945 | Milk from BYCow Regime 3 | 0.001 | 0.023 | 1.452 | 0.000 | 0.003 | 0.128 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.010 | 1.570 | 0.000 | 0.001 | 0.050 |
| 1945 | Commercial Milk (Rural) | 0.015 | 0.426 | 12.894 | 0.001 | 0.020 | 1.528 |
| 1945 | Fruit and Vegetables* | 0.064 | 0.714 | 18.791 | 0.056 | 0.571 | 21.140 |
| 1946 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.003 |
| 1946 | Inhalation | 0.000 | 0.002 | 0.116 | 0.000 | 0.003 | 0.130 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.007 | 0.753 | 0.000 | 0.000 | 0.020 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.226 | 0.000 | 0.000 | 0.008 |
| 1946 | Commercial Milk (Rural) | 0.003 | 0.051 | 1.593 | 0.000 | 0.004 | 0.217 |
| 1946 | Fruit and Vegetables* | 0.010 | 0.088 | 1.968 | 0.007 | 0.069 | 1.638 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.047 | 0.000 | 0.001 | 0.034 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.115 | 0.000 | 0.000 | 0.009 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.019 | 0.000 | 0.000 | 0.003 |
| 1947 | Commercial Milk (Rural) | 0.001 | 0.021 | 1.287 | 0.000 | 0.001 | 0.101 |
| 1947 | Fruit and Vegetables* | 0.002 | 0.019 | 0.504 | 0.002 | 0.017 | 0.433 |
| 1945-1947 | External | 0.000 | 0.001 | 0.016 | 0.000 | 0.001 | 0.019 |
| 1945-1947 | Inhalation | 0.004 | 0.031 | 0.731 | 0.003 | 0.025 | 0.567 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.007 | 0.086 | 2.321 | 0.001 | 0.007 | 0.214 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.002 | 0.030 | 1.058 | 0.000 | 0.003 | 0.048 |
| 1945-1947 | Commercial Milk (Rural) | 0.097 | 0.955 | 16.737 | 0.006 | 0.055 | 1.561 |
| 1945-1947 | Fruit and Vegetables* | 0.178 | 1.137 | 20.902 | 0.151 | 0.998 | 23.438 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Kittitas County Census Division 05 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.014 | 0.000 | 0.000 | 0.022 |
| 1945 | Inhalation | 0.000 | 0.007 | 0.557 | 0.000 | 0.005 | 0.764 |
| 1945 | Milk from BYCow Regime 3 | 0.001 | 0.036 | 2.118 | 0.000 | 0.003 | 0.554 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.006 | 0.159 | 0.000 | 0.001 | 0.038 |
| 1945 | Commercial Milk (Rural) | 0.017 | 0.299 | 13.850 | 0.002 | 0.022 | 1.993 |
| 1945 | Fruit and Vegetables* | 0.024 | 0.293 | 12.457 | 0.021 | 0.222 | 14.974 |
| 1946 | External | 0.000 | 0.000 | 0.012 | 0.000 | 0.000 | 0.014 |
| 1946 | Inhalation | 0.000 | 0.002 | 0.629 | 0.000 | 0.002 | 0.199 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.005 | 0.568 | 0.000 | 0.000 | 0.030 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.035 | 0.000 | 0.000 | 0.005 |
| 1946 | Commercial Milk (Rural) | 0.004 | 0.064 | 2.282 | 0.000 | 0.004 | 0.227 |
| 1946 | Fruit and Vegetables* | 0.003 | 0.036 | 2.194 | 0.003 | 0.030 | 1.683 |
| 1947 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.002 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.138 | 0.000 | 0.001 | 0.126 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.001 | 0.062 | 0.000 | 0.000 | 0.016 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.008 | 0.000 | 0.000 | 0.001 |
| 1947 | Commercial Milk (Rural) | 0.001 | 0.012 | 4.517 | 0.000 | 0.001 | 0.437 |
| 1947 | Fruit and Vegetables* | 0.001 | 0.008 | 0.232 | 0.001 | 0.007 | 0.364 |
| 1945-1947 | External | 0.000 | 0.001 | 0.044 | 0.000 | 0.001 | 0.063 |
| 1945-1947 | Inhalation | 0.002 | 0.026 | 3.874 | 0.002 | 0.021 | 5.117 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.005 | 0.083 | 3.446 | 0.001 | 0.014 | 1.267 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.001 | 0.012 | 0.228 | 0.000 | 0.002 | 0.050 |
| 1945-1947 | Commercial Milk (Rural) | 0.082 | 0.837 | 26.473 | 0.006 | 0.064 | 2.021 |
| 1945-1947 | Fruit and Vegetables* | 0.066 | 0.585 | 18.368 | 0.058 | 0.458 | 18.811 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Kittitas County Census Division 06 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.025 | 0.000 | 0.000 | 0.017 |
| 1945 | Inhalation | 0.000 | 0.007 | 1.077 | 0.000 | 0.005 | 0.550 |
| 1945 | Milk from BYCow Regime 1 | 0.029 | 0.967 | 175.513 | 0.002 | 0.086 | 11.553 |
| 1945 | Milk from BYCow Regime 2 | 0.022 | 0.826 | 80.051 | 0.002 | 0.048 | 3.306 |
| 1945 | Milk from BYCow Regime 3 | 0.001 | 0.017 | 0.739 | 0.000 | 0.002 | 0.063 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.199 | 0.000 | 0.001 | 0.022 |
| 1945 | Commercial Milk (Rural) | 0.035 | 0.641 | 28.395 | 0.003 | 0.066 | 2.086 |
| 1945 | Fruit and Vegetables* | 0.023 | 0.261 | 10.883 | 0.020 | 0.218 | 19.804 |
| 1946 | External | 0.000 | 0.000 | 0.013 | 0.000 | 0.000 | 0.009 |
| 1946 | Inhalation | 0.000 | 0.002 | 0.217 | 0.000 | 0.001 | 0.195 |
| 1946 | Milk from BYCow Regime 1 | 0.006 | 0.148 | 15.469 | 0.000 | 0.011 | 0.399 |
| 1946 | Milk from BYCow Regime 2 | 0.004 | 0.122 | 6.591 | 0.000 | 0.009 | 0.207 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.003 | 0.199 | 0.000 | 0.000 | 0.017 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.067 | 0.000 | 0.000 | 0.004 |
| 1946 | Commercial Milk (Rural) | 0.006 | 0.097 | 3.056 | 0.000 | 0.006 | 0.365 |
| 1946 | Fruit and Vegetables* | 0.003 | 0.035 | 1.660 | 0.002 | 0.027 | 1.712 |
| 1947 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.003 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.154 | 0.000 | 0.001 | 0.164 |
| 1947 | Milk from BYCow Regime 1 | 0.001 | 0.049 | 6.260 | 0.000 | 0.003 | 0.391 |
| 1947 | Milk from BYCow Regime 2 | 0.001 | 0.033 | 6.436 | 0.000 | 0.003 | 0.541 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.001 | 0.194 | 0.000 | 0.000 | 0.012 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.025 | 0.000 | 0.000 | 0.002 |
| 1947 | Commercial Milk (Rural) | 0.001 | 0.023 | 11.743 | 0.000 | 0.003 | 0.283 |
| 1947 | Fruit and Vegetables* | 0.001 | 0.010 | 0.454 | 0.001 | 0.008 | 0.843 |
| 1945-1947 | External | 0.000 | 0.001 | 0.078 | 0.000 | 0.001 | 0.072 |
| 1945-1947 | Inhalation | 0.002 | 0.029 | 6.235 | 0.002 | 0.020 | 2.134 |
| 1945-1947 | Milk from BYCow Regime 1 | 0.166 | 2.883 | 200.071 | 0.013 | 0.206 | 11.046 |
| 1945-1947 | Milk from BYCow Regime 2 | 0.153 | 2.125 | 159.720 | 0.011 | 0.161 | 5.458 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.004 | 0.050 | 1.221 | 0.001 | 0.004 | 0.072 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.001 | 0.010 | 0.263 | 0.000 | 0.001 | 0.032 |
| 1945-1947 | Commercial Milk (Rural) | 0.155 | 1.750 | 55.180 | 0.014 | 0.141 | 2.113 |
| 1945-1947 | Fruit and Vegetables* | 0.069 | 0.574 | 19.765 | 0.056 | 0.497 | 25.678 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Kittitas County Census Division 07 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.014 | 0.000 | 0.000 | 0.011 |
| 1945 | Inhalation | 0.000 | 0.006 | 1.264 | 0.000 | 0.006 | 1.404 |
| 1945 | Milk from BYCow Regime 1 | 0.030 | 0.858 | 134.019 | 0.003 | 0.076 | 5.247 |
| 1945 | Milk from BYCow Regime 2 | 0.026 | 0.880 | 77.151 | 0.002 | 0.086 | 7.041 |
| 1945 | Milk from BYCow Regime 3 | 0.001 | 0.044 | 8.097 | 0.000 | 0.007 | 0.918 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.011 | 0.413 | 0.000 | 0.002 | 0.055 |
| 1945 | Commercial Milk (Rural) | 0.349 | 5.191 | 160.808 | 0.029 | 0.367 | 19.071 |
| 1945 | Fruit and Vegetables* | 0.023 | 0.269 | 17.451 | 0.019 | 0.218 | 16.119 |
| 1946 | External | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.010 |
| 1946 | Inhalation | 0.000 | 0.002 | 0.575 | 0.000 | 0.002 | 0.557 |
| 1946 | Milk from BYCow Regime 1 | 0.006 | 0.173 | 15.906 | 0.001 | 0.012 | 1.172 |
| 1946 | Milk from BYCow Regime 2 | 0.006 | 0.136 | 24.714 | 0.001 | 0.011 | 0.777 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.008 | 0.968 | 0.000 | 0.001 | 0.044 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.028 | 0.000 | 0.000 | 0.008 |
| 1946 | Commercial Milk (Rural) | 0.052 | 0.631 | 16.899 | 0.004 | 0.055 | 1.188 |
| 1946 | Fruit and Vegetables* | 0.003 | 0.038 | 1.546 | 0.003 | 0.034 | 2.221 |
| 1947 | External | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.005 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.114 | 0.000 | 0.000 | 0.112 |
| 1947 | Milk from BYCow Regime 1 | 0.002 | 0.049 | 2.380 | 0.000 | 0.003 | 0.200 |
| 1947 | Milk from BYCow Regime 2 | 0.002 | 0.039 | 4.991 | 0.000 | 0.004 | 0.497 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.001 | 0.087 | 0.000 | 0.000 | 0.007 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.015 | 0.000 | 0.000 | 0.002 |
| 1947 | Commercial Milk (Rural) | 0.019 | 0.189 | 4.295 | 0.001 | 0.013 | 0.293 |
| 1947 | Fruit and Vegetables* | 0.001 | 0.008 | 0.294 | 0.001 | 0.008 | 0.591 |
| 1945-1947 | External | 0.000 | 0.001 | 0.039 | 0.000 | 0.001 | 0.049 |
| 1945-1947 | Inhalation | 0.002 | 0.032 | 4.427 | 0.002 | 0.028 | 6.046 |
| 1945-1947 | Milk from BYCow Regime 1 | 0.215 | 2.314 | 138.123 | 0.016 | 0.205 | 8.640 |
| 1945-1947 | Milk from BYCow Regime 2 | 0.170 | 2.388 | 138.637 | 0.013 | 0.197 | 7.679 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.007 | 0.116 | 13.220 | 0.001 | 0.014 | 0.803 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.002 | 0.018 | 0.291 | 0.000 | 0.004 | 0.063 |
| 1945-1947 | Commercial Milk (Rural) | 0.926 | 8.415 | 126.357 | 0.088 | 0.689 | 25.902 |
| 1945-1947 | Fruit and Vegetables* | 0.065 | 0.543 | 25.591 | 0.058 | 0.482 | 24.010 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Kittitas County Census Division 08 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.006 | 0.131 | 0.001 | 0.006 | 0.112 |
| 1945 | Inhalation | 0.010 | 0.116 | 4.718 | 0.008 | 0.097 | 3.291 |
| 1945 | Milk from BYCow Regime 1 | 0.715 | 13.875 | 369.249 | 0.060 | 0.933 | 26.025 |
| 1945 | Milk from BYCow Regime 2 | 0.710 | 10.295 | 186.163 | 0.066 | 1.030 | 23.029 |
| 1945 | Milk from BYCow Regime 3 | 0.042 | 0.824 | 17.241 | 0.003 | 0.044 | 1.627 |
| 1945 | Milk from BYCow Regime 4 | 0.003 | 0.099 | 4.542 | 0.000 | 0.012 | 0.492 |
| 1945 | Commercial Milk (Rural) | 0.371 | 4.878 | 129.458 | 0.030 | 0.373 | 8.037 |
| 1945 | Fruit and Vegetables* | 0.727 | 5.668 | 111.064 | 0.531 | 4.243 | 66.887 |
| 1946 | External | 0.000 | 0.001 | 0.026 | 0.000 | 0.002 | 0.046 |
| 1946 | Inhalation | 0.003 | 0.031 | 0.942 | 0.002 | 0.024 | 0.711 |
| 1946 | Milk from BYCow Regime 1 | 0.108 | 1.436 | 29.678 | 0.012 | 0.150 | 2.656 |
| 1946 | Milk from BYCow Regime 2 | 0.123 | 2.383 | 52.240 | 0.008 | 0.137 | 3.161 |
| 1946 | Milk from BYCow Regime 3 | 0.004 | 0.076 | 2.631 | 0.000 | 0.007 | 0.119 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.013 | 0.702 | 0.000 | 0.002 | 0.028 |
| 1946 | Commercial Milk (Rural) | 0.040 | 0.667 | 25.019 | 0.004 | 0.042 | 0.876 |
| 1946 | Fruit and Vegetables* | 0.097 | 0.784 | 12.358 | 0.076 | 0.545 | 7.292 |
| 1947 | External | 0.000 | 0.000 | 0.014 | 0.000 | 0.000 | 0.014 |
| 1947 | Inhalation | 0.001 | 0.007 | 0.237 | 0.001 | 0.006 | 0.221 |
| 1947 | Milk from BYCow Regime 1 | 0.032 | 0.516 | 9.655 | 0.002 | 0.046 | 1.644 |
| 1947 | Milk from BYCow Regime 2 | 0.039 | 0.477 | 14.193 | 0.003 | 0.036 | 0.511 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.015 | 0.285 | 0.000 | 0.001 | 0.036 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.144 | 0.000 | 0.000 | 0.011 |
| 1947 | Commercial Milk (Rural) | 0.013 | 0.164 | 5.753 | 0.001 | 0.015 | 0.352 |
| 1947 | Fruit and Vegetables* | 0.018 | 0.167 | 2.144 | 0.015 | 0.127 | 2.376 |
| 1945-1947 | External | 0.002 | 0.012 | 0.182 | 0.002 | 0.012 | 0.181 |
| 1945-1947 | Inhalation | 0.041 | 0.284 | 5.313 | 0.035 | 0.234 | 4.406 |
| 1945-1947 | Milk from BYCow Regime 1 | 2.865 | 24.269 | 464.113 | 0.284 | 1.891 | 26.062 |
| 1945-1947 | Milk from BYCow Regime 2 | 2.612 | 23.014 | 257.489 | 0.213 | 1.590 | 22.198 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.158 | 1.440 | 23.410 | 0.010 | 0.082 | 1.688 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.013 | 0.223 | 5.800 | 0.002 | 0.023 | 0.430 |
| 1945-1947 | Commercial Milk (Rural) | 1.145 | 8.863 | 151.610 | 0.101 | 0.765 | 9.752 |
| 1945-1947 | Fruit and Vegetables* | 1.674 | 8.900 | 140.317 | 1.309 | 6.747 | 71.077 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Kittitas County Census Division 09 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.020 | 0.000 | 0.001 | 0.026 |
| 1945 | Inhalation | 0.001 | 0.012 | 0.311 | 0.001 | 0.011 | 0.409 |
| 1945 | Milk from BYCow Regime 1 | 0.079 | 1.419 | 76.289 | 0.007 | 0.108 | 3.387 |
| 1945 | Milk from BYCow Regime 2 | 0.093 | 1.774 | 43.229 | 0.006 | 0.126 | 8.640 |
| 1945 | Milk from BYCow Regime 3 | 0.004 | 0.084 | 4.697 | 0.001 | 0.010 | 1.100 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.021 | 1.359 | 0.000 | 0.004 | 0.105 |
| 1945 | Commercial Milk (Rural) | 0.270 | 4.388 | 245.295 | 0.025 | 0.353 | 6.508 |
| 1945 | Fruit and Vegetables* | 0.066 | 0.687 | 13.294 | 0.062 | 0.593 | 17.092 |
| 1946 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.004 |
| 1946 | Inhalation | 0.000 | 0.003 | 0.127 | 0.000 | 0.002 | 0.067 |
| 1946 | Milk from BYCow Regime 1 | 0.013 | 0.225 | 14.580 | 0.001 | 0.014 | 0.562 |
| 1946 | Milk from BYCow Regime 2 | 0.014 | 0.197 | 18.335 | 0.001 | 0.021 | 1.027 |
| 1946 | Milk from BYCow Regime 3 | 0.001 | 0.012 | 1.065 | 0.000 | 0.001 | 0.037 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.135 | 0.000 | 0.001 | 0.012 |
| 1946 | Commercial Milk (Rural) | 0.054 | 0.952 | 44.806 | 0.004 | 0.048 | 1.677 |
| 1946 | Fruit and Vegetables* | 0.009 | 0.093 | 1.655 | 0.008 | 0.079 | 3.030 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.002 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.063 | 0.000 | 0.001 | 0.053 |
| 1947 | Milk from BYCow Regime 1 | 0.005 | 0.115 | 1.885 | 0.000 | 0.009 | 0.382 |
| 1947 | Milk from BYCow Regime 2 | 0.005 | 0.090 | 4.009 | 0.000 | 0.006 | 0.283 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.230 | 0.000 | 0.000 | 0.020 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.043 | 0.000 | 0.000 | 0.004 |
| 1947 | Commercial Milk (Rural) | 0.017 | 0.156 | 3.566 | 0.001 | 0.016 | 0.324 |
| 1947 | Fruit and Vegetables* | 0.002 | 0.019 | 0.686 | 0.002 | 0.019 | 0.496 |
| 1945-1947 | External | 0.000 | 0.001 | 0.036 | 0.000 | 0.001 | 0.035 |
| 1945-1947 | Inhalation | 0.004 | 0.033 | 0.636 | 0.004 | 0.029 | 0.683 |
| 1945-1947 | Milk from BYCow Regime 1 | 0.396 | 3.947 | 128.743 | 0.033 | 0.300 | 6.134 |
| 1945-1947 | Milk from BYCow Regime 2 | 0.353 | 3.586 | 86.422 | 0.036 | 0.316 | 11.038 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.016 | 0.194 | 5.679 | 0.002 | 0.024 | 1.189 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.004 | 0.055 | 1.989 | 0.001 | 0.008 | 0.120 |
| 1945-1947 | Commercial Milk (Rural) | 1.243 | 9.744 | 337.011 | 0.080 | 0.750 | 8.214 |
| 1945-1947 | Fruit and Vegetables* | 0.185 | 1.222 | 17.400 | 0.158 | 0.994 | 26.392 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Kittitas County Census Division 10 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.010 | 0.000 | 0.001 | 0.013 |
| 1945 | Inhalation | 0.001 | 0.013 | 0.484 | 0.001 | 0.010 | 0.540 |
| 1945 | Milk from BYCow Regime 1 | 0.081 | 1.690 | 44.607 | 0.007 | 0.109 | 5.477 |
| 1945 | Milk from BYCow Regime 2 | 0.100 | 1.871 | 114.118 | 0.006 | 0.097 | 3.524 |
| 1945 | Milk from BYCow Regime 3 | 0.005 | 0.097 | 4.957 | 0.001 | 0.010 | 0.232 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.015 | 0.632 | 0.000 | 0.002 | 0.059 |
| 1945 | Commercial Milk (Rural) | 0.303 | 4.556 | 127.786 | 0.027 | 0.453 | 11.418 |
| 1945 | Fruit and Vegetables* | 0.070 | 0.669 | 16.623 | 0.057 | 0.513 | 12.585 |
| 1946 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.004 |
| 1946 | Inhalation | 0.000 | 0.003 | 0.162 | 0.000 | 0.002 | 0.080 |
| 1946 | Milk from BYCow Regime 1 | 0.016 | 0.288 | 16.249 | 0.001 | 0.020 | 1.524 |
| 1946 | Milk from BYCow Regime 2 | 0.013 | 0.233 | 6.532 | 0.001 | 0.023 | 0.662 |
| 1946 | Milk from BYCow Regime 3 | 0.001 | 0.011 | 0.356 | 0.000 | 0.001 | 0.043 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.112 | 0.000 | 0.000 | 0.014 |
| 1946 | Commercial Milk (Rural) | 0.045 | 0.527 | 12.599 | 0.004 | 0.046 | 1.141 |
| 1946 | Fruit and Vegetables* | 0.008 | 0.078 | 1.567 | 0.008 | 0.074 | 1.840 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.032 | 0.000 | 0.001 | 0.034 |
| 1947 | Milk from BYCow Regime 1 | 0.004 | 0.072 | 5.131 | 0.000 | 0.006 | 0.160 |
| 1947 | Milk from BYCow Regime 2 | 0.004 | 0.061 | 2.195 | 0.000 | 0.007 | 0.331 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.003 | 0.137 | 0.000 | 0.000 | 0.011 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.018 | 0.000 | 0.000 | 0.003 |
| 1947 | Commercial Milk (Rural) | 0.014 | 0.197 | 4.125 | 0.001 | 0.012 | 0.304 |
| 1947 | Fruit and Vegetables* | 0.002 | 0.019 | 0.445 | 0.002 | 0.019 | 0.563 |
| 1945-1947 | External | 0.000 | 0.001 | 0.014 | 0.000 | 0.001 | 0.023 |
| 1945-1947 | Inhalation | 0.004 | 0.033 | 0.847 | 0.003 | 0.026 | 0.801 |
| 1945-1947 | Milk from BYCow Regime 1 | 0.424 | 3.955 | 57.371 | 0.027 | 0.229 | 6.130 |
| 1945-1947 | Milk from BYCow Regime 2 | 0.333 | 4.038 | 119.592 | 0.032 | 0.234 | 3.926 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.020 | 0.187 | 7.938 | 0.002 | 0.020 | 0.389 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.004 | 0.031 | 0.758 | 0.001 | 0.005 | 0.092 |
| 1945-1947 | Commercial Milk (Rural) | 1.256 | 8.954 | 124.663 | 0.075 | 0.597 | 10.373 |
| 1945-1947 | Fruit and Vegetables* | 0.187 | 1.161 | 21.080 | 0.153 | 0.939 | 17.404 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Kittitas County Census Division 11

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.010 | 0.000 | 0.001 | 0.010 |
| 1945 | Inhalation | 0.001 | 0.012 | 0.506 | 0.001 | 0.011 | 0.304 |
| 1945 | Milk from BYCow Regime 1 | 0.119 | 2.259 | 134.451 | 0.007 | 0.142 | 3.261 |
| 1945 | Milk from BYCow Regime 2 | 0.042 | 1.885 | 154.504 | 0.005 | 0.093 | 4.394 |
| 1945 | Milk from BYCow Regime 3 | 0.002 | 0.062 | 2.496 | 0.000 | 0.004 | 0.525 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.012 | 1.184 | 0.000 | 0.001 | 0.090 |
| 1945 | Commercial Milk (Urban) | 0.865 | 6.892 | 156.185 | 0.046 | 0.490 | 9.223 |
| 1945 | Fruit and Vegetables* | 0.074 | 0.661 | 17.232 | 0.061 | 0.537 | 18.228 |
| 1946 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.004 |
| 1946 | Inhalation | 0.000 | 0.003 | 0.120 | 0.000 | 0.003 | 0.095 |
| 1946 | Milk from BYCow Regime 1 | 0.016 | 0.255 | 7.786 | 0.001 | 0.024 | 1.307 |
| 1946 | Milk from BYCow Regime 2 | 0.011 | 0.221 | 15.918 | 0.001 | 0.027 | 1.474 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.010 | 0.614 | 0.000 | 0.001 | 0.032 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.247 | 0.000 | 0.000 | 0.011 |
| 1946 | Commercial Milk (Urban) | 0.139 | 1.185 | 20.251 | 0.007 | 0.083 | 1.028 |
| 1946 | Fruit and Vegetables* | 0.010 | 0.098 | 1.763 | 0.010 | 0.089 | 2.564 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.041 | 0.000 | 0.001 | 0.038 |
| 1947 | Milk from BYCow Regime 1 | 0.005 | 0.086 | 2.135 | 0.000 | 0.008 | 0.353 |
| 1947 | Milk from BYCow Regime 2 | 0.003 | 0.094 | 4.573 | 0.000 | 0.006 | 0.730 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.133 | 0.000 | 0.000 | 0.014 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.036 | 0.000 | 0.000 | 0.003 |
| 1947 | Commercial Milk (Urban) | 0.046 | 0.333 | 3.957 | 0.002 | 0.025 | 0.332 |
| 1947 | Fruit and Vegetables* | 0.002 | 0.023 | 0.535 | 0.002 | 0.017 | 0.557 |
| 1945-1947 | External | 0.000 | 0.001 | 0.018 | 0.000 | 0.001 | 0.021 |
| 1945-1947 | Inhalation | 0.004 | 0.033 | 0.752 | 0.004 | 0.031 | 1.014 |
| 1945-1947 | Milk from BYCow Regime 1 | 0.500 | 4.268 | 83.113 | 0.033 | 0.291 | 6.717 |
| 1945-1947 | Milk from BYCow Regime 2 | 0.409 | 4.885 | 112.074 | 0.025 | 0.260 | 5.962 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.014 | 0.153 | 7.909 | 0.001 | 0.012 | 0.493 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.002 | 0.039 | 1.984 | 0.000 | 0.002 | 0.090 |
| 1945-1947 | Commercial Milk (Urban) | 2.396 | 10.977 | 112.349 | 0.135 | 0.779 | 10.220 |
| 1945-1947 | Fruit and Vegetables* | 0.196 | 1.170 | 19.249 | 0.166 | 1.019 | 23.518 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Klickitat County Census Division 01 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.018 | 0.000 | 0.001 | 0.018 |
| 1945 | Inhalation | 0.001 | 0.015 | 0.431 | 0.001 | 0.011 | 0.323 |
| 1945 | Milk from BYCow Regime 3 | 0.003 | 0.057 | 1.484 | 0.000 | 0.005 | 0.193 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.014 | 1.529 | 0.000 | 0.002 | 0.074 |
| 1945 | Commercial Milk (Rural) | 0.001 | 0.011 | 0.280 | 0.000 | 0.001 | 0.022 |
| 1945 | Fruit and Vegetables* | 0.126 | 1.092 | 15.583 | 0.077 | 0.554 | 9.002 |
| 1946 | External | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.004 |
| 1946 | Inhalation | 0.000 | 0.004 | 0.112 | 0.000 | 0.003 | 0.099 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.008 | 0.321 | 0.000 | 0.000 | 0.015 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.187 | 0.000 | 0.000 | 0.008 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.002 | 0.029 | 0.000 | 0.000 | 0.003 |
| 1946 | Fruit and Vegetables* | 0.018 | 0.136 | 1.800 | 0.012 | 0.086 | 1.465 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.030 | 0.000 | 0.001 | 0.023 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.001 | 0.063 | 0.000 | 0.000 | 0.003 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.037 | 0.000 | 0.000 | 0.004 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.001 | 0.042 | 0.000 | 0.000 | 0.002 |
| 1947 | Fruit and Vegetables* | 0.003 | 0.027 | 0.440 | 0.003 | 0.019 | 0.297 |
| 1945-1947 | External | 0.000 | 0.002 | 0.024 | 0.000 | 0.002 | 0.023 |
| 1945-1947 | Inhalation | 0.005 | 0.032 | 0.578 | 0.004 | 0.027 | 0.577 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.011 | 0.126 | 1.950 | 0.001 | 0.008 | 0.237 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.003 | 0.045 | 1.759 | 0.000 | 0.004 | 0.061 |
| 1945-1947 | Commercial Milk (Rural) | 0.003 | 0.022 | 0.591 | 0.000 | 0.002 | 0.025 |
| 1945-1947 | Fruit and Vegetables* | 0.304 | 1.650 | 16.131 | 0.192 | 0.973 | 10.873 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Klickitat County Census Division 02 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.015 | 0.000 | 0.001 | 0.017 |
| 1945 | Inhalation | 0.002 | 0.017 | 0.511 | 0.001 | 0.012 | 0.391 |
| 1945 | Milk from BYCow Regime 3 | 0.004 | 0.075 | 2.396 | 0.000 | 0.006 | 0.135 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.015 | 0.886 | 0.000 | 0.002 | 0.076 |
| 1945 | Commercial Milk (Rural) | 0.001 | 0.015 | 0.336 | 0.000 | 0.001 | 0.025 |
| 1945 | Fruit and Vegetables* | 0.132 | 1.066 | 13.710 | 0.098 | 0.714 | 9.753 |
| 1946 | External | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.008 |
| 1946 | Inhalation | 0.000 | 0.004 | 0.146 | 0.000 | 0.004 | 0.130 |
| 1946 | Milk from BYCow Regime 3 | 0.001 | 0.007 | 0.195 | 0.000 | 0.001 | 0.015 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.106 | 0.000 | 0.000 | 0.005 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.002 | 0.035 | 0.000 | 0.000 | 0.004 |
| 1946 | Fruit and Vegetables* | 0.021 | 0.183 | 2.900 | 0.016 | 0.123 | 1.503 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.002 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.042 | 0.000 | 0.001 | 0.036 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.003 | 0.125 | 0.000 | 0.000 | 0.004 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.027 | 0.000 | 0.000 | 0.003 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.016 | 0.000 | 0.000 | 0.001 |
| 1947 | Fruit and Vegetables* | 0.004 | 0.035 | 0.441 | 0.003 | 0.022 | 0.346 |
| 1945-1947 | External | 0.000 | 0.002 | 0.029 | 0.000 | 0.002 | 0.031 |
| 1945-1947 | Inhalation | 0.006 | 0.041 | 0.977 | 0.005 | 0.031 | 0.749 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.016 | 0.146 | 2.028 | 0.001 | 0.011 | 0.143 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.004 | 0.041 | 0.718 | 0.000 | 0.004 | 0.185 |
| 1945-1947 | Commercial Milk (Rural) | 0.003 | 0.027 | 0.356 | 0.000 | 0.002 | 0.030 |
| 1945-1947 | Fruit and Vegetables* | 0.345 | 1.736 | 13.705 | 0.244 | 1.152 | 11.887 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Klickitat County Census Division 03

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.002 |
| 1945 | Inhalation | 0.000 | 0.003 | 0.083 | 0.000 | 0.002 | 0.070 |
| 1945 | Milk from BYCow Regime 3 | 0.001 | 0.011 | 0.378 | 0.000 | 0.001 | 0.024 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.172 | 0.000 | 0.000 | 0.016 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.001 | 0.051 | 0.000 | 0.000 | 0.004 |
| 1945 | Fruit and Vegetables* | 0.028 | 0.223 | 5.977 | 0.018 | 0.131 | 2.562 |
| 1946 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1946 | Inhalation | 0.000 | 0.001 | 0.023 | 0.000 | 0.000 | 0.016 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.037 | 0.000 | 0.000 | 0.004 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.009 | 0.000 | 0.000 | 0.001 |
| 1946 | Commetcial Milk (Rural) | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.001 |
| 1946 | Fruit and Vegetables* | 0.004 | 0.037 | 0.832 | 0.003 | 0.022 | 0.474 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.004 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 0.001 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.000 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.001 | 0.006 | 0.105 | 0.000 | 0.004 | 0.065 |
| 1945-1947 | External | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.004 |
| 1945-1947 | Inhalation | 0.001 | 0.006 | 0.128 | 0.001 | 0.005 | 0.090 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.003 | 0.025 | 0.355 | 0.000 | 0.002 | 0.024 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.001 | 0.005 | 0.151 | 0.000 | 0.000 | 0.019 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.003 | 0.056 | 0.000 | 0.000 | 0.004 |
| 1945-1947 | Fruit and Vegetables* | 0.069 | 0.383 | 6.486 | 0.041 | 0.215 | 3.239 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Klickitat County Census Division 04 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.002 |
| 1945 | Inhalation | 0.000 | 0.003 | 0.044 | 0.000 | 0.002 | 0.043 |
| 1945 | Milk from BYCow Regime 3 | 0.001 | 0.016 | 0.216 | 0.000 | 0.001 | 0.020 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.118 | 0.000 | 0.000 | 0.020 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.002 | 0.044 | 0.000 | 0.000 | 0.005 |
| 1945 | Fruit and Vegetables* | 0.029 | 0.187 | 1.921 | 0.019 | 0.119 | 1.179 |
| 1946 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1946 | Inhalation | 0.000 | 0.000 | 0.011 | 0.000 | 0.000 | 0.005 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.039 | 0.000 | 0.000 | 0.004 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.015 | 0.000 | 0.000 | 0.001 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.006 | 0.000 | 0.000 | 0.000 |
| 1946 | Fruit and Vegetables* | 0.004 | 0.025 | 0.249 | 0.003 | 0.016 | 0.169 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.002 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 0.000 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.001 | 0.005 | 0.056 | 0.000 | 0.003 | 0.031 |
| 1945-1947 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.003 |
| 1945-1947 | Inhalation | 0.001 | 0.005 | 0.066 | 0.001 | 0.004 | 0.063 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.003 | 0.023 | 0.231 | 0.000 | 0.002 | 0.016 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.000 | 0.007 | 0.135 | 0.000 | 0.000 | 0.013 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.004 | 0.065 | 0.000 | 0.000 | 0.006 |
| 1945-1947 | Fruit and Vegetables* | 0.062 | 0.267 | 1.945 | 0.038 | 0.171 | 1.363 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Klickitat County Census Division 05

| Year | Dose Pathway | Infant Dose Percentiles 5th | Infant Dose Percentiles 50th | Infant Dose Percentiles 95th | Adult Dose Percentiles 5th | Adult Dose Percentiles 50th | Adult Dose Percentiles 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.004 |
| 1945 | Inhalation | 0.000 | 0.003 | 0.142 | 0.000 | 0.002 | 0.069 |
| 1945 | Milk from BYCow Regime 1 | 0.036 | 0.569 | 18.231 | 0.003 | 0.032 | 0.660 |
| 1945 | Milk from BYCow Regime 2 | 0.024 | 0.324 | 6.381 | 0.002 | 0.030 | 0.553 |
| 1945 | Milk from BYCow Regime 3 | 0.001 | 0.015 | 0.420 | 0.000 | 0.001 | 0.053 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.004 | 0.177 | 0.000 | 0.000 | 0.022 |
| 1945 | Commercial Milk (Rural) | 0.008 | 0.160 | 2.694 | 0.001 | 0.010 | 0.168 |
| 1945 | Fruit and Vegetables* | 0.027 | 0.235 | 6.009 | 0.019 | 0.149 | 2.485 |
| 1946 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1946 | Inhalation | 0.000 | 0.001 | 0.012 | 0.000 | 0.000 | 0.010 |
| 1946 | Milk from BYCow Regime 1 | 0.005 | 0.077 | 1.561 | 0.000 | 0.005 | 0.173 |
| 1946 | Milk from BYCow Regime 2 | 0.004 | 0.065 | 2.870 | 0.000 | 0.004 | 0.111 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.092 | 0.000 | 0.000 | 0.008 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.032 | 0.000 | 0.000 | 0.003 |
| 1946 | Commercial Milk (Rural) | 0.002 | 0.019 | 0.394 | 0.000 | 0.002 | 0.053 |
| 1946 | Fruit and Vegetables* | 0.004 | 0.034 | 0.823 | 0.003 | 0.018 | 0.340 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.004 |
| 1947 | Milk from BYCow Regime 1 | 0.001 | 0.020 | 0.682 | 0.000 | 0.001 | 0.035 |
| 1947 | Milk from BYCow Regime 2 | 0.001 | 0.019 | 0.378 | 0.000 | 0.002 | 0.031 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.000 | 0.015 | 0.000 | 0.000 | 0.001 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.001 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.005 | 0.121 | 0.000 | 0.000 | 0.014 |
| 1947 | Fruit and Vegetables* | 0.001 | 0.006 | 0.089 | 0.000 | 0.004 | 0.067 |
| 1945-1947 | External | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.005 |
| 1945-1947 | Inhalation | 0.001 | 0.006 | 0.184 | 0.001 | 0.004 | 0.084 |
| 1945-1947 | Milk from BYCow Regime 1 | 0.101 | 0.971 | 15.089 | 0.008 | 0.065 | 1.092 |
| 1945-1947 | Milk from BYCow Regime 2 | 0.095 | 0.659 | 7.799 | 0.007 | 0.056 | 0.707 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.003 | 0.031 | 0.476 | 0.000 | 0.003 | 0.053 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.001 | 0.008 | 0.286 | 0.000 | 0.001 | 0.024 |
| 1945-1947 | Commercial Milk (Rural) | 0.034 | 0.282 | 3.296 | 0.002 | 0.017 | 0.214 |
| 1945-1947 | Fruit and Vegetables* | 0.068 | 0.395 | 8.541 | 0.044 | 0.233 | 2.710 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Klickitat County Census Division 06

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.004 |
| 1945 | Inhalation | 0.000 | 0.003 | 0.097 | 0.000 | 0.002 | 0.074 |
| 1945 | Milk from BYCow Regime 1 | 0.026 | 0.395 | 7.273 | 0.002 | 0.033 | 0.868 |
| 1945 | Milk from BYCow Regime 2 | 0.023 | 0.454 | 19.261 | 0.002 | 0.027 | 0.790 |
| 1945 | Milk from BYCow Regime 3 | 0.001 | 0.016 | 0.445 | 0.000 | 0.001 | 0.062 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.264 | 0.000 | 0.000 | 0.018 |
| 1945 | Commercial Milk (Rural) | 0.011 | 0.180 | 5.086 | 0.001 | 0.011 | 0.680 |
| 1945 | Fruit and Vegetables* | 0.027 | 0.237 | 4.435 | 0.019 | 0.153 | 2.697 |
| 1946 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1946 | Inhalation | 0.000 | 0.001 | 0.021 | 0.000 | 0.000 | 0.010 |
| 1946 | Milk from BYCow Regime 1 | 0.005 | 0.077 | 1.324 | 0.000 | 0.004 | 0.130 |
| 1946 | Milk from BYCow Regime 2 | 0.004 | 0.052 | 1.235 | 0.000 | 0.003 | 0.060 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.043 | 0.000 | 0.000 | 0.006 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.035 | 0.000 | 0.000 | 0.002 |
| 1946 | Commercial Milk (Rural) | 0.001 | 0.015 | 0.244 | 0.000 | 0.002 | 0.034 |
| 1946 | Fruit and Vegetables* | 0.004 | 0.033 | 0.652 | 0.003 | 0.022 | 0.362 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.002 |
| 1947 | Milk from BYCow Regime 1 | 0.001 | 0.014 | 0.306 | 0.000 | 0.001 | 0.019 |
| 1947 | Milk from BYCow Regime 2 | 0.001 | 0.018 | 0.326 | 0.000 | 0.001 | 0.027 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.000 | 0.011 | 0.000 | 0.000 | 0.001 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.014 | 0.000 | 0.000 | 0.001 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.005 | 0.149 | 0.000 | 0.000 | 0.012 |
| 1947 | Fruit and Vegetables* | 0.001 | 0.005 | 0.070 | 0.000 | 0.004 | 0.071 |
| 1945-1947 | External | 0.000 | 0.000 | 0.008 | 0.000 | 0.000 | 0.005 |
| 1945-1947 | Inhalation | 0.001 | 0.006 | 0.152 | 0.001 | 0.004 | 0.090 |
| 1945-1947 | Milk from BYCow Regime 1 | 0.095 | 0.666 | 7.805 | 0.007 | 0.054 | 1.159 |
| 1945-1947 | Milk from BYCow Regime 2 | 0.087 | 0.727 | 20.511 | 0.007 | 0.049 | 0.707 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.003 | 0.027 | 0.637 | 0.000 | 0.003 | 0.062 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.001 | 0.009 | 0.225 | 0.000 | 0.001 | 0.021 |
| 1945-1947 | Commercial Milk (Rural) | 0.026 | 0.247 | 4.564 | 0.003 | 0.022 | 0.729 |
| 1945-1947 | Fruit and Vegetables* | 0.064 | 0.375 | 5.673 | 0.043 | 0.249 | 2.735 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Klickitat County Census Division 07 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.006 |
| 1945 | Inhalation | 0.000 | 0.002 | 0.083 | 0.000 | 0.002 | 0.073 |
| 1945 | Milk from BYCow Regime 3 | 0.001 | 0.011 | 0.243 | 0.000 | 0.001 | 0.039 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.093 | 0.000 | 0.000 | 0.023 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.002 | 0.045 | 0.000 | 0.000 | 0.004 |
| 1945 | Fruit and Vegetables* | 0.026 | 0.233 | 4.765 | 0.018 | 0.142 | 2.915 |
| 1946 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1946 | Inhalation | 0.000 | 0.001 | 0.020 | 0.000 | 0.000 | 0.012 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.072 | 0.000 | 0.000 | 0.002 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.032 | 0.000 | 0.000 | 0.002 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.008 | 0.000 | 0.000 | 0.001 |
| 1946 | Fruit and Vegetables* | 0.004 | 0.032 | 0.640 | 0.003 | 0.018 | 0.334 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.003 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.001 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.006 | 0.000 | 0.000 | 0.001 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.001 | 0.005 | 0.126 | 0.001 | 0.004 | 0.056 |
| 1945-1947 | External | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.009 |
| 1945-1947 | Inhalation | 0.001 | 0.006 | 0.115 | 0.001 | 0.004 | 0.083 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.003 | 0.020 | 0.294 | 0.000 | 0.002 | 0.043 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.000 | 0.008 | 0.156 | 0.000 | 0.001 | 0.020 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.003 | 0.048 | 0.000 | 0.000 | 0.004 |
| 1945-1947 | Fruit and Vegetables* | 0.069 | 0.410 | 6.169 | 0.042 | 0.217 | 3.101 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Klickitat County Census Division 08 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.006 |
| 1945 | Inhalation | 0.000 | 0.003 | 0.095 | 0.000 | 0.002 | 0.078 |
| 1945 | Milk from BYCow Regime 3 | 0.001 | 0.013 | 0.485 | 0.000 | 0.001 | 0.022 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.133 | 0.000 | 0.000 | 0.008 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.002 | 0.045 | 0.000 | 0.000 | 0.004 |
| 1945 | Fruit and Vegetables* | 0.026 | 0.227 | 3.576 | 0.018 | 0.132 | 2.250 |
| 1946 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1946 | Inhalation | 0.000 | 0.000 | 0.012 | 0.000 | 0.000 | 0.010 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.063 | 0.000 | 0.000 | 0.003 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.026 | 0.000 | 0.000 | 0.001 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.006 | 0.000 | 0.000 | 0.001 |
| 1946 | Fruit and Vegetables* | 0.003 | 0.030 | 0.597 | 0.003 | 0.019 | 0.287 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.002 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.001 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.000 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.001 | 0.006 | 0.077 | 0.001 | 0.004 | 0.054 |
| 1945-1947 | External | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.006 |
| 1945-1947 | Inhalation | 0.001 | 0.005 | 0.126 | 0.001 | 0.004 | 0.104 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.003 | 0.021 | 0.564 | 0.000 | 0.002 | 0.026 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.000 | 0.006 | 0.164 | 0.000 | 0.000 | 0.012 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.004 | 0.059 | 0.000 | 0.000 | 0.005 |
| 1945-1947 | Fruit and Vegetables* | 0.060 | 0.353 | 4.329 | 0.040 | 0.213 | 2.408 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Klickitat County Census Division 09 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.003 |
| 1945 | Inhalation | 0.000 | 0.003 | 0.102 | 0.000 | 0.002 | 0.096 |
| 1945 | Milk from BYCow Regime 3 | 0.001 | 0.011 | 0.170 | 0.000 | 0.001 | 0.024 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.196 | 0.000 | 0.000 | 0.012 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.002 | 0.041 | 0.000 | 0.000 | 0.005 |
| 1945 | Fruit and Vegetables* | 0.025 | 0.220 | 3.659 | 0.016 | 0.124 | 2.307 |
| 1946 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1946 | Inhalation | 0.000 | 0.001 | 0.016 | 0.000 | 0.000 | 0.013 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.001 | 0.038 | 0.000 | 0.000 | 0.003 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.018 | 0.000 | 0.000 | 0.003 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.009 | 0.000 | 0.000 | 0.000 |
| 1946 | Fruit and Vegetables* | 0.004 | 0.035 | 1.451 | 0.002 | 0.021 | 0.713 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.000 | 0.000 | 0.006 | 0.000 | 0.000 | 0.002 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.001 | 0.009 | 0.000 | 0.000 | 0.001 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.013 | 0.000 | 0.000 | 0.001 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.001 | 0.006 | 0.092 | 0.000 | 0.004 | 0.067 |
| 1945-1947 | External | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.003 |
| 1945-1947 | Inhalation | 0.001 | 0.005 | 0.131 | 0.001 | 0.004 | 0.102 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.003 | 0.019 | 0.184 | 0.000 | 0.002 | 0.026 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.000 | 0.007 | 0.204 | 0.000 | 0.000 | 0.016 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.003 | 0.047 | 0.000 | 0.000 | 0.005 |
| 1945-1947 | Fruit and Vegetables* | 0.065 | 0.401 | 6.255 | 0.040 | 0.212 | 3.525 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Klickitat County Census Division 10 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.003 |
| 1945 | Inhalation | 0.000 | 0.002 | 0.089 | 0.000 | 0.002 | 0.081 |
| 1945 | Milk from BYCow Regime 3 | 0.001 | 0.012 | 0.171 | 0.000 | 0.001 | 0.020 |
| 1945 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.093 | 0.000 | 0.000 | 0.015 |
| 1945 | Commercial Milk (Rural) | 0.000 | 0.001 | 0.068 | 0.000 | 0.000 | 0.003 |
| 1945 | Fruit and Vegetables* | 0.025 | 0.222 | 5.056 | 0.017 | 0.127 | 1.860 |
| 1946 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1946 | Inhalation | 0.000 | 0.001 | 0.017 | 0.000 | 0.000 | 0.012 |
| 1946 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.031 | 0.000 | 0.000 | 0.003 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.019 | 0.000 | 0.000 | 0.002 |
| 1946 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.008 | 0.000 | 0.000 | 0.001 |
| 1946 | Fruit and Vegetables* | 0.004 | 0.037 | 0.670 | 0.003 | 0.020 | 0.421 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.003 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.001 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.000 |
| 1947 | Commercial Milk (Rural) | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 |
| 1947 | Fruit and Vegetables* | 0.001 | 0.006 | 0.101 | 0.000 | 0.004 | 0.069 |
| 1945-1947 | External | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.004 |
| 1945-1947 | Inhalation | 0.001 | 0.005 | 0.126 | 0.001 | 0.004 | 0.108 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.003 | 0.020 | 0.240 | 0.000 | 0.002 | 0.021 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.000 | 0.006 | 0.130 | 0.000 | 0.001 | 0.013 |
| 1945-1947 | Commercial Milk (Rural) | 0.000 | 0.004 | 0.129 | 0.000 | 0.000 | 0.005 |
| 1945-1947 | Fruit and Vegetables* | 0.060 | 0.383 | 5.312 | 0.040 | 0.215 | 2.132 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Morrow County Census Division 01

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.002 | 0.019 | 0.000 | 0.002 | 0.017 |
| 1945 | Inhalation | 0.009 | 0.044 | 0.680 | 0.008 | 0.040 | 0.469 |
| 1945 | Milk from BYCow Regime 1 | 1.104 | 10.292 | 129.015 | 0.082 | 0.687 | 9.386 |
| 1945 | Milk from BYCow Regime 2 | 0.926 | 9.335 | 91.555 | 0.085 | 0.845 | 12.468 |
| 1945 | Milk from BYCow Regime 3 | 0.020 | 0.269 | 3.644 | 0.003 | 0.029 | 0.420 |
| 1945 | Milk from BYCow Regime 4 | 0.003 | 0.054 | 1.582 | 0.001 | 0.011 | 0.133 |
| 1945 | Commercial Milk (Rural) | 1.010 | 7.045 | 86.334 | 0.073 | 0.548 | 6.630 |
| 1945 | Fruit and Vegetables* | 0.587 | 3.440 | 37.597 | 0.431 | 2.095 | 21.366 |
| 1946 | External | 0.000 | 0.000 | 0.005 | 0.000 | 0.001 | 0.007 |
| 1946 | Inhalation | 0.002 | 0.011 | 0.166 | 0.002 | 0.009 | 0.148 |
| 1946 | Milk from BYCow Regime 1 | 0.158 | 1.337 | 10.902 | 0.014 | 0.117 | 0.948 |
| 1946 | Milk from BYCow Regime 2 | 0.155 | 1.449 | 14.093 | 0.014 | 0.106 | 1.353 |
| 1946 | Milk from BYCow Regime 3 | 0.005 | 0.055 | 0.663 | 0.001 | 0.005 | 0.045 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.006 | 0.160 | 0.000 | 0.001 | 0.013 |
| 1946 | Commercial Milk (Rural) | 0.141 | 0.933 | 6.992 | 0.013 | 0.083 | 0.665 |
| 1946 | Fruit and Vegetables* | 0.075 | 0.455 | 4.649 | 0.063 | 0.308 | 4.667 |
| 1947 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.002 |
| 1947 | Inhalation | 0.001 | 0.003 | 0.098 | 0.000 | 0.002 | 0.042 |
| 1947 | Milk from BYCow Regime 1 | 0.055 | 0.359 | 2.920 | 0.004 | 0.034 | 0.574 |
| 1947 | Milk from BYCow Regime 2 | 0.046 | 0.397 | 2.612 | 0.004 | 0.035 | 0.385 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.016 | 0.236 | 0.000 | 0.001 | 0.013 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.035 | 0.000 | 0.000 | 0.006 |
| 1947 | Commercial Milk (Rural) | 0.039 | 0.256 | 1.945 | 0.004 | 0.022 | 0.144 |
| 1947 | Fruit and Vegetables* | 0.015 | 0.084 | 0.694 | 0.013 | 0.061 | 0.485 |
| 1945-1947 | External | 0.001 | 0.004 | 0.028 | 0.001 | 0.003 | 0.033 |
| 1945-1947 | Inhalation | 0.022 | 0.088 | 1.194 | 0.018 | 0.071 | 0.786 |
| 1945-1947 | Milk from BYCow Regime 1 | 3.148 | 16.305 | 223.673 | 0.248 | 1.107 | 8.441 |
| 1945-1947 | Milk from BYCow Regime 2 | 2.647 | 11.710 | 72.632 | 0.261 | 1.398 | 11.306 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.089 | 0.509 | 4.442 | 0.008 | 0.043 | 0.444 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.010 | 0.110 | 2.290 | 0.002 | 0.015 | 0.149 |
| 1945-1947 | Commercial Milk (Rural) | 1.977 | 9.200 | 76.954 | 0.175 | 0.767 | 10.914 |
| 1945-1947 | Fruit and Vegetables* | 1.173 | 4.889 | 43.552 | 0.837 | 3.097 | 33.766 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Morrow County Census Division 02

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.002 | 0.008 | 0.001 | 0.002 | 0.008 |
| 1945 | Inhalation | 0.011 | 0.042 | 0.337 | 0.009 | 0.032 | 0.182 |
| 1945 | Milk from BYCow Regime 1 | 1.130 | 7.225 | 66.275 | 0.082 | 0.561 | 4.571 |
| 1945 | Milk from BYCow Regime 2 | 1.052 | 6.991 | 43.385 | 0.063 | 0.554 | 3.895 |
| 1945 | Milk from BYCow Regime 3 | 0.030 | 0.187 | 1.352 | 0.003 | 0.018 | 0.162 |
| 1945 | Milk from BYCow Regime 4 | 0.003 | 0.059 | 1.190 | 0.001 | 0.007 | 0.075 |
| 1945 | Commercial Milk (Rural) | 0.377 | 2.704 | 19.109 | 0.026 | 0.177 | 1.490 |
| 1945 | Fruit and Vegetables* | 0.542 | 2.320 | 14.029 | 0.382 | 1.548 | 7.859 |
| 1946 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.003 |
| 1946 | Inhalation | 0.002 | 0.008 | 0.059 | 0.002 | 0.007 | 0.048 |
| 1946 | Milk from BYCow Regime 1 | 0.168 | 1.269 | 10.500 | 0.017 | 0.094 | 0.738 |
| 1946 | Milk from BYCow Regime 2 | 0.166 | 0.969 | 6.526 | 0.014 | 0.097 | 0.695 |
| 1946 | Milk from BYCow Regime 3 | 0.004 | 0.030 | 0.251 | 0.000 | 0.003 | 0.019 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.011 | 0.188 | 0.000 | 0.001 | 0.009 |
| 1946 | Commercial Milk (Rural) | 0.059 | 0.425 | 3.230 | 0.004 | 0.031 | 0.266 |
| 1946 | Fruit and Vegetables* | 0.078 | 0.361 | 2.647 | 0.056 | 0.250 | 1.723 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.001 | 0.002 | 0.025 | 0.001 | 0.002 | 0.017 |
| 1947 | Milk from BYCow Regime 1 | 0.044 | 0.324 | 2.263 | 0.005 | 0.029 | 0.215 |
| 1947 | Milk from BYCow Regime 2 | 0.048 | 0.327 | 2.121 | 0.004 | 0.027 | 0.159 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.009 | 0.100 | 0.000 | 0.001 | 0.008 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.054 | 0.000 | 0.000 | 0.005 |
| 1947 | Commercial Milk (Rural) | 0.016 | 0.110 | 1.029 | 0.001 | 0.010 | 0.080 |
| 1947 | Fruit and Vegetables* | 0.013 | 0.069 | 0.407 | 0.012 | 0.048 | 0.270 |
| 1945-1947 | External | 0.001 | 0.002 | 0.012 | 0.001 | 0.002 | 0.013 |
| 1945-1947 | Inhalation | 0.022 | 0.064 | 0.405 | 0.018 | 0.048 | 0.318 |
| 1945-1947 | Milk from BYCow Regime 1 | 2.605 | 10.842 | 61.320 | 0.211 | 0.872 | 3.877 |
| 1945-1947 | Milk from BYCow Regime 2 | 2.570 | 10.089 | 51.385 | 0.198 | 0.847 | 4.788 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.076 | 0.296 | 1.681 | 0.006 | 0.029 | 0.179 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.014 | 0.112 | 1.039 | 0.002 | 0.011 | 0.077 |
| 1945-1947 | Commercial Milk (Rural) | 0.958 | 3.771 | 20.136 | 0.071 | 0.304 | 1.974 |
| 1945-1947 | Fruit and Vegetables* | 0.979 | 3.233 | 15.725 | 0.692 | 2.164 | 9.025 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Morrow County Census Division 03 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.002 | 0.031 | 0.000 | 0.002 | 0.022 |
| 1945 | Inhalation | 0.006 | 0.033 | 0.609 | 0.005 | 0.028 | 0.456 |
| 1945 | Milk from BYCow Regime 1 | 0.724 | 5.582 | 56.107 | 0.059 | 0.486 | 7.516 |
| 1945 | Milk from BYCow Regime 2 | 0.587 | 5.749 | 76.852 | 0.044 | 0.434 | 5.201 |
| 1945 | Milk from BYCow Regime 3 | 0.021 | 0.203 | 2.107 | 0.002 | 0.016 | 0.167 |
| 1945 | Milk from BYCow Regime 4 | 0.003 | 0.045 | 1.437 | 0.000 | 0.006 | 0.082 |
| 1945 | Commercial Milk (Rural) | 0.270 | 2.384 | 26.744 | 0.020 | 0.173 | 2.154 |
| 1945 | Fruit and Vegetables* | 0.402 | 2.113 | 28.995 | 0.298 | 1.406 | 13.231 |
| 1946 | External | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 0.010 |
| 1946 | Inhalation | 0.001 | 0.007 | 0.322 | 0.001 | 0.006 | 0.180 |
| 1946 | Milk from BYCow Regime 1 | 0.103 | 0.767 | 19.728 | 0.008 | 0.056 | 0.632 |
| 1946 | Milk from BYCow Regime 2 | 0.099 | 0.813 | 10.294 | 0.008 | 0.069 | 0.798 |
| 1946 | Milk from BYCow Regime 3 | 0.003 | 0.021 | 0.253 | 0.000 | 0.002 | 0.019 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.008 | 0.100 | 0.000 | 0.001 | 0.011 |
| 1946 | Commercial Milk (Rural) | 0.032 | 0.253 | 2.446 | 0.003 | 0.022 | 0.311 |
| 1946 | Fruit and Vegetables* | 0.056 | 0.307 | 3.929 | 0.036 | 0.200 | 2.510 |
| 1947 | External | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.005 |
| 1947 | Inhalation | 0.000 | 0.002 | 0.083 | 0.000 | 0.002 | 0.047 |
| 1947 | Milk from BYCow Regime 1 | 0.028 | 0.234 | 2.461 | 0.003 | 0.021 | 0.202 |
| 1947 | Milk from BYCow Regime 2 | 0.029 | 0.249 | 2.311 | 0.003 | 0.025 | 0.279 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.005 | 0.055 | 0.000 | 0.000 | 0.006 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.044 | 0.000 | 0.000 | 0.008 |
| 1947 | Commercial Milk (Rural) | 0.011 | 0.077 | 1.109 | 0.001 | 0.006 | 0.052 |
| 1947 | Fruit and Vegetables* | 0.010 | 0.059 | 0.523 | 0.008 | 0.046 | 0.440 |
| 1945-1947 | External | 0.001 | 0.003 | 0.085 | 0.001 | 0.003 | 0.059 |
| 1945-1947 | Inhalation | 0.016 | 0.065 | 1.644 | 0.013 | 0.055 | 1.319 |
| 1945-1947 | Milk from BYCow Regime 1 | 1.917 | 7.984 | 69.349 | 0.131 | 0.680 | 7.698 |
| 1945-1947 | Milk from BYCow Regime 2 | 1.493 | 7.405 | 60.981 | 0.135 | 0.767 | 8.684 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.050 | 0.293 | 2.814 | 0.005 | 0.024 | 0.177 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.013 | 0.093 | 1.018 | 0.001 | 0.009 | 0.078 |
| 1945-1947 | Commercial Milk (Rural) | 0.608 | 3.068 | 27.403 | 0.054 | 0.240 | 2.438 |
| 1945-1947 | Fruit and Vegetables* | 0.784 | 3.185 | 38.608 | 0.562 | 2.066 | 16.537 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Umatilla County Census Division 01 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.003 | 0.005 | 0.014 | 0.003 | 0.006 | 0.015 |
| 1945 | Inhalation | 0.062 | 0.185 | 0.665 | 0.054 | 0.148 | 0.503 |
| 1945 | Milk from BYCow Regime 1 | 7.364 | 45.923 | 230.356 | 0.483 | 3.159 | 12.987 |
| 1945 | Milk from BYCow Regime 2 | 7.661 | 41.733 | 226.333 | 0.461 | 2.817 | 14.446 |
| 1945 | Milk from BYCow Regime 3 | 0.148 | 1.473 | 14.175 | 0.015 | 0.103 | 1.418 |
| 1945 | Milk from BYCow Regime 4 | 0.015 | 0.211 | 4.262 | 0.003 | 0.025 | 0.298 |
| 1945 | Commercial Milk (Rural) | 9.271 | 37.338 | 114.822 | 0.715 | 2.572 | 9.223 |
| 1945 | Fruit and Vegetables* | 2.382 | 9.344 | 44.364 | 1.614 | 5.832 | 25.861 |
| 1946 | External | 0.001 | 0.001 | 0.003 | 0.001 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.014 | 0.041 | 0.156 | 0.013 | 0.031 | 0.100 |
| 1946 | Milk from BYCow Regime 1 | 1.065 | 5.961 | 38.543 | 0.095 | 0.512 | 2.607 |
| 1946 | Milk from BYCow Regime 2 | 1.100 | 6.193 | 33.303 | 0.079 | 0.458 | 2.305 |
| 1946 | Milk from BYCow Regime 3 | 0.026 | 0.217 | 2.280 | 0.002 | 0.016 | 0.097 |
| 1946 | Milk from BYCow Regime 4 | 0.002 | 0.040 | 0.542 | 0.001 | 0.005 | 0.048 |
| 1946 | Commercial Milk (Rural) | 1.356 | 6.286 | 16.171 | 0.116 | 0.420 | 1.267 |
| 1946 | Fruit and Vegetables* | 0.321 | 1.158 | 5.342 | 0.240 | 0.860 | 3.870 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.004 | 0.012 | 0.054 | 0.003 | 0.009 | 0.037 |
| 1947 | Milk from BYCow Regime 1 | 0.333 | 1.828 | 10.276 | 0.025 | 0.134 | 0.996 |
| 1947 | Milk from BYCow Regime 2 | 0.330 | 1.866 | 16.517 | 0.028 | 0.161 | 0.755 |
| 1947 | Milk from BYCow Regime 3 | 0.007 | 0.049 | 0.438 | 0.001 | 0.005 | 0.031 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.008 | 0.169 | 0.000 | 0.001 | 0.013 |
| 1947 | Commercial Milk (Rural) | 0.451 | 1.646 | 5.796 | 0.034 | 0.120 | 0.482 |
| 1947 | Fruit and Vegetables* | 0.056 | 0.213 | 0.914 | 0.042 | 0.171 | 0.746 |
| 1945-1947 | External | 0.004 | 0.008 | 0.017 | 0.004 | 0.008 | 0.017 |
| 1945-1947 | Inhalation | 0.115 | 0.260 | 0.758 | 0.097 | 0.206 | 0.561 |
| 1945-1947 | Milk from BYCow Regime 1 | 15.845 | 61.603 | 244.861 | 1.185 | 4.578 | 15.263 |
| 1945-1947 | Milk from BYCow Regime 2 | 17.000 | 56.686 | 277.984 | 1.100 | 3.563 | 15.974 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.415 | 2.243 | 19.620 | 0.036 | 0.152 | 1.566 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.047 | 0.380 | 6.886 | 0.009 | 0.043 | 0.341 |
| 1945-1947 | Commercial Milk (Rural) | 16.734 | 46.171 | 131.171 | 1.246 | 3.398 | 9.709 |
| 1945-1947 | Fruit and Vegetables* | 3.768 | 11.723 | 48.666 | 2.739 | 7.557 | 26.450 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Umatilla County Census Division 02

| Year | Dose Pathway | Infant Dose Percentiles 5th | Infant Dose Percentiles 50th | Infant Dose Percentiles 95th | Adult Dose Percentiles 5th | Adult Dose Percentiles 50th | Adult Dose Percentiles 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.005 | 0.014 | 0.002 | 0.005 | 0.014 |
| 1945 | Inhalation | 0.064 | 0.182 | 0.688 | 0.051 | 0.139 | 0.460 |
| 1945 | Milk from BYCow Regime 1 | 7.179 | 42.235 | 215.978 | 0.612 | 3.627 | 23.602 |
| 1945 | Milk from BYCow Regime 2 | 7.499 | 41.770 | 188.629 | 0.732 | 4.303 | 19.473 |
| 1945 | Milk from BYCow Regime 3 | 0.165 | 1.360 | 12.566 | 0.019 | 0.135 | 1.478 |
| 1945 | Milk from BYCow Regime 4 | 0.014 | 0.207 | 6.283 | 0.004 | 0.034 | 0.463 |
| 1945 | Commercial Milk (Rural) | 11.632 | 55.640 | 177.815 | 1.002 | 4.274 | 12.946 |
| 1945 | Fruit and Vegetables* | 2.348 | 8.902 | 42.593 | 1.628 | 6.129 | 26.174 |
| 1946 | External | 0.001 | 0.001 | 0.003 | 0.001 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.013 | 0.035 | 0.113 | 0.012 | 0.030 | 0.090 |
| 1946 | Milk from BYCow Regime 1 | 1.310 | 6.187 | 29.018 | 0.115 | 0.649 | 3.625 |
| 1946 | Milk from BYCow Regime 2 | 1.373 | 7.360 | 53.208 | 0.095 | 0.590 | 3.661 |
| 1946 | Milk from BYCow Regime 3 | 0.022 | 0.221 | 2.730 | 0.003 | 0.018 | 0.147 |
| 1946 | Milk from BYCow Regime 4 | 0.003 | 0.029 | 0.834 | 0.001 | 0.006 | 0.068 |
| 1946 | Commercial Milk (Rural) | 2.123 | 8.838 | 31.051 | 0.164 | 0.652 | 2.301 |
| 1946 | Fruit and Vegetables* | 0.340 | 1.246 | 5.489 | 0.263 | 0.940 | 3.965 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.004 | 0.011 | 0.042 | 0.003 | 0.008 | 0.030 |
| 1947 | Milk from BYCow Regime 1 | 0.364 | 2.100 | 12.987 | 0.028 | 0.157 | 1.005 |
| 1947 | Milk from BYCow Regime 2 | 0.350 | 1.980 | 11.121 | 0.023 | 0.137 | 0.912 |
| 1947 | Milk from BYCow Regime 3 | 0.006 | 0.061 | 0.713 | 0.001 | 0.005 | 0.041 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.009 | 0.227 | 0.000 | 0.001 | 0.010 |
| 1947 | Commercial Milk (Rural) | 0.571 | 2.274 | 6.665 | 0.051 | 0.184 | 0.627 |
| 1947 | Fruit and Vegetables* | 0.059 | 0.233 | 1.103 | 0.050 | 0.190 | 1.014 |
| 1945-1947 | External | 0.004 | 0.007 | 0.016 | 0.004 | 0.007 | 0.017 |
| 1945-1947 | Inhalation | 0.112 | 0.249 | 0.737 | 0.088 | 0.190 | 0.534 |
| 1945-1947 | Milk from BYCow Regime 1 | 17.107 | 58.340 | 228.244 | 1.322 | 5.046 | 26.377 |
| 1945-1947 | Milk from BYCow Regime 2 | 17.093 | 59.225 | 234.636 | 1.304 | 5.214 | 17.724 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.462 | 2.263 | 14.583 | 0.044 | 0.206 | 1.564 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.052 | 0.364 | 8.297 | 0.012 | 0.052 | 0.638 |
| 1945-1947 | Commercial Milk (Rural) | 23.649 | 67.738 | 195.368 | 1.776 | 5.482 | 13.294 |
| 1945-1947 | Fruit and Vegetables* | 3.840 | 11.375 | 44.117 | 2.802 | 8.037 | 29.798 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Umatilla County Census Division 03 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.004 | 0.014 | 0.002 | 0.004 | 0.015 |
| 1945 | Inhalation | 0.040 | 0.129 | 0.583 | 0.034 | 0.101 | 0.415 |
| 1945 | Milk from BYCow Regime 1 | 3.761 | 21.291 | 142.917 | 0.288 | 2.154 | 14.498 |
| 1945 | Milk from BYCow Regime 2 | 3.261 | 23.897 | 185.316 | 0.247 | 1.899 | 12.548 |
| 1945 | Milk from BYCow Regime 3 | 0.094 | 0.870 | 6.813 | 0.008 | 0.061 | 0.474 |
| 1945 | Milk from BYCow Regime 4 | 0.010 | 0.170 | 3.436 | 0.002 | 0.017 | 0.217 |
| 1945 | Commercial Milk (Rural) | 2.508 | 13.242 | 90.469 | 0.201 | 1.133 | 6.578 |
| 1945 | Fruit and Vegetables* | 1.454 | 6.221 | 29.803 | 1.072 | 4.126 | 21.272 |
| 1946 | External | 0.000 | 0.001 | 0.003 | 0.000 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.009 | 0.027 | 0.100 | 0.008 | 0.021 | 0.076 |
| 1946 | Milk from BYCow Regime 1 | 0.547 | 2.946 | 15.940 | 0.037 | 0.240 | 1.745 |
| 1946 | Milk from BYCow Regime 2 | 0.538 | 3.274 | 17.961 | 0.035 | 0.257 | 1.567 |
| 1946 | Milk from BYCow Regime 3 | 0.009 | 0.082 | 0.791 | 0.001 | 0.007 | 0.054 |
| 1946 | Milk from BYCow Regime 4 | 0.002 | 0.023 | 0.500 | 0.000 | 0.003 | 0.035 |
| 1946 | Commercial Milk (Rural) | 0.405 | 2.037 | 11.781 | 0.033 | 0.159 | 1.504 |
| 1946 | Fruit and Vegetables* | 0.213 | 0.824 | 4.220 | 0.157 | 0.572 | 2.646 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.003 | 0.008 | 0.033 | 0.002 | 0.006 | 0.026 |
| 1947 | Milk from BYCow Regime 1 | 0.136 | 1.017 | 8.274 | 0.012 | 0.075 | 0.391 |
| 1947 | Milk from BYCow Regime 2 | 0.155 | 0.867 | 5.693 | 0.010 | 0.062 | 0.397 |
| 1947 | Milk from BYCow Regime 3 | 0.003 | 0.022 | 0.284 | 0.000 | 0.002 | 0.019 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.006 | 0.096 | 0.000 | 0.001 | 0.009 |
| 1947 | Commercial Milk (Rural) | 0.107 | 0.584 | 3.100 | 0.008 | 0.046 | 0.256 |
| 1947 | Fruit and Vegetables* | 0.038 | 0.139 | 0.706 | 0.030 | 0.114 | 0.521 |
| 1945-1947 | External | 0.003 | 0.006 | 0.017 | 0.003 | 0.006 | 0.017 |
| 1945-1947 | Inhalation | 0.074 | 0.176 | 0.643 | 0.064 | 0.141 | 0.461 |
| 1945-1947 | Milk from BYCow Regime 1 | 8.111 | 29.995 | 169.071 | 0.622 | 2.800 | 15.389 |
| 1945-1947 | Milk from BYCow Regime 2 | 7.949 | 31.020 | 132.663 | 0.653 | 2.563 | 13.196 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.230 | 1.072 | 5.668 | 0.019 | 0.082 | 0.457 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.042 | 0.288 | 3.965 | 0.005 | 0.027 | 0.226 |
| 1945-1947 | Commercial Milk (Rural) | 5.868 | 20.671 | 113.480 | 0.389 | 1.521 | 6.447 |
| 1945-1947 | Fruit and Vegetables* | 2.572 | 7.925 | 30.309 | 1.817 | 5.225 | 22.787 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Umatilla County Census Division 04 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.003 | 0.007 | 0.019 | 0.003 | 0.007 | 0.019 |
| 1945 | Inhalation | 0.074 | 0.220 | 0.742 | 0.065 | 0.181 | 0.586 |
| 1945 | Milk from BYCow Regime 3 | 0.108 | 1.114 | 12.250 | 0.007 | 0.076 | 0.637 |
| 1945 | Milk from BYCow Regime 4 | 0.008 | 0.260 | 5.977 | 0.001 | 0.016 | 0.367 |
| 1945 | Commercial Milk (Rural) | 0.704 | 3.973 | 36.053 | 0.045 | 0.295 | 3.398 |
| 1945 | Fruit and Vegetables* | 2.425 | 10.173 | 45.079 | 1.716 | 6.500 | 32.661 |
| 1946 | External | 0.001 | 0.002 | 0.004 | 0.001 | 0.002 | 0.004 |
| 1946 | Inhalation | 0.019 | 0.054 | 0.174 | 0.017 | 0.043 | 0.134 |
| 1946 | Milk from BYCow Regime 3 | 0.016 | 0.189 | 1.531 | 0.001 | 0.012 | 0.078 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.028 | 0.623 | 0.000 | 0.002 | 0.041 |
| 1946 | Commercial Milk (Rural) | 0.105 | 0.580 | 4.002 | 0.008 | 0.038 | 0.230 |
| 1946 | Fruit and Vegetables* | 0.343 | 1.337 | 6.733 | 0.268 | 0.987 | 4.195 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.005 | 0.016 | 0.065 | 0.005 | 0.013 | 0.046 |
| 1947 | Milk from BYCow Regime 3 | 0.005 | 0.053 | 0.335 | 0.000 | 0.004 | 0.041 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.009 | 0.163 | 0.000 | 0.001 | 0.022 |
| 1947 | Commercial Milk (Rural) | 0.031 | 0.169 | 1.037 | 0.002 | 0.013 | 0.065 |
| 1947 | Fruit and Vegetables* | 0.059 | 0.230 | 1.027 | 0.047 | 0.166 | 0.699 |
| 1945-1947 | External | 0.005 | 0.009 | 0.023 | 0.005 | 0.010 | 0.021 |
| 1945-1947 | Inhalation | 0.144 | 0.315 | 0.871 | 0.120 | 0.257 | 0.686 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.298 | 1.735 | 12.652 | 0.022 | 0.106 | 0.700 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.038 | 0.420 | 6.325 | 0.004 | 0.033 | 0.387 |
| 1945-1947 | Commercial Milk (Rural) | 1.350 | 5.366 | 35.371 | 0.105 | 0.404 | 3.525 |
| 1945-1947 | Fruit and Vegetables* | 4.034 | 12.559 | 48.504 | 3.075 | 8.447 | 35.884 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Umatilla County Census Division 05 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.004 | 0.012 | 0.002 | 0.004 | 0.012 |
| 1945 | Inhalation | 0.055 | 0.164 | 0.605 | 0.046 | 0.126 | 0.409 |
| 1945 | Milk from BYCow Regime 3 | 0.133 | 1.117 | 9.926 | 0.009 | 0.091 | 1.025 |
| 1945 | Milk from BYCow Regime 4 | 0.005 | 0.160 | 4.246 | 0.000 | 0.012 | 0.567 |
| 1945 | Commercial Milk (Urban) | 17.306 | 65.692 | 212.094 | 0.823 | 3.616 | 11.185 |
| 1945 | Fruit and Vegetables* | 2.101 | 7.535 | 35.827 | 1.508 | 5.273 | 22.369 |
| 1946 | External | 0.000 | 0.001 | 0.003 | 0.000 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.012 | 0.033 | 0.109 | 0.010 | 0.026 | 0.087 |
| 1946 | Milk from BYCow Regime 3 | 0.025 | 0.180 | 1.879 | 0.001 | 0.014 | 0.153 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.026 | 0.414 | 0.000 | 0.002 | 0.048 |
| 1946 | Commercial Milk (Urban) | 2.610 | 10.270 | 28.271 | 0.158 | 0.577 | 1.865 |
| 1946 | Fruit and Vegetables* | 0.298 | 1.105 | 4.836 | 0.210 | 0.825 | 3.561 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.003 | 0.010 | 0.049 | 0.003 | 0.008 | 0.030 |
| 1947 | Milk from BYCow Regime 3 | 0.004 | 0.042 | 0.475 | 0.001 | 0.004 | 0.039 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.007 | 0.220 | 0.000 | 0.001 | 0.015 |
| 1947 | Commercial Milk (Urban) | 0.756 | 2.579 | 8.564 | 0.040 | 0.165 | 0.687 |
| 1947 | Fruit and Vegetables* | 0.052 | 0.207 | 1.088 | 0.041 | 0.152 | 0.745 |
| 1945-1947 | External | 0.003 | 0.006 | 0.014 | 0.003 | 0.006 | 0.014 |
| 1945-1947 | Inhalation | 0.098 | 0.226 | 0.706 | 0.082 | 0.175 | 0.466 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.320 | 1.660 | 11.615 | 0.030 | 0.134 | 0.953 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.031 | 0.284 | 3.647 | 0.002 | 0.021 | 0.529 |
| 1945-1947 | Commercial Milk (Urban) | 30.267 | 78.022 | 236.069 | 1.626 | 4.640 | 11.931 |
| 1945-1947 | Fruit and Vegetables* | 3.547 | 9.866 | 39.367 | 2.465 | 6.772 | 23.296 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Umatilla County Census Division 06 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.005 | 0.012 | 0.002 | 0.005 | 0.014 |
| 1945 | Inhalation | 0.052 | 0.152 | 0.600 | 0.043 | 0.117 | 0.419 |
| 1945 | Milk from BYCow Regime 3 | 0.105 | 0.806 | 5.378 | 0.009 | 0.074 | 0.547 |
| 1945 | Milk from BYCow Regime 4 | 0.004 | 0.146 | 3.544 | 0.000 | 0.014 | 0.279 |
| 1945 | Commercial Milk (Urban) | 6.230 | 24.725 | 91.725 | 0.303 | 1.309 | 5.259 |
| 1945 | Fruit and Vegetables* | 1.753 | 6.891 | 30.679 | 1.318 | 4.610 | 21.682 |
| 1946 | External | 0.001 | 0.001 | 0.003 | 0.001 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.013 | 0.037 | 0.123 | 0.011 | 0.028 | 0.079 |
| 1946 | Milk from BYCow Regime 3 | 0.014 | 0.104 | 1.016 | 0.001 | 0.009 | 0.065 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.021 | 0.610 | 0.000 | 0.002 | 0.038 |
| 1946 | Commercial Milk (Urban) | 0.918 | 3.666 | 14.189 | 0.044 | 0.203 | 0.730 |
| 1946 | Fruit and Vegetables* | 0.239 | 0.891 | 4.693 | 0.185 | 0.656 | 2.690 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.004 | 0.011 | 0.047 | 0.003 | 0.009 | 0.031 |
| 1947 | Milk from BYCow Regime 3 | 0.003 | 0.024 | 0.172 | 0.000 | 0.002 | 0.016 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.006 | 0.121 | 0.000 | 0.001 | 0.011 |
| 1947 | Commercial Milk (Urban) | 0.269 | 0.990 | 3.937 | 0.015 | 0.057 | 0.258 |
| 1947 | Fruit and Vegetables* | 0.043 | 0.171 | 0.884 | 0.034 | 0.128 | 0.652 |
| 1945-1947 | External | 0.004 | 0.007 | 0.014 | 0.004 | 0.007 | 0.015 |
| 1945-1947 | Inhalation | 0.096 | 0.215 | 0.652 | 0.081 | 0.168 | 0.470 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.215 | 1.168 | 5.565 | 0.020 | 0.098 | 0.653 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.032 | 0.289 | 3.439 | 0.003 | 0.025 | 0.296 |
| 1945-1947 | Commercial Milk (Urban) | 12.298 | 31.356 | 87.524 | 0.629 | 1.729 | 9.096 |
| 1945-1947 | Fruit and Vegetables* | 2.970 | 8.786 | 32.489 | 2.175 | 5.784 | 22.969 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Umatilla County Census Division 07 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.002 | 0.007 | 0.001 | 0.002 | 0.009 |
| 1945 | Inhalation | 0.021 | 0.067 | 0.290 | 0.018 | 0.054 | 0.190 |
| 1945 | Milk from BYCow Regime 1 | 1.534 | 10.016 | 64.882 | 0.141 | 0.914 | 7.084 |
| 1945 | Milk from BYCow Regime 2 | 1.712 | 11.278 | 72.251 | 0.122 | 0.878 | 5.754 |
| 1945 | Milk from BYCow Regime 3 | 0.051 | 0.411 | 3.458 | 0.005 | 0.037 | 0.298 |
| 1945 | Milk from BYCow Regime 4 | 0.006 | 0.090 | 2.293 | 0.001 | 0.012 | 0.193 |
| 1945 | Commercial Milk (Rural) | 1.874 | 10.403 | 51.673 | 0.126 | 0.658 | 3.754 |
| 1945 | Fruit and Vegetables* | 0.857 | 3.432 | 17.623 | 0.629 | 2.365 | 9.636 |
| 1946 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1946 | Inhalation | 0.005 | 0.016 | 0.069 | 0.004 | 0.012 | 0.046 |
| 1946 | Milk from BYCow Regime 1 | 0.306 | 1.652 | 11.160 | 0.024 | 0.152 | 0.985 |
| 1946 | Milk from BYCow Regime 2 | 0.253 | 1.537 | 7.787 | 0.018 | 0.121 | 0.859 |
| 1946 | Milk from BYCow Regime 3 | 0.007 | 0.047 | 0.361 | 0.001 | 0.004 | 0.034 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.014 | 0.331 | 0.000 | 0.002 | 0.032 |
| 1946 | Commercial Milk (Rural) | 0.302 | 1.261 | 5.457 | 0.021 | 0.107 | 0.564 |
| 1946 | Fruit and Vegetables* | 0.123 | 0.481 | 2.414 | 0.087 | 0.345 | 1.624 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.001 | 0.004 | 0.023 | 0.001 | 0.003 | 0.017 |
| 1947 | Milk from BYCow Regime 1 | 0.077 | 0.451 | 2.842 | 0.005 | 0.040 | 0.239 |
| 1947 | Milk from BYCow Regime 2 | 0.098 | 0.543 | 2.965 | 0.007 | 0.043 | 0.280 |
| 1947 | Milk from BYCow Regime 3 | 0.002 | 0.011 | 0.085 | 0.000 | 0.001 | 0.009 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.004 | 0.108 | 0.000 | 0.000 | 0.010 |
| 1947 | Commercial Milk (Rural) | 0.079 | 0.402 | 1.921 | 0.006 | 0.031 | 0.128 |
| 1947 | Fruit and Vegetables* | 0.021 | 0.087 | 0.461 | 0.017 | 0.066 | 0.307 |
| 1945-1947 | External | 0.002 | 0.003 | 0.009 | 0.002 | 0.003 | 0.010 |
| 1945-1947 | Inhalation | 0.041 | 0.098 | 0.358 | 0.033 | 0.077 | 0.227 |
| 1945-1947 | Milk from BYCow Regime 1 | 4.045 | 14.287 | 75.597 | 0.356 | 1.307 | 7.975 |
| 1945-1947 | Milk from BYCow Regime 2 | 3.727 | 16.147 | 99.204 | 0.319 | 1.246 | 6.568 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.117 | 0.580 | 3.645 | 0.012 | 0.051 | 0.290 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.024 | 0.178 | 2.206 | 0.003 | 0.019 | 0.183 |
| 1945-1947 | Commercial Milk (Rural) | 3.580 | 12.627 | 62.043 | 0.277 | 0.934 | 4.821 |
| 1945-1947 | Fruit and Vegetables* | 1.487 | 4.520 | 18.736 | 1.142 | 2.993 | 10.470 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Umatilla County Census Division 08 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.004 | 0.009 | 0.002 | 0.004 | 0.010 |
| 1945 | Inhalation | 0.041 | 0.123 | 0.460 | 0.037 | 0.098 | 0.299 |
| 1945 | Milk from BYCow Regime 3 | 0.078 | 0.715 | 5.909 | 0.006 | 0.060 | 0.550 |
| 1945 | Milk from BYCow Regime 4 | 0.005 | 0.157 | 3.030 | 0.001 | 0.014 | 0.198 |
| 1945 | Commercial Milk (Rural) | 0.541 | 3.033 | 17.087 | 0.034 | 0.202 | 1.292 |
| 1945 | Fruit and Vegetables* | 1.504 | 5.511 | 25.049 | 1.065 | 3.918 | 18.312 |
| 1946 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1946 | Inhalation | 0.010 | 0.029 | 0.097 | 0.009 | 0.023 | 0.065 |
| 1946 | Milk from BYCow Regime 3 | 0.014 | 0.082 | 0.505 | 0.001 | 0.007 | 0.066 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.018 | 0.396 | 0.000 | 0.002 | 0.028 |
| 1946 | Commercial Milk (Rural) | 0.072 | 0.451 | 2.681 | 0.006 | 0.030 | 0.163 |
| 1946 | Fruit and Vegetables* | 0.202 | 0.761 | 3.716 | 0.163 | 0.560 | 2.757 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.003 | 0.009 | 0.032 | 0.002 | 0.007 | 0.027 |
| 1947 | Milk from BYCow Regime 3 | 0.002 | 0.023 | 0.154 | 0.000 | 0.002 | 0.013 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.007 | 0.127 | 0.000 | 0.001 | 0.010 |
| 1947 | Commercial Milk (Rural) | 0.019 | 0.117 | 0.699 | 0.002 | 0.009 | 0.054 |
| 1947 | Fruit and Vegetables* | 0.039 | 0.145 | 0.664 | 0.031 | 0.115 | 0.495 |
| 1945-1947 | External | 0.003 | 0.005 | 0.010 | 0.003 | 0.005 | 0.012 |
| 1945-1947 | Inhalation | 0.078 | 0.177 | 0.537 | 0.066 | 0.137 | 0.358 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.201 | 0.920 | 6.441 | 0.016 | 0.083 | 0.578 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.028 | 0.234 | 2.368 | 0.003 | 0.021 | 0.260 |
| 1945-1947 | Commercial Milk (Rural) | 1.010 | 3.790 | 18.157 | 0.084 | 0.281 | 1.389 |
| 1945-1947 | Fruit and Vegetables* | 2.411 | 7.178 | 27.948 | 1.794 | 5.084 | 19.675 |

* Dose from the fruit and vegetables pathway assumes that 10D% of diet comes from local sources

---------- Umatilla County Census Division 09 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.003 | 0.010 | 0.001 | 0.003 | 0.009 |
| 1945 | Inhalation | 0.026 | 0.086 | 0.400 | 0.022 | 0.064 | 0.314 |
| 1945 | Milk from BYCow Regime 1 | 2.988 | 16.981 | 88.182 | 0.185 | 1.323 | 9.373 |
| 1945 | Milk from BYCow Regime 2 | 2.343 | 14.380 | 91.610 | 0.224 | 1.282 | 10.600 |
| 1945 | Milk from BYCow Regime 3 | 0.055 | 0.576 | 5.462 | 0.007 | 0.049 | 0.452 |
| 1945 | Milk from BYCow Regime 4 | 0.011 | 0.138 | 2.559 | 0.002 | 0.019 | 0.239 |
| 1945 | Commercial Milk (Rural) | 1.945 | 9.973 | 60.287 | 0.163 | 1.029 | 7.504 |
| 1945 | Fruit and Vegetables* | 1.025 | 4.323 | 23.013 | 0.796 | 3.022 | 15.839 |
| 1946 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1946 | Inhalation | 0.006 | 0.018 | 0.075 | 0.005 | 0.014 | 0.048 |
| 1946 | Milk from BYCow Regime 1 | 0.444 | 2.435 | 17.573 | 0.028 | 0.177 | 1.089 |
| 1946 | Milk from BYCow Regime 2 | 0.363 | 2.413 | 16.241 | 0.024 | 0.172 | 1.148 |
| 1946 | Milk from BYCow Regime 3 | 0.008 | 0.057 | 0.398 | 0.001 | 0.006 | 0.046 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.017 | 0.658 | 0.000 | 0.002 | 0.030 |
| 1946 | Commercial Milk (Rural) | 0.278 | 1.729 | 11.965 | 0.022 | 0.122 | 0.788 |
| 1946 | Fruit and Vegetables* | 0.150 | 0.617 | 3.379 | 0.124 | 0.451 | 2.236 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.002 | 0.005 | 0.026 | 0.001 | 0.004 | 0.018 |
| 1947 | Milk from BYCow Regime 1 | 0.109 | 0.691 | 4.998 | 0.007 | 0.049 | 0.365 |
| 1947 | Milk from BYCow Regime 2 | 0.094 | 0.638 | 4.698 | 0.007 | 0.040 | 0.216 |
| 1947 | Milk from BYCow Regime 3 | 0.002 | 0.016 | 0.157 | 0.000 | 0.002 | 0.011 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.008 | 0.173 | 0.000 | 0.001 | 0.015 |
| 1947 | Commercial Milk (Rural) | 0.080 | 0.391 | 2.126 | 0.006 | 0.037 | 0.227 |
| 1947 | Fruit and Vegetables* | 0.026 | 0.111 | 0.587 | 0.022 | 0.080 | 0.358 |
| 1945-1947 | External | 0.002 | 0.004 | 0.011 | 0.002 | 0.004 | 0.011 |
| 1945-1947 | Inhalation | 0.049 | 0.126 | 0.469 | 0.039 | 0.090 | 0.351 |
| 1945-1947 | Milk from BYCow Regime 1 | 5.274 | 24.947 | 104.916 | 0.434 | 1.764 | 8.321 |
| 1945-1947 | Milk from BYCow Regime 2 | 5.500 | 22.214 | 95.209 | 0.478 | 1.708 | 10.342 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.137 | 0.731 | 5.759 | 0.014 | 0.067 | 0.450 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.037 | 0.265 | 2.728 | 0.005 | 0.025 | 0.348 |
| 1945-1947 | Commercial Milk (Rural) | 4.192 | 15.431 | 69.460 | 0.359 | 1.356 | 10.701 |
| 1945-1947 | Fruit and Vegetables* | 1.737 | 5.489 | 24.726 | 1.350 | 3.942 | 16.895 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Umatilla County Census Division 10

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.003 | 0.007 | 0.001 | 0.002 | 0.006 |
| 1945 | Inhalation | 0.027 | 0.082 | 0.349 | 0.024 | 0.063 | 0.211 |
| 1945 | Milk from BYCow Regime 3 | 0.064 | 0.504 | 4.749 | 0.005 | 0.046 | 0.561 |
| 1945 | Milk from BYCow Regime 4 | 0.004 | 0.096 | 1.255 | 0.001 | 0.006 | 0.110 |
| 1945 | Commercial Milk (Rural) | 0.591 | 3.292 | 27.371 | 0.039 | 0.245 | 1.759 |
| 1945 | Fruit and Vegetables* | 1.097 | 3.961 | 18.434 | 0.735 | 2.785 | 12.444 |
| 1946 | External | 0.000 | 0.001 | 0.001 | 0.000 | 0.001 | 0.002 |
| 1946 | Inhalation | 0.006 | 0.017 | 0.058 | 0.005 | 0.014 | 0.045 |
| 1946 | Milk from BYCow Regime 3 | 0.009 | 0.059 | 0.497 | 0.001 | 0.004 | 0.035 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.015 | 0.379 | 0.000 | 0.001 | 0.033 |
| 1946 | Commercial Milk (Rural) | 0.072 | 0.489 | 3.534 | 0.008 | 0.045 | 0.229 |
| 1946 | Fruit and Vegetables* | 0.141 | 0.570 | 2.736 | 0.106 | 0.399 | 1.921 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.002 | 0.005 | 0.024 | 0.001 | 0.004 | 0.015 |
| 1947 | Milk from BYCow Regime 3 | 0.002 | 0.016 | 0.138 | 0.000 | 0.002 | 0.018 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.005 | 0.077 | 0.000 | 0.000 | 0.008 |
| 1947 | Commercial Milk (Rural) | 0.027 | 0.155 | 1.129 | 0.002 | 0.012 | 0.072 |
| 1947 | Fruit and Vegetables* | 0.024 | 0.094 | 0.421 | 0.020 | 0.077 | 0.327 |
| 1945-1947 | External | 0.002 | 0.003 | 0.008 | 0.002 | 0.003 | 0.007 |
| 1945-1947 | Inhalation | 0.050 | 0.111 | 0.391 | 0.042 | 0.090 | 0.260 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.148 | 0.708 | 4.665 | 0.012 | 0.056 | 0.458 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.020 | 0.170 | 1.693 | 0.002 | 0.013 | 0.145 |
| 1945-1947 | Commercial Milk (Rural) | 1.214 | 5.372 | 38.428 | 0.094 | 0.330 | 1.945 |
| 1945-1947 | Fruit and Vegetables* | 1.768 | 5.159 | 19.948 | 1.261 | 3.467 | 12.998 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Umatilla County Census Division 11 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.003 | 0.006 | 0.015 | 0.003 | 0.006 | 0.015 |
| 1945 | Inhalation | 0.070 | 0.208 | 0.703 | 0.058 | 0.160 | 0.565 |
| 1945 | Milk from BYCow Regime 1 | 8.631 | 47.430 | 266.519 | 0.552 | 3.631 | 19.963 |
| 1945 | Milk from BYCow Regime 2 | 8.553 | 40.012 | 255.990 | 0.542 | 3.219 | 22.083 |
| 1945 | Milk from BYCow Regime 3 | 0.219 | 1.635 | 15.334 | 0.023 | 0.157 | 1.517 |
| 1945 | Milk from BYCow Regime 4 | 0.015 | 0.222 | 4.760 | 0.004 | 0.034 | 0.542 |
| 1945 | Commercial Milk (Rural) | 12.710 | 41.894 | 172.762 | 0.929 | 4.324 | 13.453 |
| 1945 | Fruit and Vegetables* | 2.420 | 10.092 | 45.108 | 1.863 | 6.366 | 28.967 |
| 1946 | External | 0.001 | 0.001 | 0.003 | 0.001 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.016 | 0.044 | 0.151 | 0.013 | 0.033 | 0.105 |
| 1946 | Milk from BYCow Regime 1 | 1.478 | 8.393 | 59.013 | 0.100 | 0.553 | 3.068 |
| 1946 | Milk from BYCow Regime 2 | 1.421 | 7.635 | 40.673 | 0.103 | 0.592 | 2.964 |
| 1946 | Milk from BYCow Regime 3 | 0.029 | 0.259 | 2.467 | 0.003 | 0.022 | 0.224 |
| 1946 | Milk from BYCow Regime 4 | 0.003 | 0.035 | 0.564 | 0.001 | 0.005 | 0.052 |
| 1946 | Commercial Milk (Rural) | 2.266 | 8.165 | 31.894 | 0.181 | 0.622 | 2.375 |
| 1946 | Fruit and Vegetables* | 0.354 | 1.419 | 7.356 | 0.268 | 0.979 | 4.129 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.004 | 0.013 | 0.050 | 0.003 | 0.010 | 0.033 |
| 1947 | Milk from BYCow Regime 1 | 0.443 | 1.939 | 8.665 | 0.041 | 0.240 | 1.644 |
| 1947 | Milk from BYCow Regime 2 | 0.437 | 2.201 | 12.188 | 0.028 | 0.191 | 1.960 |
| 1947 | Milk from BYCow Regime 3 | 0.010 | 0.086 | 1.176 | 0.001 | 0.006 | 0.055 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.010 | 0.177 | 0.000 | 0.002 | 0.018 |
| 1947 | Commercial Milk (Rural) | 0.585 | 2.601 | 7.261 | 0.043 | 0.188 | 0.788 |
| 1947 | Fruit and Vegetables* | 0.065 | 0.253 | 1.290 | 0.052 | 0.191 | 0.876 |
| 1945-1947 | External | 0.004 | 0.008 | 0.018 | 0.005 | 0.008 | 0.017 |
| 1945-1947 | Inhalation | 0.128 | 0.292 | 0.811 | 0.100 | 0.216 | 0.631 |
| 1945-1947 | Milk from BYCow Regime 1 | 19.225 | 68.349 | 290.392 | 1.608 | 5.100 | 19.842 |
| 1945-1947 | Milk from BYCow Regime 2 | 19.309 | 62.038 | 286.945 | 1.289 | 4.713 | 22.995 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.494 | 2.440 | 17.311 | 0.051 | 0.221 | 1.639 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.046 | 0.398 | 5.400 | 0.011 | 0.052 | 0.640 |
| 1945-1947 | Commercial Milk (Rural) | 24.458 | 59.174 | 191.765 | 1.791 | 5.411 | 14.814 |
| 1945-1947 | Fruit and Vegetables* | 4.251 | 12.889 | 47.980 | 3.141 | 8.188 | 29.854 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Umatilla County Census Division 12 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.004 | 0.014 | 0.002 | 0.004 | 0.015 |
| 1945 | Inhalation | 0.040 | 0.132 | 0.563 | 0.034 | 0.097 | 0.401 |
| 1945 | Milk from BYCow Regime 1 | 3.607 | 22.836 | 142.605 | 0.364 | 1.964 | 15.395 |
| 1945 | Milk from BYCow Regime 2 | 3.404 | 21.936 | 101.051 | 0.260 | 1.771 | 12.092 |
| 1945 | Milk from BYCow Regime 3 | 0.067 | 0.665 | 6.905 | 0.008 | 0.077 | 0.606 |
| 1945 | Milk from BYCow Regime 4 | 0.009 | 0.189 | 4.945 | 0.001 | 0.013 | 0.220 |
| 1945 | Commercial Milk (Rural) | 2.596 | 13.983 | 98.428 | 0.257 | 1.376 | 14.752 |
| 1945 | Fruit and Vegetables* | 1.414 | 5.924 | 28.802 | 1.130 | 4.174 | 21.056 |
| 1946 | External | 0.000 | 0.001 | 0.003 | 0.000 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.009 | 0.028 | 0.116 | 0.008 | 0.022 | 0.080 |
| 1946 | Milk from BYCow Regime 1 | 0.737 | 3.935 | 21.739 | 0.043 | 0.251 | 1.286 |
| 1946 | Milk from BYCow Regime 2 | 0.479 | 3.437 | 26.648 | 0.039 | 0.264 | 1.895 |
| 1946 | Milk from BYCow Regime 3 | 0.013 | 0.119 | 1.050 | 0.001 | 0.012 | 0.129 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.013 | 0.417 | 0.000 | 0.002 | 0.030 |
| 1946 | Commercial Milk (Rural) | 0.423 | 2.296 | 15.568 | 0.030 | 0.171 | 1.055 |
| 1946 | Fruit and Vegetables* | 0.206 | 0.842 | 4.500 | 0.158 | 0.584 | 2.500 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.003 | 0.008 | 0.034 | 0.002 | 0.006 | 0.028 |
| 1947 | Milk from BYCow Regime 1 | 0.194 | 1.062 | 6.315 | 0.012 | 0.086 | 0.535 |
| 1947 | Milk from BYCow Regime 2 | 0.188 | 1.024 | 6.495 | 0.015 | 0.070 | 0.525 |
| 1947 | Milk from BYCow Regime 3 | 0.005 | 0.034 | 0.202 | 0.000 | 0.003 | 0.029 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.006 | 0.144 | 0.000 | 0.001 | 0.007 |
| 1947 | Commercial Milk (Rural) | 0.127 | 0.607 | 3.659 | 0.008 | 0.040 | 0.206 |
| 1947 | Fruit and Vegetables* | 0.039 | 0.161 | 0.748 | 0.031 | 0.117 | 0.510 |
| 1945-1947 | External | 0.003 | 0.006 | 0.016 | 0.003 | 0.006 | 0.017 |
| 1945-1947 | Inhalation | 0.078 | 0.188 | 0.659 | 0.061 | 0.142 | 0.456 |
| 1945-1947 | Milk from BYCow Regime 1 | 8.522 | 34.283 | 173.025 | 0.724 | 2.498 | 14.966 |
| 1945-1947 | Milk from BYCow Regime 2 | 8.230 | 31.528 | 99.941 | 0.639 | 2.543 | 13.248 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.203 | 1.042 | 8.175 | 0.020 | 0.110 | 0.635 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.029 | 0.312 | 5.334 | 0.004 | 0.021 | 0.260 |
| 1945-1947 | Commercial Milk (Rural) | 5.539 | 19.180 | 99.044 | 0.466 | 1.886 | 13.488 |
| 1945-1947 | Fruit and Vegetables* | 2.358 | 7.385 | 28.907 | 1.899 | 5.254 | 21.209 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Umatilla County Census Division 13 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.004 | 0.010 | 0.002 | 0.004 | 0.010 |
| 1945 | Inhalation | 0.049 | 0.145 | 0.600 | 0.042 | 0.114 | 0.379 |
| 1945 | Milk from BYCow Regime 3 | 0.135 | 1.025 | 8.645 | 0.014 | 0.083 | 0.703 |
| 1945 | Milk from BYCow Regime 4 | 0.018 | 0.218 | 4.414 | 0.003 | 0.031 | 0.346 |
| 1945 | Commercial Milk (Rural) | 8.172 | 34.387 | 96.769 | 0.595 | 2.774 | 8.529 |
| 1945 | Fruit and Vegetables* | 1.922 | 7.318 | 33.573 | 1.400 | 5.087 | 22.180 |
| 1946 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1946 | Inhalation | 0.011 | 0.029 | 0.107 | 0.008 | 0.022 | 0.072 |
| 1946 | Milk from BYCow Regime 3 | 0.016 | 0.125 | 1.202 | 0.002 | 0.012 | 0.053 |
| 1946 | Milk from BYCow Regime 4 | 0.002 | 0.040 | 0.778 | 0.001 | 0.005 | 0.026 |
| 1946 | Commercial Milk (Rural) | 1.561 | 5.453 | 16.750 | 0.108 | 0.390 | 1.623 |
| 1946 | Fruit and Vegetables* | 0.273 | 1.051 | 4.830 | 0.218 | 0.753 | 3.193 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.003 | 0.007 | 0.030 | 0.002 | 0.006 | 0.023 |
| 1947 | Milk from BYCow Regime 3 | 0.004 | 0.029 | 0.274 | 0.000 | 0.003 | 0.028 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.011 | 0.136 | 0.000 | 0.001 | 0.019 |
| 1947 | Commercial Milk (Rural) | 0.371 | 1.527 | 4.813 | 0.032 | 0.133 | 0.441 |
| 1947 | Fruit and Vegetables* | 0.047 | 0.183 | 0.854 | 0.038 | 0.147 | 0.735 |
| 1945-1947 | External | 0.003 | 0.005 | 0.012 | 0.003 | 0.005 | 0.012 |
| 1945-1947 | Inhalation | 0.087 | 0.202 | 0.678 | 0.069 | 0.152 | 0.421 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.286 | 1.380 | 9.392 | 0.028 | 0.109 | 0.748 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.066 | 0.401 | 3.540 | 0.011 | 0.046 | 0.357 |
| 1945-1947 | Commercial Milk (Rural) | 15.001 | 44.166 | 110.111 | 1.202 | 3.464 | 9.080 |
| 1945-1947 | Fruit and Vegetables* | 3.214 | 9.541 | 37.553 | 2.352 | 6.678 | 25.034 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Umatilla County Census Division 14 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.003 | 0.009 | 0.001 | 0.003 | 0.009 |
| 1945 | Inhalation | 0.038 | 0.115 | 0.449 | 0.033 | 0.094 | 0.322 |
| 1945 | Milk from BYCow Regime 3 | 0.088 | 0.745 | 7.321 | 0.011 | 0.064 | 0.562 |
| 1945 | Milk from BYCow Regime 4 | 0.013 | 0.177 | 3.399 | 0.004 | 0.025 | 0.221 |
| 1945 | Commercial Milk (Rural) | 7.684 | 34.177 | 93.559 | 0.564 | 2.505 | 8.175 |
| 1945 | Fruit and Vegetables* | 1.398 | 5.132 | 23.153 | 1.095 | 4.029 | 16.561 |
| 1946 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1946 | Inhalation | 0.008 | 0.023 | 0.090 | 0.007 | 0.018 | 0.057 |
| 1946 | Milk from BYCow Regime 3 | 0.011 | 0.075 | 0.665 | 0.001 | 0.008 | 0.049 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.019 | 0.469 | 0.000 | 0.004 | 0.044 |
| 1946 | Commercial Milk (Rural) | 1.423 | 5.594 | 21.161 | 0.107 | 0.422 | 1.294 |
| 1946 | Fruit and Vegetables* | 0.207 | 0.786 | 3.287 | 0.151 | 0.513 | 2.496 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.002 | 0.007 | 0.029 | 0.002 | 0.005 | 0.022 |
| 1947 | Milk from BYCow Regime 3 | 0.003 | 0.021 | 0.155 | 0.000 | 0.002 | 0.014 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.008 | 0.129 | 0.000 | 0.001 | 0.012 |
| 1947 | Commercial Milk (Rural) | 0.439 | 1.623 | 5.265 | 0.031 | 0.129 | 0.421 |
| 1947 | Fruit and Vegetables* | 0.034 | 0.134 | 0.614 | 0.028 | 0.105 | 0.463 |
| 1945-1947 | External | 0.002 | 0.004 | 0.010 | 0.002 | 0.004 | 0.010 |
| 1945-1947 | Inhalation | 0.070 | 0.158 | 0.489 | 0.058 | 0.124 | 0.347 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.180 | 0.945 | 7.107 | 0.023 | 0.091 | 0.547 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.050 | 0.327 | 4.881 | 0.008 | 0.039 | 0.373 |
| 1945-1947 | Commercial Milk (Rural) | 15.579 | 45.966 | 108.179 | 1.145 | 3.261 | 8.222 |
| 1945-1947 | Fruit and Vegetables* | 2.350 | 6.689 | 24.969 | 1.749 | 4.966 | 17.627 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Walla Walla County Census Division 01 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.005 | 0.013 | 0.002 | 0.005 | 0.014 |
| 1945 | Inhalation | 0.048 | 0.150 | 0.663 | 0.043 | 0.120 | 0.452 |
| 1945 | Milk from BYCow Regime 3 | 0.106 | 1.018 | 10.098 | 0.012 | 0.076 | 0.939 |
| 1945 | Milk from BYCow Regime 4 | 0.006 | 0.189 | 3.602 | 0.002 | 0.017 | 0.359 |
| 1945 | Commercial Milk (Rural) | 2.522 | 10.657 | 38.925 | 0.221 | 0.837 | 3.328 |
| 1945 | Fruit and Vegetables* | 1.891 | 7.724 | 35.967 | 1.486 | 5.435 | 26.753 |
| 1946 | External | 0.000 | 0.001 | 0.003 | 0.000 | 0.001 | 0.002 |
| 1946 | Inhalation | 0.010 | 0.029 | 0.102 | 0.009 | 0.024 | 0.079 |
| 1946 | Milk from BYCow Regime 3 | 0.016 | 0.152 | 1.528 | 0.002 | 0.014 | 0.138 |
| 1946 | Milk from BYCow Regime 4 | 0.002 | 0.037 | 0.515 | 0.000 | 0.003 | 0.077 |
| 1946 | Commercial Milk (Rural) | 0.469 | 1.862 | 7.253 | 0.040 | 0.172 | 0.459 |
| 1946 | Fruit and Vegetables* | 0.266 | 1.102 | 5.427 | 0.200 | 0.807 | 3.712 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.003 | 0.009 | 0.040 | 0.003 | 0.007 | 0.027 |
| 1947 | Milk from BYCow Regime 3 | 0.003 | 0.044 | 0.534 | 0.000 | 0.003 | 0.032 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.009 | 0.142 | 0.000 | 0.001 | 0.015 |
| 1947 | Commercial Milk (Rural) | 0.138 | 0.519 | 2.143 | 0.010 | 0.041 | 0.164 |
| 1947 | Fruit and Vegetables* | 0.050 | 0.198 | 1.042 | 0.042 | 0.164 | 0.840 |
| 1945-1947 | External | 0.003 | 0.006 | 0.015 | 0.003 | 0.006 | 0.016 |
| 1945-1947 | Inhalation | 0.089 | 0.205 | 0.741 | 0.074 | 0.165 | 0.485 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.299 | 1.429 | 10.098 | 0.028 | 0.122 | 0.941 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.045 | 0.382 | 3.995 | 0.005 | 0.031 | 0.319 |
| 1945-1947 | Commercial Milk (Rural) | 5.350 | 14.744 | 43.970 | 0.421 | 1.138 | 3.570 |
| 1945-1947 | Fruit and Vegetables* | 3.185 | 9.538 | 36.579 | 2.484 | 7.086 | 29.463 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Walla Walla County Census Division 02 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.005 | 0.011 | 0.028 | 0.005 | 0.011 | 0.031 |
| 1945 | Inhalation | 0.133 | 0.380 | 1.479 | 0.107 | 0.290 | 1.048 |
| 1945 | Milk from BYCow Regime 3 | 0.317 | 2.004 | 15.936 | 0.036 | 0.213 | 1.558 |
| 1945 | Milk from BYCow Regime 4 | 0.041 | 0.481 | 11.103 | 0.008 | 0.069 | 0.793 |
| 1945 | Commercial Milk (Rural) | 16.946 | 78.401 | 281.513 | 1.547 | 6.297 | 22.497 |
| 1945 | Fruit and Vegetables* | 4.845 | 19.076 | 80.523 | 3.576 | 13.094 | 56.854 |
| 1946 | External | 0.001 | 0.002 | 0.006 | 0.001 | 0.002 | 0.006 |
| 1946 | Inhalation | 0.028 | 0.080 | 0.281 | 0.023 | 0.058 | 0.194 |
| 1946 | Milk from BYCow Regime 3 | 0.038 | 0.302 | 3.089 | 0.004 | 0.028 | 0.235 |
| 1946 | Milk from BYCow Regime 4 | 0.006 | 0.095 | 1.834 | 0.001 | 0.012 | 0.140 |
| 1946 | Commercial Milk (Rural) | 3.222 | 11.415 | 47.384 | 0.239 | 0.910 | 3.238 |
| 1946 | Fruit and Vegetables* | 0.677 | 2.656 | 11.385 | 0.569 | 2.067 | 8.234 |
| 1947 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1947 | Inhalation | 0.007 | 0.022 | 0.090 | 0.006 | 0.017 | 0.067 |
| 1947 | Milk from BYCow Regime 3 | 0.008 | 0.095 | 0.887 | 0.001 | 0.007 | 0.065 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.022 | 0.526 | 0.000 | 0.003 | 0.034 |
| 1947 | Commercial Milk (Rural) | 0.910 | 3.329 | 15.136 | 0.079 | 0.292 | 1.398 |
| 1947 | Fruit and Vegetables* | 0.124 | 0.466 | 1.883 | 0.099 | 0.353 | 1.611 |
| 1945-1947 | External | 0.008 | 0.014 | 0.032 | 0.008 | 0.015 | 0.035 |
| 1945-1947 | Inhalation | 0.238 | 0.533 | 1.695 | 0.181 | 0.390 | 1.043 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.643 | 3.043 | 16.165 | 0.071 | 0.295 | 1.673 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.128 | 1.006 | 12.412 | 0.023 | 0.121 | 0.940 |
| 1945-1947 | Commercial Milk (Rural) | 37.566 | 101.897 | 306.174 | 2.632 | 8.090 | 24.086 |
| 1945-1947 | Fruit and Vegetables* | 8.084 | 23.180 | 85.392 | 6.137 | 16.805 | 63.259 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Walla Walla County Census Division 03 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.007 | 0.016 | 0.044 | 0.007 | 0.016 | 0.043 |
| 1945 | Inhalation | 0.194 | 0.564 | 2.002 | 0.160 | 0.433 | 1.474 |
| 1945 | Milk from BYCow Regime 3 | 0.302 | 2.889 | 22.469 | 0.042 | 0.307 | 2.931 |
| 1945 | Milk from BYCow Regime 4 | 0.064 | 0.596 | 6.379 | 0.011 | 0.098 | 1.251 |
| 1945 | Commercial Milk (Rural) | 27.870 | 135.803 | 441.484 | 2.320 | 10.805 | 40.833 |
| 1945 | Fruit and Vegetables* | 6.833 | 25.484 | 113.132 | 4.504 | 16.972 | 83.557 |
| 1946 | External | 0.002 | 0.004 | 0.009 | 0.002 | 0.004 | 0.009 |
| 1946 | Inhalation | 0.044 | 0.125 | 0.408 | 0.037 | 0.095 | 0.285 |
| 1946 | Milk from BYCow Regime 3 | 0.037 | 0.371 | 3.094 | 0.006 | 0.043 | 0.488 |
| 1946 | Milk from BYCow Regime 4 | 0.007 | 0.103 | 1.709 | 0.002 | 0.014 | 0.168 |
| 1946 | Commercial Milk (Rural) | 4.590 | 19.514 | 81.440 | 0.362 | 1.435 | 5.994 |
| 1946 | Fruit and Vegetables* | 0.851 | 3.253 | 16.048 | 0.650 | 2.380 | 10.703 |
| 1947 | External | 0.001 | 0.001 | 0.003 | 0.001 | 0.001 | 0.003 |
| 1947 | Inhalation | 0.012 | 0.034 | 0.156 | 0.010 | 0.028 | 0.103 |
| 1947 | Milk from BYCow Regime 3 | 0.017 | 0.156 | 1.240 | 0.002 | 0.013 | 0.107 |
| 1947 | Milk from BYCow Regime 4 | 0.002 | 0.024 | 0.858 | 0.001 | 0.005 | 0.069 |
| 1947 | Commercial Milk (Rural) | 1.270 | 5.355 | 17.420 | 0.111 | 0.474 | 2.337 |
| 1947 | Fruit and Vegetables* | 0.164 | 0.654 | 3.473 | 0.128 | 0.477 | 2.044 |
| 1945-1947 | External | 0.012 | 0.022 | 0.050 | 0.012 | 0.022 | 0.051 |
| 1945-1947 | Inhalation | 0.351 | 0.777 | 2.298 | 0.280 | 0.603 | 1.763 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.881 | 4.341 | 30.509 | 0.102 | 0.421 | 3.004 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.197 | 1.158 | 6.716 | 0.032 | 0.154 | 1.120 |
| 1945-1947 | Commercial Milk (Rural) | 55.105 | 168.669 | 445.292 | 4.052 | 12.676 | 42.776 |
| 1945-1947 | Fruit and Vegetables* | 11.348 | 33.381 | 120.556 | 7.694 | 21.347 | 87.577 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Walla Walla County Census Division 04 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | Infant Dose Percentiles 50th | Infant Dose Percentiles 95th | Adult Dose Percentiles 5th | Adult Dose Percentiles 50th | Adult Dose Percentiles 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.004 | 0.010 | 0.025 | 0.004 | 0.009 | 0.023 |
| 1945 | Inhalation | 0.109 | 0.326 | 1.185 | 0.093 | 0.250 | 0.791 |
| 1945 | Milk from BYCow Regime 1 | 11.653 | 60.342 | 311.884 | 0.975 | 5.585 | 29.638 |
| 1945 | Milk from BYCow Regime 2 | 12.339 | 62.493 | 406.724 | 0.841 | 5.689 | 25.542 |
| 1945 | Milk from BYCow Regime 3 | 0.195 | 1.577 | 11.011 | 0.022 | 0.166 | 0.976 |
| 1945 | Milk from BYCow Regime 4 | 0.034 | 0.530 | 6.530 | 0.008 | 0.057 | 0.841 |
| 1945 | Commercial Milk (Rural) | 14.174 | 54.173 | 165.491 | 1.204 | 4.611 | 18.717 |
| 1945 | Fruit and Vegetables* | 4.167 | 15.352 | 73.492 | 2.979 | 10.665 | 41.638 |
| 1946 | External | 0.001 | 0.002 | 0.005 | 0.001 | 0.002 | 0.005 |
| 1946 | Inhalation | 0.025 | 0.070 | 0.237 | 0.021 | 0.054 | 0.171 |
| 1946 | Milk from BYCow Regime 1 | 2.026 | 10.298 | 61.717 | 0.149 | 0.918 | 5.464 |
| 1946 | Milk from BYCow Regime 2 | 1.866 | 9.120 | 48.241 | 0.130 | 0.716 | 3.802 |
| 1946 | Milk from BYCow Regime 3 | 0.037 | 0.313 | 2.390 | 0.004 | 0.029 | 0.176 |
| 1946 | Milk from BYCow Regime 4 | 0.003 | 0.053 | 1.190 | 0.001 | 0.007 | 0.104 |
| 1946 | Commercial Milk (Rural) | 2.455 | 10.559 | 32.023 | 0.205 | 0.842 | 2.169 |
| 1946 | Fruit and Vegetables* | 0.559 | 2.308 | 11.664 | 0.395 | 1.499 | 6.696 |
| 1947 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1947 | Inhalation | 0.007 | 0.021 | 0.090 | 0.006 | 0.015 | 0.062 |
| 1947 | Milk from BYCow Regime 1 | 0.575 | 2.846 | 17.207 | 0.047 | 0.262 | 1.643 |
| 1947 | Milk from BYCow Regime 2 | 0.542 | 2.666 | 17.212 | 0.046 | 0.219 | 1.230 |
| 1947 | Milk from BYCow Regime 3 | 0.008 | 0.070 | 0.750 | 0.001 | 0.007 | 0.087 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.020 | 0.524 | 0.000 | 0.002 | 0.067 |
| 1947 | Commercial Milk (Rural) | 0.720 | 2.782 | 11.028 | 0.047 | 0.218 | 0.608 |
| 1947 | Fruit and Vegetables* | 0.107 | 0.420 | 2.050 | 0.084 | 0.307 | 1.413 |
| 1945-1947 | External | 0.007 | 0.013 | 0.029 | 0.007 | 0.013 | 0.028 |
| 1945-1947 | Inhalation | 0.202 | 0.455 | 1.396 | 0.159 | 0.341 | 0.876 |
| 1945-1947 | Milk from BYCow Regime 1 | 23.623 | 87.910 | 399.690 | 2.311 | 8.424 | 35.215 |
| 1945-1947 | Milk from BYCow Regime 2 | 26.698 | 89.500 | 417.777 | 2.026 | 7.330 | 26.448 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.625 | 2.797 | 13.471 | 0.052 | 0.241 | 1.551 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.109 | 0.817 | 6.959 | 0.017 | 0.098 | 1.302 |
| 1945-1947 | Commercial Milk (Rural) | 26.989 | 73.040 | 189.459 | 2.219 | 5.571 | 19.152 |
| 1945-1947 | Fruit and Vegetables* | 6.889 | 19.406 | 75.225 | 4.881 | 13.516 | 44.272 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Walla Walla County Census Division 05 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.003 | 0.006 | 0.017 | 0.003 | 0.007 | 0.018 |
| 1945 | Inhalation | 0.072 | 0.221 | 0.800 | 0.060 | 0.171 | 0.536 |
| 1945 | Milk from BYCow Regime 3 | 0.148 | 1.280 | 10.078 | 0.015 | 0.102 | 0.780 |
| 1945 | Milk from BYCow Regime 4 | 0.023 | 0.293 | 8.976 | 0.005 | 0.050 | 0.598 |
| 1945 | Commercial Milk (Rural) | 14.500 | 58.614 | 158.803 | 1.148 | 4.569 | 12.841 |
| 1945 | Fruit and Vegetables* | 2.838 | 11.224 | 41.839 | 2.191 | 7.992 | 39.502 |
| 1946 | External | 0.001 | 0.001 | 0.003 | 0.001 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.015 | 0.043 | 0.141 | 0.013 | 0.034 | 0.103 |
| 1946 | Milk from BYCow Regime 3 | 0.021 | 0.182 | 1.754 | 0.003 | 0.022 | 0.167 |
| 1946 | Milk from BYCow Regime 4 | 0.003 | 0.042 | 0.585 | 0.001 | 0.007 | 0.069 |
| 1946 | Commercial Milk (Rural) | 2.382 | 9.499 | 31.373 | 0.173 | 0.733 | 2.674 |
| 1946 | Fruit and Vegetables* | 0.393 | 1.626 | 7.085 | 0.290 | 1.123 | 5.082 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.004 | 0.012 | 0.047 | 0.004 | 0.010 | 0.032 |
| 1947 | Milk from BYCow Regime 3 | 0.008 | 0.074 | 0.599 | 0.001 | 0.006 | 0.054 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.014 | 0.236 | 0.000 | 0.002 | 0.017 |
| 1947 | Commercial Milk (Rural) | 0.692 | 2.705 | 8.970 | 0.057 | 0.203 | 0.603 |
| 1947 | Fruit and Vegetables* | 0.072 | 0.309 | 1.440 | 0.061 | 0.230 | 1.003 |
| 1945-1947 | External | 0.005 | 0.008 | 0.020 | 0.005 | 0.009 | 0.020 |
| 1945-1947 | Inhalation | 0.128 | 0.295 | 0.923 | 0.103 | 0.226 | 0.605 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.426 | 1.914 | 10.679 | 0.053 | 0.180 | 0.785 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.081 | 0.563 | 9.439 | 0.014 | 0.075 | 0.640 |
| 1945-1947 | Commercial Milk (Rural) | 25.415 | 77.314 | 178.712 | 2.030 | 5.822 | 13.956 |
| 1945-1947 | Fruit and Vegetables* | 4.830 | 14.414 | 46.512 | 3.582 | 10.388 | 42.584 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Walla Walla County Census Division 06 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.005 | 0.013 | 0.002 | 0.005 | 0.015 |
| 1945 | Inhalation | 0.050 | 0.160 | 0.656 | 0.046 | 0.134 | 0.576 |
| 1945 | Milk from BYCow Regime 3 | 0.096 | 0.817 | 16.404 | 0.015 | 0.096 | 0.604 |
| 1945 | Milk from BYCow Regime 4 | 0.019 | 0.264 | 5.115 | 0.004 | 0.033 | 0.459 |
| 1945 | Commercial Milk (Rural) | 14.428 | 61.193 | 163.992 | 1.100 | 4.206 | 14.116 |
| 1945 | Fruit and Vegetables* | 2.092 | 7.684 | 34.194 | 1.546 | 5.759 | 24.265 |
| 1946 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1946 | Inhalation | 0.010 | 0.030 | 0.126 | 0.009 | 0.024 | 0.092 |
| 1946 | Milk from BYCow Regime 3 | 0.019 | 0.188 | 1.904 | 0.003 | 0.016 | 0.133 |
| 1946 | Milk from BYCow Regime 4 | 0.003 | 0.036 | 0.845 | 0.001 | 0.005 | 0.047 |
| 1946 | Commercial Milk (Rural) | 2.737 | 10.974 | 28.538 | 0.195 | 0.761 | 2.578 |
| 1946 | Fruit and Vegetables* | 0.285 | 1.092 | 5.135 | 0.217 | 0.796 | 3.615 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.003 | 0.009 | 0.033 | 0.002 | 0.007 | 0.024 |
| 1947 | Milk from BYCow Regime 3 | 0.006 | 0.054 | 0.676 | 0.001 | 0.006 | 0.039 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.009 | 0.193 | 0.000 | 0.002 | 0.017 |
| 1947 | Commercial Milk (Rural) | 0.797 | 2.869 | 7.507 | 0.054 | 0.204 | 0.736 |
| 1947 | Fruit and Vegetables* | 0.056 | 0.215 | 1.001 | 0.045 | 0.167 | 0.749 |
| 1945-1947 | External | 0.003 | 0.006 | 0.015 | 0.003 | 0.006 | 0.017 |
| 1945-1947 | Inhalation | 0.090 | 0.220 | 0.739 | 0.078 | 0.178 | 0.707 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.313 | 1.455 | 15.000 | 0.036 | 0.134 | 0.662 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.054 | 0.414 | 5.420 | 0.011 | 0.054 | 0.483 |
| 1945-1947 | Commercial Milk (Rural) | 27.030 | 75.522 | 189.009 | 2.024 | 5.358 | 15.982 |
| 1945-1947 | Fruit and Vegetables* | 3.414 | 10.025 | 36.957 | 2.584 | 7.208 | 25.126 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Walla Walla County Census Division 07 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.004 | 0.011 | 0.002 | 0.004 | 0.012 |
| 1945 | Inhalation | 0.044 | 0.146 | 0.691 | 0.036 | 0.107 | 0.450 |
| 1945 | Milk from BYCow Regime 3 | 0.111 | 0.806 | 5.494 | 0.015 | 0.082 | 0.604 |
| 1945 | Milk from BYCow Regime 4 | 0.018 | 0.253 | 6.742 | 0.005 | 0.028 | 0.222 |
| 1945 | Commercial Milk (Rural) | 15.598 | 59.592 | 214.812 | 1.234 | 4.088 | 15.486 |
| 1945 | Fruit and Vegetables* | 1.849 | 6.599 | 30.094 | 1.378 | 5.034 | 22.451 |
| 1946 | External | 0.000 | 0.001 | 0.002 | 0.000 | 0.001 | 0.002 |
| 1946 | Inhalation | 0.009 | 0.026 | 0.106 | 0.007 | 0.019 | 0.073 |
| 1946 | Milk from BYCow Regime 3 | 0.016 | 0.106 | 0.857 | 0.002 | 0.014 | 0.094 |
| 1946 | Milk from BYCow Regime 4 | 0.003 | 0.046 | 0.643 | 0.001 | 0.005 | 0.046 |
| 1946 | Commercial Milk (Rural) | 2.305 | 9.948 | 29.589 | 0.191 | 0.760 | 2.317 |
| 1946 | Fruit and Vegetables* | 0.258 | 1.057 | 5.097 | 0.209 | 0.751 | 3.248 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.002 | 0.007 | 0.028 | 0.002 | 0.005 | 0.019 |
| 1947 | Milk from BYCow Regime 3 | 0.004 | 0.039 | 0.470 | 0.001 | 0.003 | 0.019 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.010 | 0.211 | 0.000 | 0.002 | 0.009 |
| 1947 | Commercial Milk (Rural) | 0.734 | 2.566 | 10.264 | 0.045 | 0.200 | 0.582 |
| 1947 | Fruit and Vegetables* | 0.046 | 0.179 | 0.906 | 0.037 | 0.146 | 0.677 |
| 1945-1947 | External | 0.003 | 0.005 | 0.013 | 0.003 | 0.005 | 0.014 |
| 1945-1947 | Inhalation | 0.078 | 0.197 | 0.737 | 0.064 | 0.143 | 0.531 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.305 | 1.182 | 6.903 | 0.033 | 0.110 | 0.644 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.069 | 0.496 | 7.402 | 0.011 | 0.042 | 0.258 |
| 1945-1947 | Commercial Milk (Rural) | 29.254 | 75.857 | 214.087 | 2.221 | 5.799 | 16.359 |
| 1945-1947 | Fruit and Vegetables* | 3.026 | 8.734 | 31.543 | 2.291 | 6.529 | 24.008 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Walla Walla County Census Division 08

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.005 | 0.012 | 0.002 | 0.005 | 0.013 |
| 1945 | Inhalation | 0.060 | 0.171 | 0.633 | 0.049 | 0.138 | 0.448 |
| 1945 | Milk from BYCow Regime 1 | 7.663 | 48.833 | 254.161 | 0.549 | 3.300 | 19.960 |
| 1945 | Milk from BYCow Regime 2 | 8.292 | 41.152 | 273.290 | 0.466 | 3.210 | 22.346 |
| 1945 | Milk from BYCow Regime 3 | 0.138 | 1.435 | 15.508 | 0.020 | 0.111 | 0.690 |
| 1945 | Milk from BYCow Regime 4 | 0.018 | 0.259 | 3.453 | 0.006 | 0.043 | 0.476 |
| 1945 | Commercial Milk (Rural) | 11.534 | 45.871 | 162.513 | 0.968 | 3.828 | 14.260 |
| 1945 | Fruit and Vegetables* | 2.355 | 8.553 | 34.463 | 1.721 | 6.274 | 28.833 |
| 1946 | External | 0.000 | 0.001 | 0.003 | 0.000 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.012 | 0.034 | 0.124 | 0.010 | 0.027 | 0.086 |
| 1946 | Milk from BYCow Regime 1 | 1.034 | 6.628 | 49.989 | 0.088 | 0.504 | 2.314 |
| 1946 | Milk from BYCow Regime 2 | 1.121 | 6.280 | 40.443 | 0.094 | 0.656 | 3.654 |
| 1946 | Milk from BYCow Regime 3 | 0.035 | 0.224 | 1.816 | 0.003 | 0.020 | 0.132 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.024 | 0.545 | 0.001 | 0.005 | 0.102 |
| 1946 | Commercial Milk (Rural) | 2.007 | 8.652 | 25.190 | 0.162 | 0.672 | 2.598 |
| 1946 | Fruit and Vegetables* | 0.330 | 1.278 | 6.113 | 0.253 | 0.902 | 3.969 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.003 | 0.010 | 0.037 | 0.003 | 0.008 | 0.029 |
| 1947 | Milk from BYCow Regime 1 | 0.319 | 1.981 | 12.798 | 0.026 | 0.157 | 0.779 |
| 1947 | Milk from BYCow Regime 2 | 0.365 | 2.168 | 15.206 | 0.024 | 0.152 | 1.049 |
| 1947 | Milk from BYCow Regime 3 | 0.008 | 0.078 | 0.587 | 0.001 | 0.006 | 0.045 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.011 | 0.236 | 0.000 | 0.002 | 0.017 |
| 1947 | Commercial Milk (Rural) | 0.586 | 2.177 | 8.304 | 0.046 | 0.169 | 0.656 |
| 1947 | Fruit and Vegetables* | 0.062 | 0.245 | 1.141 | 0.049 | 0.192 | 0.792 |
| 1945-1947 | External | 0.004 | 0.007 | 0.015 | 0.004 | 0.007 | 0.015 |
| 1945-1947 | Inhalation | 0.106 | 0.230 | 0.695 | 0.082 | 0.181 | 0.478 |
| 1945-1947 | Milk from BYCow Regime 1 | 15.771 | 63.168 | 293.903 | 1.384 | 4.455 | 22.168 |
| 1945-1947 | Milk from BYCow Regime 2 | 15.671 | 58.837 | 307.992 | 1.193 | 5.010 | 22.447 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.410 | 2.140 | 14.560 | 0.045 | 0.166 | 0.648 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.052 | 0.390 | 3.852 | 0.011 | 0.061 | 0.551 |
| 1945-1947 | Commercial Milk (Rural) | 24.640 | 64.487 | 175.394 | 1.794 | 4.819 | 13.996 |
| 1945-1947 | Fruit and Vegetables* | 3.918 | 11.006 | 38.081 | 2.823 | 8.067 | 31.144 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Walla Walla County Census Division 09 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | Infant Dose Percentiles 50th | Infant Dose Percentiles 95th | Adult Dose Percentiles 5th | Adult Dose Percentiles 50th | Adult Dose Percentiles 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.003 | 0.006 | 0.017 | 0.003 | 0.006 | 0.016 |
| 1945 | Inhalation | 0.076 | 0.228 | 0.827 | 0.062 | 0.166 | 0.537 |
| 1945 | Milk from BYCow Regime 1 | 9.245 | 47.565 | 248.857 | 0.754 | 3.836 | 22.576 |
| 1945 | Milk from BYCow Regime 2 | 9.813 | 58.405 | 319.694 | 0.558 | 3.373 | 14.983 |
| 1945 | Milk from BYCow Regime 3 | 0.153 | 1.318 | 19.496 | 0.018 | 0.127 | 0.784 |
| 1945 | Milk from BYCow Regime 4 | 0.017 | 0.264 | 7.843 | 0.005 | 0.037 | 0.502 |
| 1945 | Commercial Milk (Rural) | 14.211 | 55.398 | 196.899 | 1.129 | 4.841 | 17.292 |
| 1945 | Fruit and Vegetables* | 2.861 | 10.667 | 52.550 | 2.157 | 7.660 | 34.328 |
| 1946 | External | 0.001 | 0.001 | 0.004 | 0.001 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.017 | 0.046 | 0.144 | 0.013 | 0.035 | 0.106 |
| 1946 | Milk from BYCow Regime 1 | 1.462 | 7.745 | 49.437 | 0.106 | 0.625 | 3.382 |
| 1946 | Milk from BYCow Regime 2 | 1.330 | 8.305 | 48.366 | 0.100 | 0.618 | 3.418 |
| 1946 | Milk from BYCow Regime 3 | 0.034 | 0.284 | 2.835 | 0.004 | 0.025 | 0.239 |
| 1946 | Milk from BYCow Regime 4 | 0.002 | 0.029 | 0.542 | 0.001 | 0.005 | 0.055 |
| 1946 | Commercial Milk (Rural) | 2.157 | 8.641 | 29.936 | 0.189 | 0.670 | 2.652 |
| 1946 | Fruit and Vegetables* | 0.386 | 1.424 | 6.601 | 0.290 | 1.045 | 4.951 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.004 | 0.013 | 0.058 | 0.004 | 0.010 | 0.035 |
| 1947 | Milk from BYCow Regime 1 | 0.488 | 2.273 | 14.643 | 0.029 | 0.185 | 0.977 |
| 1947 | Milk from BYCow Regime 2 | 0.468 | 2.167 | 14.509 | 0.032 | 0.179 | 0.956 |
| 1947 | Milk from BYCow Regime 3 | 0.009 | 0.071 | 0.677 | 0.001 | 0.007 | 0.058 |
| 1947 | Milk from BYCow Regime 4 | 0.001 | 0.011 | 0.240 | 0.000 | 0.001 | 0.017 |
| 1947 | Commercial Milk (Rural) | 0.680 | 2.453 | 8.817 | 0.047 | 0.195 | 0.791 |
| 1947 | Fruit and Vegetables* | 0.067 | 0.292 | 1.399 | 0.058 | 0.219 | 1.079 |
| 1945-1947 | External | 0.005 | 0.009 | 0.020 | 0.005 | 0.008 | 0.019 |
| 1945-1947 | Inhalation | 0.139 | 0.311 | 0.956 | 0.109 | 0.228 | 0.600 |
| 1945-1947 | Milk from BYCow Regime 1 | 18.391 | 69.346 | 241.773 | 1.683 | 5.486 | 25.008 |
| 1945-1947 | Milk from BYCow Regime 2 | 19.424 | 71.453 | 308.233 | 1.383 | 4.867 | 17.686 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.515 | 2.205 | 24.557 | 0.043 | 0.201 | 0.980 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.056 | 0.464 | 8.273 | 0.012 | 0.057 | 0.442 |
| 1945-1947 | Commercial Milk (Rural) | 24.164 | 72.179 | 222.889 | 2.071 | 6.326 | 17.454 |
| 1945-1947 | Fruit and Vegetables* | 4.826 | 13.489 | 57.671 | 3.621 | 9.735 | 35.380 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Walla Walla County Census Division 10

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.005 | 0.014 | 0.002 | 0.005 | 0.014 |
| 1945 | Inhalation | 0.063 | 0.185 | 0.650 | 0.051 | 0.140 | 0.440 |
| 1945 | Milk from BYCow Regime 1 | 7.314 | 41.593 | 284.734 | 0.554 | 3.308 | 21.877 |
| 1945 | Milk from BYCow Regime 2 | 7.347 | 41.989 | 223.377 | 0.640 | 3.274 | 18.659 |
| 1945 | Milk from BYCow Regime 3 | 0.148 | 1.244 | 14.404 | 0.008 | 0.098 | 1.105 |
| 1945 | Milk from BYCow Regime 4 | 0.009 | 0.209 | 6.216 | 0.001 | 0.020 | 0.780 |
| 1945 | Commercial Milk (Urban) | 22.188 | 69.049 | 198.440 | 1.021 | 3.920 | 12.813 |
| 1945 | Fruit and Vegetables* | 2.432 | 9.198 | 39.161 | 1.831 | 6.584 | 29.834 |
| 1946 | External | 0.001 | 0.001 | 0.002 | 0.001 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.013 | 0.036 | 0.113 | 0.011 | 0.028 | 0.094 |
| 1946 | Milk from BYCow Regime 1 | 1.496 | 6.632 | 28.305 | 0.088 | 0.502 | 3.154 |
| 1946 | Milk from BYCow Regime 2 | 1.170 | 6.389 | 38.025 | 0.084 | 0.546 | 2.789 |
| 1946 | Milk from BYCow Regime 3 | 0.022 | 0.185 | 1.823 | 0.002 | 0.016 | 0.142 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.028 | 0.764 | 0.000 | 0.002 | 0.042 |
| 1946 | Commercial Milk (Urban) | 3.442 | 11.700 | 31.399 | 0.152 | 0.757 | 2.062 |
| 1946 | Fruit and Vegetables* | 0.348 | 1.418 | 7.774 | 0.280 | 1.018 | 4.205 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.003 | 0.011 | 0.045 | 0.003 | 0.009 | 0.032 |
| 1947 | Milk from BYCow Regime 1 | 0.355 | 2.140 | 10.819 | 0.025 | 0.176 | 1.086 |
| 1947 | Milk from BYCow Regime 2 | 0.377 | 2.208 | 14.446 | 0.026 | 0.144 | 0.783 |
| 1947 | Milk from BYCow Regime 3 | 0.009 | 0.068 | 0.619 | 0.001 | 0.005 | 0.064 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.008 | 0.099 | 0.000 | 0.001 | 0.010 |
| 1947 | Commercial Milk (Urban) | 0.889 | 3.186 | 8.902 | 0.052 | 0.196 | 0.773 |
| 1947 | Fruit and Vegetables* | 0.057 | 0.232 | 1.296 | 0.046 | 0.176 | 0.868 |
| 1945-1947 | External | 0.004 | 0.007 | 0.016 | 0.004 | 0.007 | 0.016 |
| 1945-1947 | Inhalation | 0.111 | 0.251 | 0.718 | 0.091 | 0.188 | 0.487 |
| 1945-1947 | Milk from BYCow Regime 1 | 16.957 | 55.369 | 272.129 | 1.146 | 4.728 | 26.343 |
| 1945-1947 | Milk from BYCow Regime 2 | 16.816 | 64.072 | 231.542 | 1.254 | 4.597 | 19.785 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.431 | 2.002 | 13.263 | 0.033 | 0.174 | 1.235 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.036 | 0.409 | 6.923 | 0.003 | 0.033 | 0.705 |
| 1945-1947 | Commercial Milk (Urban) | 35.523 | 84.725 | 216.080 | 1.707 | 5.404 | 14.950 |
| 1945-1947 | Fruit and Vegetables* | 4.036 | 11.840 | 43.457 | 3.168 | 8.988 | 33.331 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Walla Walla County Census Division 11 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.005 | 0.013 | 0.002 | 0.005 | 0.014 |
| 1945 | Inhalation | 0.061 | 0.190 | 0.733 | 0.052 | 0.137 | 0.446 |
| 1945 | Milk from BYCow Regime 1 | 7.720 | 44.814 | 225.865 | 0.517 | 3.398 | 22.556 |
| 1945 | Milk from BYCow Regime 2 | 7.849 | 42.807 | 236.336 | 0.515 | 3.006 | 17.640 |
| 1945 | Milk from BYCow Regime 3 | 0.124 | 1.371 | 11.701 | 0.009 | 0.094 | 0.768 |
| 1945 | Milk from BYCow Regime 4 | 0.008 | 0.379 | 8.334 | 0.001 | 0.024 | 0.418 |
| 1945 | Commercial Milk (Urban) | 19.644 | 73.411 | 177.311 | 0.819 | 3.823 | 12.585 |
| 1945 | Fruit and Vegetables* | 2.414 | 9.595 | 42.553 | 1.884 | 6.568 | 27.923 |
| 1946 | External | 0.001 | 0.001 | 0.003 | 0.001 | 0.001 | 0.003 |
| 1946 | Inhalation | 0.013 | 0.036 | 0.117 | 0.011 | 0.028 | 0.083 |
| 1946 | Milk from BYCow Regime 1 | 1.214 | 6.675 | 36.505 | 0.081 | 0.470 | 2.505 |
| 1946 | Milk from BYCow Regime 2 | 0.977 | 5.802 | 32.023 | 0.089 | 0.485 | 2.624 |
| 1946 | Milk from BYCow Regime 3 | 0.026 | 0.244 | 1.989 | 0.001 | 0.013 | 0.194 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.030 | 0.588 | 0.000 | 0.001 | 0.040 |
| 1946 | Commercial Milk (Urban) | 3.390 | 13.166 | 33.669 | 0.173 | 0.786 | 2.410 |
| 1946 | Fruit and Vegetables* | 0.347 | 1.385 | 6.331 | 0.257 | 0.954 | 4.309 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.004 | 0.010 | 0.039 | 0.003 | 0.008 | 0.029 |
| 1947 | Milk from BYCow Regime 1 | 0.362 | 1.905 | 10.091 | 0.022 | 0.141 | 0.965 |
| 1947 | Milk from BYCow Regime 2 | 0.382 | 2.221 | 14.045 | 0.026 | 0.163 | 0.810 |
| 1947 | Milk from BYCow Regime 3 | 0.008 | 0.072 | 0.845 | 0.001 | 0.006 | 0.049 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.008 | 0.146 | 0.000 | 0.001 | 0.012 |
| 1947 | Commercial Milk (Urban) | 0.850 | 3.039 | 8.268 | 0.049 | 0.183 | 0.635 |
| 1947 | Fruit and Vegetables* | 0.068 | 0.250 | 1.214 | 0.050 | 0.187 | 0.895 |
| 1945-1947 | External | 0.004 | 0.007 | 0.015 | 0.004 | 0.007 | 0.016 |
| 1945-1947 | Inhalation | 0.110 | 0.253 | 0.811 | 0.088 | 0.191 | 0.504 |
| 1945-1947 | Milk from BYCow Regime 1 | 16.676 | 57.844 | 283.012 | 1.152 | 4.485 | 23.806 |
| 1945-1947 | Milk from BYCow Regime 2 | 16.633 | 57.782 | 249.045 | 1.307 | 4.501 | 19.847 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.407 | 2.116 | 12.987 | 0.027 | 0.149 | 0.780 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.041 | 0.508 | 7.025 | 0.003 | 0.036 | 0.411 |
| 1945-1947 | Commercial Milk (Urban) | 34.124 | 87.023 | 202.229 | 1.719 | 5.045 | 14.008 |
| 1945-1947 | Fruit and Vegetables* | 4.126 | 12.399 | 44.592 | 3.060 | 8.551 | 31.003 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Yakima County Census Division 01 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.006 | 0.144 | 0.001 | 0.006 | 0.097 |
| 1945 | Inhalation | 0.008 | 0.104 | 3.112 | 0.007 | 0.099 | 5.164 |
| 1945 | Milk from BYCow Regime 3 | 0.024 | 0.312 | 7.539 | 0.003 | 0.045 | 1.732 |
| 1945 | Milk from BYCow Regime 4 | 0.005 | 0.070 | 4.274 | 0.001 | 0.008 | 0.164 |
| 1945 | Commercial Milk (Rural) | 2.155 | 11.464 | 93.758 | 0.156 | 0.990 | 8.996 |
| 1945 | Fruit and Vegetables* | 0.574 | 5.724 | 178.704 | 0.419 | 4.021 | 126.297 |
| 1946 | External | 0.000 | 0.002 | 0.060 | 0.000 | 0.002 | 0.065 |
| 1946 | Inhalation | 0.002 | 0.031 | 1.669 | 0.002 | 0.023 | 2.044 |
| 1946 | Milk from BYCow Regime 3 | 0.003 | 0.051 | 2.102 | 0.000 | 0.005 | 0.351 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.008 | 0.375 | 0.000 | 0.001 | 0.053 |
| 1946 | Commercial Milk (Rural) | 0.260 | 1.366 | 9.510 | 0.022 | 0.120 | 0.607 |
| 1946 | Fruit and Vegetables* | 0.071 | 0.596 | 11.171 | 0.058 | 0.489 | 9.956 |
| 1947 | External | 0.000 | 0.000 | 0.015 | 0.000 | 0.000 | 0.011 |
| 1947 | Inhalation | 0.001 | 0.007 | 0.174 | 0.000 | 0.006 | 0.162 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.014 | 0.260 | 0.000 | 0.001 | 0.034 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.102 | 0.000 | 0.000 | 0.017 |
| 1947 | Commercial Milk (Rural) | 0.108 | 0.431 | 2.276 | 0.008 | 0.041 | 0.228 |
| 1947 | Fruit and Vegetables* | 0.012 | 0.122 | 1.980 | 0.011 | 0.101 | 2.223 |
| 1945-1947 | External | 0.002 | 0.015 | 0.273 | 0.002 | 0.014 | 0.238 |
| 1945-1947 | Inhalation | 0.035 | 0.268 | 6.881 | 0.031 | 0.247 | 7.789 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.096 | 0.712 | 10.605 | 0.009 | 0.090 | 1.968 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.016 | 0.174 | 4.487 | 0.003 | 0.016 | 0.251 |
| 1945-1947 | Commercial Milk (Rural) | 4.081 | 14.884 | 85.227 | 0.345 | 1.343 | 9.285 |
| 1945-1947 | Fruit and Vegetables* | 1.382 | 8.620 | 181.683 | 1.009 | 6.490 | 137.064 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Yakima County Census Division 02

| Year | Dose Pathway | Infant Dose Percentiles 5th | Infant Dose Percentiles 50th | Infant Dose Percentiles 95th | Adult Dose Percentiles 5th | Adult Dose Percentiles 50th | Adult Dose Percentiles 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.020 | 0.000 | 0.001 | 0.016 |
| 1945 | Inhalation | 0.001 | 0.014 | 0.517 | 0.001 | 0.011 | 0.420 |
| 1945 | Milk from BYCow Regime 3 | 0.007 | 0.112 | 3.680 | 0.001 | 0.012 | 0.300 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.010 | 0.576 | 0.000 | 0.003 | 0.047 |
| 1945 | Commercial Milk (Rural) | 1.391 | 8.006 | 80.669 | 0.117 | 0.588 | 4.667 |
| 1945 | Fruit and Vegetables* | 0.079 | 0.731 | 17.531 | 0.063 | 0.643 | 12.331 |
| 1946 | External | 0.000 | 0.000 | 0.005 | 0.000 | 0.000 | 0.005 |
| 1946 | Inhalation | 0.000 | 0.003 | 0.136 | 0.000 | 0.002 | 0.109 |
| 1946 | Milk from BYCow Regime 3 | 0.001 | 0.014 | 0.244 | 0.000 | 0.001 | 0.016 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.145 | 0.000 | 0.000 | 0.006 |
| 1946 | Commercial Milk (Rural) | 0.207 | 0.969 | 5.245 | 0.016 | 0.079 | 0.665 |
| 1946 | Fruit and Vegetables* | 0.010 | 0.098 | 2.975 | 0.009 | 0.085 | 1.747 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.033 | 0.000 | 0.000 | 0.020 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.003 | 0.063 | 0.000 | 0.000 | 0.006 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.023 | 0.000 | 0.000 | 0.004 |
| 1947 | Commercial Milk (Rural) | 0.049 | 0.254 | 1.805 | 0.004 | 0.023 | 0.110 |
| 1947 | Fruit and Vegetables* | 0.002 | 0.024 | 0.611 | 0.002 | 0.020 | 0.436 |
| 1945-1947 | External | 0.000 | 0.001 | 0.031 | 0.000 | 0.001 | 0.023 |
| 1945-1947 | Inhalation | 0.004 | 0.032 | 0.846 | 0.003 | 0.024 | 0.640 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.027 | 0.204 | 3.841 | 0.003 | 0.019 | 0.412 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.003 | 0.023 | 0.729 | 0.001 | 0.005 | 0.058 |
| 1945-1947 | Commercial Milk (Rural) | 2.764 | 10.413 | 80.266 | 0.198 | 0.805 | 4.883 |
| 1945-1947 | Fruit and Vegetables* | 0.216 | 1.313 | 21.413 | 0.165 | 1.063 | 14.791 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Yakima County Census Division 03

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.013 | 0.000 | 0.001 | 0.012 |
| 1945 | Inhalation | 0.001 | 0.014 | 0.612 | 0.001 | 0.011 | 0.385 |
| 1945 | Milk from BYCow Regime 1 | 0.108 | 1.528 | 42.349 | 0.010 | 0.121 | 6.533 |
| 1945 | Milk from BYCow Regime 2 | 0.083 | 1.569 | 80.611 | 0.007 | 0.154 | 6.864 |
| 1945 | Milk from BYCow Regime 3 | 0.007 | 0.100 | 1.981 | 0.001 | 0.010 | 0.328 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.011 | 0.781 | 0.000 | 0.003 | 0.086 |
| 1945 | Commercial Milk (Rural) | 0.957 | 5.374 | 48.070 | 0.060 | 0.406 | 3.652 |
| 1945 | Fruit and Vegetables* | 0.071 | 0.697 | 23.289 | 0.074 | 0.677 | 20.396 |
| 1946 | External | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.005 |
| 1946 | Inhalation | 0.000 | 0.002 | 0.255 | 0.000 | 0.002 | 0.114 |
| 1946 | Milk from BYCow Regime 1 | 0.019 | 0.307 | 8.420 | 0.002 | 0.020 | 0.556 |
| 1946 | Milk from BYCow Regime 2 | 0.014 | 0.205 | 10.415 | 0.001 | 0.017 | 0.283 |
| 1946 | Milk from BYCow Regime 3 | 0.001 | 0.010 | 0.252 | 0.000 | 0.001 | 0.029 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.166 | 0.000 | 0.000 | 0.004 |
| 1946 | Commercial Milk (Rural) | 0.160 | 0.862 | 7.990 | 0.009 | 0.072 | 0.566 |
| 1946 | Fruit and Vegetables* | 0.010 | 0.130 | 4.382 | 0.009 | 0.096 | 2.874 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.027 | 0.000 | 0.000 | 0.014 |
| 1947 | Milk from BYCow Regime 1 | 0.005 | 0.074 | 2.029 | 0.000 | 0.005 | 0.136 |
| 1947 | Milk from BYCow Regime 2 | 0.005 | 0.078 | 2.889 | 0.000 | 0.007 | 0.156 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.003 | 0.055 | 0.000 | 0.000 | 0.006 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.032 | 0.000 | 0.000 | 0.009 |
| 1947 | Commercial Milk (Rural) | 0.039 | 0.243 | 2.129 | 0.003 | 0.018 | 0.152 |
| 1947 | Fruit and Vegetables* | 0.002 | 0.024 | 0.540 | 0.002 | 0.020 | 0.440 |
| 1945-1947 | External | 0.000 | 0.001 | 0.037 | 0.000 | 0.001 | 0.029 |
| 1945-1947 | Inhalation | 0.004 | 0.035 | 1.252 | 0.003 | 0.024 | 0.782 |
| 1945-1947 | Milk from BYCow Regime 1 | 0.449 | 3.159 | 45.110 | 0.030 | 0.242 | 8.097 |
| 1945-1947 | Milk from BYCow Regime 2 | 0.370 | 3.833 | 113.559 | 0.032 | 0.267 | 4.804 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.017 | 0.179 | 1.917 | 0.002 | 0.017 | 0.357 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.003 | 0.034 | 1.424 | 0.001 | 0.006 | 0.117 |
| 1945-1947 | Commercial Milk (Rural) | 2.072 | 8.179 | 53.270 | 0.141 | 0.638 | 3.241 |
| 1945-1947 | Fruit and Vegetables* | 0.202 | 1.401 | 28.320 | 0.181 | 1.141 | 22.348 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Yakima County Census Division 04 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.020 | 0.000 | 0.000 | 0.015 |
| 1945 | Inhalation | 0.001 | 0.007 | 0.222 | 0.001 | 0.006 | 0.223 |
| 1945 | Milk from BYCow Regime 1 | 0.114 | 1.489 | 68.153 | 0.010 | 0.118 | 4.080 |
| 1945 | Milk from BYCow Regime 2 | 0.082 | 1.540 | 63.370 | 0.007 | 0.101 | 2.371 |
| 1945 | Milk from BYCow Regime 3 | 0.006 | 0.070 | 2.792 | 0.001 | 0.010 | 0.137 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.013 | 0.477 | 0.000 | 0.003 | 0.050 |
| 1945 | Commercial Milk (Rural) | 1.814 | 9.257 | 88.295 | 0.157 | 0.827 | 9.015 |
| 1945 | Fruit and Vegetables* | 0.058 | 0.662 | 29.611 | 0.054 | 0.542 | 24.554 |
| 1946 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.005 |
| 1946 | Inhalation | 0.000 | 0.001 | 0.035 | 0.000 | 0.001 | 0.025 |
| 1946 | Milk from BYCow Regime 1 | 0.014 | 0.199 | 8.731 | 0.002 | 0.014 | 0.562 |
| 1946 | Milk from BYCow Regime 2 | 0.015 | 0.255 | 10.771 | 0.001 | 0.018 | 0.472 |
| 1946 | Milk from BYCow Regime 3 | 0.001 | 0.009 | 0.177 | 0.000 | 0.001 | 0.030 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.057 | 0.000 | 0.001 | 0.005 |
| 1946 | Commercial Milk (Rural) | 0.271 | 1.392 | 8.302 | 0.018 | 0.106 | 0.623 |
| 1946 | Fruit and Vegetables* | 0.008 | 0.097 | 4.166 | 0.007 | 0.069 | 2.557 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 0.005 |
| 1947 | Milk from BYCow Regime 1 | 0.004 | 0.046 | 1.460 | 0.000 | 0.005 | 0.134 |
| 1947 | Milk from BYCow Regime 2 | 0.004 | 0.063 | 4.946 | 0.000 | 0.005 | 0.125 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.054 | 0.000 | 0.000 | 0.006 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.014 | 0.000 | 0.000 | 0.002 |
| 1947 | Commercial Milk (Rural) | 0.089 | 0.393 | 3.051 | 0.006 | 0.035 | 0.226 |
| 1947 | Fruit and Vegetables* | 0.002 | 0.022 | 0.686 | 0.001 | 0.016 | 0.683 |
| 1945-1947 | External | 0.000 | 0.001 | 0.032 | 0.000 | 0.001 | 0.042 |
| 1945-1947 | Inhalation | 0.002 | 0.014 | 0.484 | 0.002 | 0.011 | 0.332 |
| 1945-1947 | Milk from BYCow Regime 1 | 0.353 | 3.116 | 87.966 | 0.034 | 0.240 | 4.806 |
| 1945-1947 | Milk from BYCow Regime 2 | 0.310 | 2.973 | 71.312 | 0.028 | 0.213 | 3.072 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.015 | 0.107 | 2.705 | 0.003 | 0.017 | 0.136 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.003 | 0.022 | 0.882 | 0.001 | 0.005 | 0.057 |
| 1945-1947 | Commercial Milk (Rural) | 3.750 | 13.791 | 69.113 | 0.296 | 1.065 | 7.780 |
| 1945-1947 | Fruit and Vegetables* | 0.170 | 1.312 | 46.521 | 0.142 | 1.007 | 32.532 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Yakima County Census Division 05 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.000 | 0.020 | 0.000 | 0.000 | 0.013 |
| 1945 | Inhalation | 0.001 | 0.006 | 0.209 | 0.001 | 0.006 | 0.186 |
| 1945 | Milk from BYCow Regime 1 | 0.125 | 1.301 | 31.943 | 0.009 | 0.096 | 1.875 |
| 1945 | Milk from BYCow Regime 2 | 0.087 | 1.127 | 25.306 | 0.007 | 0.103 | 3.203 |
| 1945 | Milk from BYCow Regime 3 | 0.006 | 0.065 | 1.325 | 0.001 | 0.009 | 0.156 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.013 | 0.833 | 0.000 | 0.004 | 0.136 |
| 1945 | Commercial Milk (Rural) | 2.052 | 9.331 | 61.562 | 0.162 | 1.051 | 7.933 |
| 1945 | Fruit and Vegetables* | 0.062 | 0.649 | 22.711 | 0.055 | 0.552 | 15.859 |
| 1946 | External | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.002 |
| 1946 | Inhalation | 0.000 | 0.001 | 0.037 | 0.000 | 0.001 | 0.039 |
| 1946 | Milk from BYCow Regime 1 | 0.015 | 0.284 | 10.464 | 0.001 | 0.016 | 0.380 |
| 1946 | Milk from BYCow Regime 2 | 0.011 | 0.209 | 6.853 | 0.001 | 0.017 | 0.692 |
| 1946 | Milk from BYCow Regime 3 | 0.001 | 0.008 | 0.190 | 0.000 | 0.001 | 0.020 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.088 | 0.000 | 0.000 | 0.012 |
| 1946 | Commercial Milk (Rural) | 0.329 | 1.653 | 11.704 | 0.025 | 0.131 | 0.640 |
| 1946 | Fruit and Vegetables* | 0.009 | 0.109 | 3.699 | 0.008 | 0.091 | 3.871 |
| 1947 | External | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1947 | Inhalation | 0.000 | 0.000 | 0.012 | 0.000 | 0.000 | 0.006 |
| 1947 | Milk from BYCow Regime 1 | 0.005 | 0.061 | 1.699 | 0.000 | 0.006 | 0.277 |
| 1947 | Milk from BYCow Regime 2 | 0.004 | 0.058 | 2.549 | 0.000 | 0.006 | 0.189 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.046 | 0.000 | 0.000 | 0.004 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.000 | 0.017 | 0.000 | 0.000 | 0.005 |
| 1947 | Commercial Milk (Rural) | 0.094 | 0.407 | 2.109 | 0.007 | 0.030 | 0.153 |
| 1947 | Fruit and Vegetables* | 0.002 | 0.021 | 1.053 | 0.002 | 0.018 | 0.700 |
| 1945-1947 | External | 0.000 | 0.001 | 0.028 | 0.000 | 0.001 | 0.022 |
| 1945-1947 | Inhalation | 0.002 | 0.012 | 0.410 | 0.002 | 0.011 | 0.312 |
| 1945-1947 | Milk from BYCow Regime 1 | 0.425 | 3.094 | 39.029 | 0.027 | 0.198 | 2.483 |
| 1945-1947 | Milk from BYCow Regime 2 | 0.297 | 2.616 | 41.705 | 0.026 | 0.190 | 4.537 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.016 | 0.123 | 1.402 | 0.002 | 0.015 | 0.149 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.003 | 0.022 | 0.797 | 0.001 | 0.006 | 0.107 |
| 1945-1947 | Commercial Milk (Rural) | 4.309 | 13.810 | 76.077 | 0.380 | 1.404 | 9.232 |
| 1945-1947 | Fruit and Vegetables* | 0.169 | 1.278 | 32.520 | 0.145 | 1.100 | 27.133 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Yakima County Census Division 06

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.001 | 0.010 | 0.218 | 0.001 | 0.010 | 0.318 |
| 1945 | Inhalation | 0.017 | 0.199 | 9.423 | 0.016 | 0.154 | 4.558 |
| 1945 | Milk from BYCow Regime 1 | 2.127 | 28.541 | 569.757 | 0.127 | 1.639 | 32.771 |
| 1945 | Milk from BYCow Regime 2 | 1.369 | 19.018 | 469.741 | 0.096 | 1.781 | 41.096 |
| 1945 | Milk from BYCow Regime 3 | 0.041 | 0.626 | 20.028 | 0.005 | 0.068 | 8.504 |
| 1945 | Milk from BYCow Regime 4 | 0.006 | 0.109 | 3.760 | 0.001 | 0.016 | 0.570 |
| 1945 | Commercial Milk (Rural) | 2.628 | 20.067 | 234.385 | 0.224 | 1.673 | 25.920 |
| 1945 | Fruit and Vegetables* | 1.100 | 10.800 | 284.426 | 0.895 | 6.990 | 117.825 |
| 1946 | External | 0.000 | 0.004 | 0.149 | 0.000 | 0.003 | 0.237 |
| 1946 | Inhalation | 0.004 | 0.053 | 3.115 | 0.003 | 0.039 | 1.972 |
| 1946 | Milk from BYCow Regime 1 | 0.280 | 3.463 | 73.171 | 0.020 | 0.300 | 4.202 |
| 1946 | Milk from BYCow Regime 2 | 0.231 | 3.482 | 108.189 | 0.019 | 0.243 | 4.858 |
| 1946 | Milk from BYCow Regime 3 | 0.005 | 0.081 | 1.682 | 0.001 | 0.009 | 0.191 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.018 | 0.640 | 0.000 | 0.002 | 0.059 |
| 1946 | Commercial Milk (Rural) | 0.462 | 2.755 | 26.281 | 0.034 | 0.248 | 2.801 |
| 1946 | Fruit and Vegetables* | 0.157 | 1.334 | 28.721 | 0.118 | 0.912 | 18.473 |
| 1947 | External | 0.000 | 0.001 | 0.033 | 0.000 | 0.001 | 0.043 |
| 1947 | Inhalation | 0.001 | 0.012 | 0.622 | 0.001 | 0.010 | 0.402 |
| 1947 | Milk from BYCow Regime 1 | 0.093 | 1.074 | 21.332 | 0.006 | 0.088 | 1.499 |
| 1947 | Milk from BYCow Regime 2 | 0.061 | 0.919 | 15.520 | 0.005 | 0.079 | 1.201 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.019 | 0.480 | 0.000 | 0.002 | 0.058 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.005 | 0.389 | 0.000 | 0.001 | 0.043 |
| 1947 | Commercial Milk (Rural) | 0.120 | 0.813 | 5.045 | 0.011 | 0.072 | 0.601 |
| 1947 | Fruit and Vegetables* | 0.032 | 0.276 | 5.081 | 0.024 | 0.184 | 3.680 |
| 1945-1947 | External | 0.004 | 0.028 | 0.791 | 0.004 | 0.026 | 0.993 |
| 1945-1947 | Inhalation | 0.069 | 0.533 | 23.125 | 0.053 | 0.379 | 8.931 |
| 1945-1947 | Milk from BYCow Regime 1 | 6.823 | 50.339 | 976.336 | 0.520 | 3.481 | 57.923 |
| 1945-1947 | Milk from BYCow Regime 2 | 5.906 | 41.210 | 716.339 | 0.350 | 2.815 | 50.051 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.120 | 1.043 | 21.157 | 0.017 | 0.129 | 5.197 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.028 | 0.288 | 5.830 | 0.004 | 0.033 | 0.614 |
| 1945-1947 | Commercial Milk (Rural) | 6.314 | 30.110 | 280.143 | 0.598 | 2.581 | 18.175 |
| 1945-1947 | Fruit and Vegetables* | 2.887 | 18.124 | 289.400 | 2.048 | 11.488 | 139.040 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Yakima County Census Division 07 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.030 | 0.000 | 0.001 | 0.026 |
| 1945 | Inhalation | 0.001 | 0.023 | 0.814 | 0.001 | 0.017 | 0.470 |
| 1945 | Milk from BYCow Regime 1 | 0.244 | 3.506 | 56.852 | 0.018 | 0.291 | 8.176 |
| 1945 | Milk from BYCow Regime 2 | 0.192 | 3.651 | 67.360 | 0.020 | 0.232 | 7.595 |
| 1945 | Milk from BYCow Regime 3 | 0.007 | 0.110 | 2.838 | 0.001 | 0.013 | 0.203 |
| 1945 | Milk from BYCow Regime 4 | 0.002 | 0.029 | 1.141 | 0.001 | 0.006 | 0.072 |
| 1945 | Commercial Milk (Rural) | 2.484 | 14.048 | 155.390 | 0.184 | 0.921 | 7.508 |
| 1945 | Fruit and Vegetables* | 0.167 | 1.530 | 47.420 | 0.107 | 0.949 | 25.661 |
| 1946 | External | 0.000 | 0.000 | 0.006 | 0.000 | 0.000 | 0.008 |
| 1946 | Inhalation | 0.000 | 0.004 | 0.191 | 0.000 | 0.003 | 0.123 |
| 1946 | Milk from BYCow Regime 1 | 0.037 | 0.592 | 17.500 | 0.003 | 0.044 | 1.657 |
| 1946 | Milk from BYCow Regime 2 | 0.027 | 0.459 | 13.429 | 0.002 | 0.027 | 0.722 |
| 1946 | Milk from BYCow Regime 3 | 0.001 | 0.015 | 0.378 | 0.000 | 0.002 | 0.055 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.087 | 0.000 | 0.001 | 0.021 |
| 1946 | Commercial Milk (Rural) | 0.286 | 1.549 | 9.270 | 0.023 | 0.135 | 0.729 |
| 1946 | Fruit and Vegetables* | 0.024 | 0.241 | 4.749 | 0.016 | 0.154 | 4.212 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.026 | 0.000 | 0.001 | 0.023 |
| 1947 | Milk from BYCow Regime 1 | 0.010 | 0.133 | 3.479 | 0.001 | 0.011 | 0.287 |
| 1947 | Milk from BYCow Regime 2 | 0.009 | 0.137 | 3.185 | 0.001 | 0.008 | 0.308 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.005 | 0.132 | 0.000 | 0.000 | 0.013 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.045 | 0.000 | 0.000 | 0.003 |
| 1947 | Commercial Milk (Rural) | 0.101 | 0.539 | 2.782 | 0.006 | 0.042 | 0.349 |
| 1947 | Fruit and Vegetables* | 0.005 | 0.046 | 1.027 | 0.003 | 0.030 | 0.602 |
| 1945-1947 | External | 0.000 | 0.002 | 0.042 | 0.000 | 0.002 | 0.052 |
| 1945-1947 | Inhalation | 0.006 | 0.048 | 1.088 | 0.005 | 0.034 | 0.963 |
| 1945-1947 | Milk from BYCow Regime 1 | 0.885 | 7.500 | 109.139 | 0.067 | 0.626 | 10.486 |
| 1945-1947 | Milk from BYCow Regime 2 | 0.699 | 5.974 | 84.472 | 0.055 | 0.464 | 5.775 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.027 | 0.198 | 4.116 | 0.004 | 0.021 | 0.276 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.006 | 0.053 | 0.855 | 0.002 | 0.011 | 0.099 |
| 1945-1947 | Commercial Milk (Rural) | 4.459 | 17.747 | 165.678 | 0.383 | 1.251 | 7.843 |
| 1945-1947 | Fruit and Vegetables* | 0.443 | 2.881 | 63.278 | 0.280 | 1.733 | 32.337 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Yakima County Census Division 08 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.002 | 0.058 | 0.000 | 0.002 | 0.063 |
| 1945 | Inhalation | 0.002 | 0.029 | 2.383 | 0.002 | 0.026 | 1.385 |
| 1945 | Milk from BYCow Regime 3 | 0.010 | 0.171 | 7.579 | 0.002 | 0.018 | 0.478 |
| 1945 | Milk from BYCow Regime 4 | 0.002 | 0.030 | 0.796 | 0.001 | 0.007 | 0.150 |
| 1945 | Commercial Milk (Rural) | 2.284 | 10.658 | 92.128 | 0.173 | 0.946 | 13.141 |
| 1945 | Fruit and Vegetables* | 0.252 | 3.018 | 83.171 | 0.191 | 1.815 | 55.736 |
| 1946 | External | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 0.011 |
| 1946 | Inhalation | 0.001 | 0.008 | 0.398 | 0.000 | 0.006 | 0.319 |
| 1946 | Milk from BYCow Regime 3 | 0.001 | 0.021 | 0.867 | 0.000 | 0.003 | 0.086 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.005 | 0.132 | 0.000 | 0.001 | 0.013 |
| 1946 | Commercial Milk (Rural) | 0.300 | 1.459 | 8.948 | 0.022 | 0.105 | 0.580 |
| 1946 | Fruit and Vegetables* | 0.039 | 0.379 | 11.449 | 0.026 | 0.259 | 7.356 |
| 1947 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.002 |
| 1947 | Inhalation | 0.000 | 0.002 | 0.058 | 0.000 | 0.002 | 0.053 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.006 | 0.145 | 0.000 | 0.001 | 0.017 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.002 | 0.065 | 0.000 | 0.000 | 0.005 |
| 1947 | Commercial Milk (Rural) | 0.101 | 0.432 | 1.876 | 0.007 | 0.035 | 0.198 |
| 1947 | Fruit and Vegetables* | 0.007 | 0.071 | 1.388 | 0.005 | 0.048 | 1.098 |
| 1945-1947 | External | 0.001 | 0.004 | 0.084 | 0.001 | 0.004 | 0.079 |
| 1945-1947 | Inhalation | 0.009 | 0.085 | 3.842 | 0.008 | 0.068 | 1.920 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.032 | 0.313 | 7.910 | 0.005 | 0.038 | 0.482 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.009 | 0.064 | 0.993 | 0.002 | 0.011 | 0.160 |
| 1945-1947 | Commercial Milk (Rural) | 4.318 | 14.652 | 77.740 | 0.350 | 1.159 | 12.894 |
| 1945-1947 | Fruit and Vegetables* | 0.714 | 5.072 | 89.645 | 0.490 | 3.261 | 58.337 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Yakima County Census Division 09

| Year | Dose Pathway | Infant Dose Percentiles 5th | Infant Dose Percentiles 50th | Infant Dose Percentiles 95th | Adult Dose Percentiles 5th | Adult Dose Percentiles 50th | Adult Dose Percentiles 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.002 | 0.006 | 0.070 | 0.001 | 0.006 | 0.077 |
| 1945 | Inhalation | 0.026 | 0.142 | 1.969 | 0.023 | 0.105 | 2.421 |
| 1945 | Milk from BYCow Regime 1 | 3.192 | 28.597 | 261.965 | 0.226 | 1.593 | 12.864 |
| 1945 | Milk from BYCow Regime 2 | 3.218 | 21.990 | 169.718 | 0.258 | 1.940 | 15.152 |
| 1945 | Milk from BYCow Regime 3 | 0.065 | 0.731 | 9.045 | 0.009 | 0.062 | 0.696 |
| 1945 | Milk from BYCow Regime 4 | 0.016 | 0.329 | 4.623 | 0.003 | 0.028 | 0.445 |
| 1945 | Commercial Milk (Rural) | 4.182 | 22.118 | 147.722 | 0.317 | 1.633 | 12.111 |
| 1945 | Fruit and Vegetables* | 1.513 | 7.019 | 42.482 | 1.081 | 4.821 | 28.109 |
| 1946 | External | 0.000 | 0.002 | 0.021 | 0.000 | 0.002 | 0.030 |
| 1946 | Inhalation | 0.007 | 0.034 | 0.583 | 0.006 | 0.029 | 0.490 |
| 1946 | Milk from BYCow Regime 1 | 0.467 | 3.650 | 34.281 | 0.029 | 0.232 | 1.812 |
| 1946 | Milk from BYCow Regime 2 | 0.399 | 2.854 | 22.185 | 0.039 | 0.314 | 2.312 |
| 1946 | Milk from BYCow Regime 3 | 0.009 | 0.111 | 1.171 | 0.001 | 0.009 | 0.077 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.032 | 0.587 | 0.000 | 0.004 | 0.040 |
| 1946 | Commercial Milk (Rural) | 0.624 | 3.533 | 22.419 | 0.049 | 0.273 | 1.680 |
| 1946 | Fruit and Vegetables* | 0.210 | 1.002 | 6.686 | 0.153 | 0.683 | 4.075 |
| 1947 | External | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.004 |
| 1947 | Inhalation | 0.002 | 0.011 | 0.143 | 0.002 | 0.008 | 0.091 |
| 1947 | Milk from BYCow Regime 1 | 0.123 | 0.702 | 5.089 | 0.012 | 0.108 | 0.911 |
| 1947 | Milk from BYCow Regime 2 | 0.144 | 1.207 | 13.067 | 0.009 | 0.086 | 0.792 |
| 1947 | Milk from BYCow Regime 3 | 0.002 | 0.032 | 0.252 | 0.000 | 0.003 | 0.028 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.009 | 0.198 | 0.000 | 0.001 | 0.022 |
| 1947 | Commercial Milk (Rural) | 0.197 | 1.002 | 5.893 | 0.014 | 0.079 | 0.458 |
| 1947 | Fruit and Vegetables* | 0.039 | 0.197 | 1.246 | 0.030 | 0.147 | 0.913 |
| 1945-1947 | External | 0.003 | 0.011 | 0.115 | 0.003 | 0.011 | 0.143 |
| 1945-1947 | Inhalation | 0.067 | 0.253 | 3.660 | 0.054 | 0.205 | 3.472 |
| 1945-1947 | Milk from BYCow Regime 1 | 7.160 | 40.983 | 282.023 | 0.630 | 2.535 | 17.673 |
| 1945-1947 | Milk from BYCow Regime 2 | 7.471 | 32.111 | 196.112 | 0.644 | 2.931 | 15.765 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.194 | 1.167 | 9.209 | 0.022 | 0.101 | 0.957 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.054 | 0.502 | 7.772 | 0.009 | 0.044 | 0.440 |
| 1945-1947 | Commercial Milk (Rural) | 8.694 | 31.150 | 155.666 | 0.765 | 2.500 | 12.959 |
| 1945-1947 | Fruit and Vegetables* | 2.712 | 9.517 | 48.542 | 2.023 | 6.490 | 29.632 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Yakima County Census Division 10 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.002 | 0.022 | 0.000 | 0.002 | 0.026 |
| 1945 | Inhalation | 0.008 | 0.052 | 1.228 | 0.007 | 0.040 | 1.206 |
| 1945 | Milk from BYCow Regime 1 | 0.923 | 7.922 | 83.687 | 0.080 | 0.639 | 7.012 |
| 1945 | Milk from BYCow Regime 2 | 0.810 | 8.572 | 85.756 | 0.080 | 0.683 | 9.160 |
| 1945 | Milk from BYCow Regime 3 | 0.027 | 0.277 | 5.028 | 0.003 | 0.027 | 0.290 |
| 1945 | Milk from BYCow Regime 4 | 0.005 | 0.111 | 2.819 | 0.001 | 0.014 | 0.278 |
| 1945 | Commercial Milk (Rural) | 4.126 | 25.874 | 204.520 | 0.348 | 1.891 | 11.425 |
| 1945 | Fruit and Vegetables* | 0.478 | 3.025 | 32.775 | 0.358 | 1.861 | 19.339 |
| 1946 | External | 0.000 | 0.001 | 0.008 | 0.000 | 0.001 | 0.011 |
| 1946 | Inhalation | 0.002 | 0.012 | 0.237 | 0.002 | 0.010 | 0.188 |
| 1946 | Milk from BYCow Regime 1 | 0.149 | 1.291 | 12.494 | 0.014 | 0.118 | 1.377 |
| 1946 | Milk from BYCow Regime 2 | 0.143 | 1.240 | 15.306 | 0.012 | 0.111 | 1.329 |
| 1946 | Milk from BYCow Regime 3 | 0.005 | 0.048 | 0.669 | 0.000 | 0.005 | 0.059 |
| 1946 | Milk from BYCow Regime 4 | 0.001 | 0.017 | 0.408 | 0.000 | 0.002 | 0.051 |
| 1946 | Commercial Milk (Rural) | 0.737 | 3.369 | 23.613 | 0.046 | 0.232 | 1.437 |
| 1946 | Fruit and Vegetables* | 0.071 | 0.434 | 6.046 | 0.053 | 0.280 | 3.337 |
| 1947 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.003 |
| 1947 | Inhalation | 0.001 | 0.004 | 0.128 | 0.000 | 0.003 | 0.102 |
| 1947 | Milk from BYCow Regime 1 | 0.037 | 0.346 | 3.444 | 0.003 | 0.028 | 0.353 |
| 1947 | Milk from BYCow Regime 2 | 0.050 | 0.481 | 5.511 | 0.003 | 0.028 | 0.279 |
| 1947 | Milk from BYCow Regime 3 | 0.001 | 0.015 | 0.220 | 0.000 | 0.001 | 0.012 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.085 | 0.000 | 0.001 | 0.006 |
| 1947 | Commercial Milk (Rural) | 0.191 | 0.862 | 4.660 | 0.015 | 0.071 | 0.519 |
| 1947 | Fruit and Vegetables* | 0.014 | 0.079 | 0.719 | 0.011 | 0.061 | 0.503 |
| 1945-1947 | External | 0.001 | 0.004 | 0.032 | 0.001 | 0.004 | 0.038 |
| 1945-1947 | Inhalation | 0.022 | 0.108 | 2.262 | 0.018 | 0.080 | 1.720 |
| 1945-1947 | Milk from BYCow Regime 1 | 2.460 | 12.620 | 105.711 | 0.174 | 0.953 | 8.498 |
| 1945-1947 | Milk from BYCow Regime 2 | 2.685 | 13.241 | 113.189 | 0.204 | 1.150 | 9.838 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.080 | 0.493 | 3.946 | 0.010 | 0.045 | 0.296 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.021 | 0.215 | 3.652 | 0.005 | 0.026 | 0.185 |
| 1945-1947 | Commercial Milk (Rural) | 9.483 | 37.232 | 184.967 | 0.730 | 2.393 | 11.160 |
| 1945-1947 | Fruit and Vegetables* | 1.006 | 4.459 | 41.332 | 0.712 | 2.696 | 20.956 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

Yakima County Census Division 11

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.001 | 0.037 | 0.000 | 0.001 | 0.046 |
| 1945 | Inhalation | 0.001 | 0.017 | 0.676 | 0.001 | 0.014 | 0.455 |
| 1945 | Milk from BYCow Regime 3 | 0.006 | 0.098 | 2.229 | 0.001 | 0.011 | 0.284 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.026 | 0.625 | 0.001 | 0.006 | 0.078 |
| 1945 | Commercial Milk (Rural) | 2.437 | 13.944 | 145.393 | 0.204 | 0.993 | 6.043 |
| 1945 | Fruit and Vegetables* | 0.162 | 1.550 | 46.272 | 0.115 | 0.954 | 14.717 |
| 1946 | External | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.007 |
| 1946 | Inhalation | 0.000 | 0.004 | 0.092 | 0.000 | 0.003 | 0.098 |
| 1946 | Milk from BYCow Regime 3 | 0.001 | 0.012 | 0.366 | 0.000 | 0.002 | 0.031 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.003 | 0.128 | 0.000 | 0.001 | 0.009 |
| 1946 | Commercial Milk (Rural) | 0.311 | 1.581 | 8.453 | 0.026 | 0.139 | 0.961 |
| 1946 | Fruit and Vegetables* | 0.024 | 0.197 | 3.193 | 0.016 | 0.121 | 2.989 |
| 1947 | External | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.033 | 0.000 | 0.001 | 0.020 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.004 | 0.072 | 0.000 | 0.000 | 0.007 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.033 | 0.000 | 0.000 | 0.003 |
| 1947 | Commercial Milk (Rural) | 0.083 | 0.405 | 2.408 | 0.007 | 0.035 | 0.216 |
| 1947 | Fruit and Vegetables* | 0.005 | 0.041 | 0.593 | 0.003 | 0.028 | 0.516 |
| 1945-1947 | External | 0.000 | 0.002 | 0.042 | 0.000 | 0.002 | 0.064 |
| 1945-1947 | Inhalation | 0.005 | 0.040 | 0.874 | 0.005 | 0.031 | 0.663 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.022 | 0.167 | 2.608 | 0.003 | 0.019 | 0.258 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.006 | 0.061 | 0.829 | 0.001 | 0.008 | 0.097 |
| 1945-1947 | Commercial Milk (Rural) | 4.562 | 16.648 | 148.327 | 0.358 | 1.318 | 5.833 |
| 1945-1947 | Fruit and Vegetables* | 0.413 | 2.423 | 45.497 | 0.255 | 1.554 | 19.604 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

---------- Yakima County Census Division 12 ----------

| Year | Dose Pathway | Infant Dose Percentiles 5th | 50th | 95th | Adult Dose Percentiles 5th | 50th | 95th |
|---|---|---|---|---|---|---|---|
| 1945 | External | 0.000 | 0.002 | 0.068 | 0.000 | 0.002 | 0.049 |
| 1945 | Inhalation | 0.002 | 0.027 | 1.805 | 0.001 | 0.022 | 1.337 |
| 1945 | Milk from BYCow Regime 3 | 0.006 | 0.094 | 2.991 | 0.001 | 0.013 | 0.501 |
| 1945 | Milk from BYCow Regime 4 | 0.001 | 0.028 | 2.008 | 0.001 | 0.007 | 0.098 |
| 1945 | Commercial Milk (Rural) | 2.069 | 10.914 | 77.368 | 0.174 | 0.997 | 11.657 |
| 1945 | Fruit and Vegetables* | 0.200 | 2.386 | 52.324 | 0.129 | 1.181 | 28.836 |
| 1946 | External | 0.000 | 0.000 | 0.010 | 0.000 | 0.000 | 0.013 |
| 1946 | Inhalation | 0.000 | 0.006 | 0.300 | 0.000 | 0.005 | 0.297 |
| 1946 | Milk from BYCow Regime 3 | 0.001 | 0.014 | 0.422 | 0.000 | 0.002 | 0.033 |
| 1946 | Milk from BYCow Regime 4 | 0.000 | 0.005 | 0.253 | 0.000 | 0.001 | 0.019 |
| 1946 | Commercial Milk (Rural) | 0.337 | 1.599 | 8.386 | 0.027 | 0.136 | 0.824 |
| 1946 | Fruit and Vegetables* | 0.029 | 0.273 | 6.421 | 0.019 | 0.172 | 3.775 |
| 1947 | External | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.001 |
| 1947 | Inhalation | 0.000 | 0.001 | 0.056 | 0.000 | 0.001 | 0.030 |
| 1947 | Milk from BYCow Regime 3 | 0.000 | 0.002 | 0.094 | 0.000 | 0.000 | 0.006 |
| 1947 | Milk from BYCow Regime 4 | 0.000 | 0.001 | 0.041 | 0.000 | 0.000 | 0.005 |
| 1947 | Commercial Milk (Rural) | 0.104 | 0.479 | 2.651 | 0.006 | 0.033 | 0.194 |
| 1947 | Fruit and Vegetables* | 0.005 | 0.043 | 0.810 | 0.003 | 0.027 | 0.443 |
| 1945-1947 | External | 0.001 | 0.004 | 0.095 | 0.001 | 0.003 | 0.079 |
| 1945-1947 | Inhalation | 0.008 | 0.072 | 3.235 | 0.006 | 0.052 | 1.984 |
| 1945-1947 | Milk from BYCow Regime 3 | 0.019 | 0.162 | 2.928 | 0.003 | 0.021 | 0.341 |
| 1945-1947 | Milk from BYCow Regime 4 | 0.006 | 0.060 | 2.012 | 0.002 | 0.010 | 0.101 |
| 1945-1947 | Commercial Milk (Rural) | 4.668 | 15.318 | 96.954 | 0.356 | 1.365 | 15.410 |
| 1945-1947 | Fruit and Vegetables* | 0.550 | 3.611 | 66.036 | 0.307 | 1.993 | 38.815 |

* Dose from the fruit and vegetables pathway assumes that 100% of diet comes from local sources

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