

Review Committee - Study of the Lifetime Health
and Mortality Experience of Employees of AEC Contractors
(Mancuso, Sanders, Brodsky) AE Contract No. AT (30-1) - 3394
and No. CH AT (11-1) - 3428

AEC Headquarters, Germantown, M.D.
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This contract research, dealing with low-level radiation influences on health and longevity in workers in the environment of atomic plants and laboratories, is characterized by a number of herculean problems and a less than heroic approach to their solution despite the large expenditure of time and energy to date. The least, but certainly not the only favorable, comment that must be made at the outset is that the investigators must be complimented for their courage in undertaking an inquiry so fraught with difficulties.

The major problem appears to be the selection of proper controls to which the mortality experience of the atomic plant workers may be compared.

This was understood by all of us to be a most serious and difficult one particularly since there appears to be a reluctance to go beyond plant and social security records which may be inadequate in some important respects.

Among my concerns is the danger of lack of comparability, particularly in socioeconomic status (a powerful determinant of mortality and cause-specific mortality), if comparisons were made with the general population of the U.S. utilizing its life-table experience.

Although internal controls would be relatively easy to obtain and their radiation exposure (primarily external exposure) derived from records in the plant and in the study files (I understand much of these data have been amassed), a danger exists in that these could prove to be a trap and a snare if a high correlation exists between skill level and radiation exposure and skill level is reflected by socioeconomic status. Certainly this must be

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explored and, since data on potential internal controls are already available, this approach should also be utilized even if it proves of supplemental value only.

Sibling controls were stated to be inadequate in number for even at Hanford where the ratio of known siblings to employees is highest only one-third of the employees have had their siblings identified. It was difficult for me to understand the cause of incompleteness of a roster of siblings though I would admit that the obtaining of occupational histories on them could prove to be formidable though the Social Security Administration files could be of help. It was also not clear to me why rosters of siblings could not be made much more nearly complete. Why not a follow-up inquiry among survivors (Could SSA mail such letters?) In any event a matched-pair analysis should be attempted on the available sibling pairs. Obviously tests of homogeneity for other important variables would be a prime consideration. Since these data are available, they should be analyzed despite the shortcomings

be inherent in this system of controls. I do not, however, place a high priority on the quality of the results.

Although not without its own problems, matching and methodologic, the selection of the "A" and "B" controls from Social Security rosters as recommended could well prove to be the most feasible, if provision could be made to obtain a match on socioeconomic status. Without a serious attempt in this regard the inherent bias of differential mortality risks could well become operative and would obfuscate true differences if they exist. Why could not doubling the number of the matched controls be a partial way out? Followup for some reasonable measure of socioeconomic status could be an intermediate step before final matching.

Since SSA could supply earnings data post facto, double the number of controls could reduce the attrition in matching on this variable. I tend to prefer this type of selected controls over a simple comparison with U.S. life-table experience in that the former at least represent an employed population.

With reference to external controls in another comparable industry without radiation exposure of the type experienced in AE plants and laboratories, I would concede the difficulties inherent in this approach not only in terms of finding one comparable in a reasonable number of confounding variables but in obtaining records de novo retroactively. May not some effort be made to compare the data from Hanford, Oak Ridge, National Lead, Mallinckrodt etc. with the data of some possibly comparable (socioeconomic status) study already completed in the same time period approximately? Hinkle's Bell-Telephone Co. employees study comes to mind.

Another external control group, which I did not propose or at least "toss into the ring" for discussion at the consultation meeting, but which comes to mind now, is that which might be generated from Selective Service records for the proper age-groups and then utilizing V.A. insurance records (for the insured among them) for matching on socioeconomic status as well as year of birth, sex, race and State of longest (?) residence.

I would, in general, agree with Dr. Elston that when ideal controls are virtually impossible to obtain, one should study several types of controls (within constraints of economic feasibility).

What concerns me more than any of the variables (other than age) is the powerful determinant which cigarette smoking has been demonstrated to be of general and selected cause-specific mortalities. First, I would expect this to be a more powerful determinant than low-level radiation and secondly, I would not assume that cigarette smokers are randomly distributed among the

AE plant employees or any group of controls, internal or external. Thus the investigators will, in my opinion, have to execute inquiries of at least random samples of employees and controls in regard to their smoking habits. Although I understand that there were provisos relative to invasion of privacy in the imitation of these studies, I cannot see how the numerous problems of comparability will ever be resolved without a conscientious effort to overcome these restrictions at the present time. The "cleaning-up" of records and the obtaining of measures of matching variables would be worth the effort -- far more than the "purging" of groups of controls in regard to prior radiation exposure.

In summary, I would suggest that the current study be brought to completion utilizing all the AEC contractor employee groups for whom data are available particularly because mortality is indeed a "slow" end point. Furthermore, the interactions of radiation with other environmental hazards would be more readily detected with larger groups of employees and controls and such larger populations would provide the capability of analysis at various levels and kinds of exposures. I cannot see how some of the problems will be overcome without some form of contact with the subject groups -- either by interview or questionnaire, nor an avoidance of the resolution of the important determinants, socioeconomic status and smoking habits. Finally, it is politically expedient to continue and complete this study as soon as possible, not so much to avoid episodes of the Sternglass variety, but to obviate a charge of white-washing a hazard or burying the data.