
Chapter 6

Conclusions and Options for Future Work

Contents: This chapter provides a brief summary of five options that could be considered for future work on assessing the health impacts to people in the United States from exposure to radioactive fallout from nuclear weapons testing. The recommendations of the Committee of the National Academy of Sciences (NAS) that peer-reviewed this report are clearly identified.

6.1 Introduction

The purpose of this report is to provide an initial assessment of the feasibility and public health implications of a detailed study of the health consequences of nuclear weapons testing to people in the United States. The findings of this feasibility study demonstrate that conducting a detailed study of the health impact on American people as a result of exposure to radioactive fallout from the testing of nuclear weapons in the United States and abroad is technically possible. However, significant resources would be required to implement this detailed study, and careful consideration should be given to public health priorities, as well as to concerns that some stakeholders have expressed to DHHS about national and global nuclear weapons testing fallout.

To assist in the process of making a decision about future fallout-related work, five different options have been developed for consideration. Each of these options is briefly described below. Detailed estimates of the resources needed to complete each option considered have not been developed. However, the actual cost of some past projects is presented for purposes of illustration only.

6.2 Options for Future Work

Option 1. Conduct no additional fallout-related work

Rationale: The dose and risk estimates presented in this report are recognized to be crude. Estimates of uncertainty have not been quantified for many of these estimates, they are subject to a variety of errors, and they are incomplete, e.g., estimates are not provided for the states of Alaska and Hawaii.

On the basis of these crude estimates of dose and risk, fallout radiation appears to have the greatest impact on risks of thyroid tumors. The National Cancer Institute (NCI) is undertaking a communications program to inform people in the United States about thyroid disease and radionuclide fallout as a follow up to their dose reconstruction of ^{131}I releases from the Nevada Test Site (NTS) (NCI 1997). Both the American Thyroid Association (Ladenson et al. 2000) and the American Association of Clinical Endocrinologists (AACE 1999) are urging people in the United States to get regular thyroid examinations as part of good preventive medicine practices. Supporting these public health activities may be more appropriate than performing a more detailed dose reconstruction and risk assessment for fallout from nuclear weapons testing.

An important factor for conducting this feasibility study was the public's concern over their right-to-know about the health impact of weapons testing. In addition, as a result of the NCI study on the impact of ^{131}I released from the NTS, people became interested in information concerning other radionuclides released from NTS and by nuclear weapons testing worldwide. This interest was formally supported by the Department's Advisory Committee for Energy-Related Epidemiologic Research (ACERER), and was expressed by participants at the January 2000 workshop held by NCI and the Centers for Disease Control and Prevention (CDC) to devise a ^{131}I communications plan. Therefore, while the dose and risk estimates presented in this report are crude and contain large uncertainties, they may be sufficient to address the public's need for information on the public health impact of radioactive fallout.

NAS recommendation: Option 1 was implicitly rejected by the Committee, as it recommended that additional fallout-related work should be carried out.

Option 2. Retrieve and archive the historic documentation related to radioactive fallout from nuclear weapons testing conducted by the United States and other nations.

Rationale: Although a large number of summary reports related to nuclear weapons fallout have been published, many of the primary documents upon which these summary reports are based will be lost forever if they are not protected soon. Documents related to nuclear weapons testing will always be valuable to the scientific and health community. Hence, documents could be collected and protected immediately from further loss. Implementing this option would preserve the possibility of conducting a meaningful study of the health consequences of nuclear weapons testing in the future. This option could be implemented alone or in conjunction with one of the other three options discussed below.

The National Center for Environmental Health of the CDC has been actively involved in document retrieval and document data base development since 1992. Such projects have been an integral part of dose reconstruction activities conducted by CDC for the Idaho National Engineering and Environmental Laboratory, the Savannah River Site, and the Los Alamos National Laboratory. These document location, retrieval, and data base development projects have cost between \$3 million and \$5 million and taken 2-4 years to complete at each of these nuclear weapons research and development sites.

NAS recommendation: “The Committee recommends an effort to retrieve and archive additional relevant information about the nuclear-weapons testing program. That means collecting data preserved in various repositories that have not been cataloged and may be in danger of imminent destruction.

CDC should also:

- Continue its search for documents not held by governmental agencies and take steps necessary to ensure their presentation.
- Enroll other government agencies, especially the Department of Defense, in the effort to identify, preserve, and publish information.
- Make copies of key documents, the data archived from them, and relevant computer codes or other calculation tools and make them all publicly available, including archiving and providing public access to all the databases and spreadsheets generated by the feasibility study and mentioned in it and its appendices, together with inputs and calculation tools used for other studies performed for NCI and CDC.”

Option 3. Conduct a more detailed dose reconstruction of radioactive fallout from global nuclear weapons testing for Iodine-131, the most significant radionuclide identified in this study.

Rationale: As noted earlier, the present dose and risk analyses indicate that fallout radiation has the greatest impact on risks of thyroid tumors. The NCI has previously completed an extensive dose reconstruction and basic risk analysis for ^{131}I fallout received from the NTS (NCI 1997; IOM 1999). This project cost approximately \$5 million and took many years to complete. Follow-up activities include development of an Internet site where individuals may obtain an estimate of their individual dose, and implementation of a communications project to inform people in the United States about the results of this study and its potential public health implications.

The estimates presented in this report of ^{131}I doses from global fallout are crude, as they only refer to an average over the entire population of the United States, and they do not include a quantitative estimate of uncertainty. On average over the population of the United States, consideration of global fallout would likely increase the dose and risk estimates previously developed for ^{131}I from NTS fallout by about 10%. However, the distribution of doses over the population of the United States is likely to be very different for global fallout than for NTS fallout because deposition of global fallout is closely dependent on thunderstorm activity. As a result, some people received higher doses from global fallout than from NTS fallout while other people received much less. Therefore, it might be desirable to perform a detailed dose reconstruction and basic risk analysis for ^{131}I in global fallout, and incorporate that information into the NCI Internet site and communications plan. The states of Alaska and Hawaii could be included in this effort, too. This effort should also include collecting and protecting primary documents related to nuclear weapons testing (Option 2).

NAS recommendation: “CDC and NCI should consider performing a reanalysis of the ¹³¹I exposures to the American public that would incorporate new dosimetry-related information from Chernobyl and elsewhere, the contribution of global fallout, a more comprehensive uncertainty analysis, and correction of acknowledged errors in the previous dosimetry.”

Option 4. Conduct a more detailed dose reconstruction for multiple radionuclides in radioactive fallout from both Nevada Test Site and global nuclear weapons testing.

Rationale: The work that has now been completed demonstrates that conducting a more detailed study of the health impact of exposure to radioactive fallout from the testing of nuclear weapons in the United States and abroad on American people is technically possible. There are numerous possible subject areas that can be researched for the purpose of improving the crude dose estimates provided in this report and for providing a more complete historical record of the nature of the releases from the weapons testing and the resulting exposures received by Americans from NTS and global fallout. These recommendations primarily have emerged from noting the limitations of the input data and available models to conduct the work reported here. The research options provided in Chapter 3 of this report can generally be categorized as those related to (1) availability of nuclear test data, (2) improvement in models, (3) inclusion of specific locations, and (4) public health. However, despite the improvements that are possible, inherent and unavoidable limitations in knowledge about the lifestyle of individual Americans will prohibit ever determining precise doses to specific persons.

As a result of these technical considerations and the results presented in this report, it might be desirable to expand on Option 3, above, and perform a detailed dose reconstruction and basic risk analysis not only for ¹³¹I in global fallout but also for other radionuclides found in both NTS and global fallout. As described in Option 3, the results of this dose reconstruction and risk analysis could then be incorporated, for example, into the existing NCI Internet site and communications plan. The states of Alaska and Hawaii could be included in this effort, too. This effort should also include collecting and protecting primary documents related to nuclear weapons testing (Option 2).

The cost and staffing requirements for implementing Option 4 would depend on the level of detail desired beyond that presented in the Report. For example, CDC’s National Center for Environmental Health has been involved in a comprehensive dose reconstruction for the Department of Energy’s nuclear weapons production site at Hanford, Washington, since 1992. This project involves portions of the states of Washington, Oregon, and Idaho, and it includes nine Native American nations. The Hanford project has cost approximately \$30 million to date. Option 4 would, of course, involve 50 states and it could include numerous population subgroups.

NAS recommendation: “...the Committee does not recommend an expanded study of exposure to radionuclides other than ¹³¹I; inasmuch as the human doses were much lower than those of ¹³¹I, they confer

essentially non-detectable increases in individual risk, and the risks are of little public health significance.”

Option 5. Conduct a detailed study of the health effects of nuclear weapons testing fallout including, in a single project, dose estimation, risk analysis, and communication of the results to interested parties.

Rationale: As noted previously in Option 4, above, the work that is presented in this report demonstrates that conducting a more detailed study of the health impact of exposure to radioactive fallout from the testing of nuclear weapons in the United States and abroad on American people is technically possible. The estimates of dose from nuclear weapons testing fallout developed in this project could be refined to make them more suitable for use in evaluating health consequences to American population groups.

This option differs from Option 4 primarily in the type of communication campaign and risk analysis that would be undertaken. Option 4 proposes to perform a limited risk analysis and to utilize existing communication planning being undertaken by NCI. This option would include a more detail risk analysis for American population subgroups and expand NCI’s effort to include more of the communication options discussed in Chapter 5.

Costs and staffing requirements for communications efforts are dependent on the results of the dose reconstruction and the risk assessment work and what public health implications are learned through that research. However, other issues will also need to be considered. For example, even if results from the dose reconstruction and risk analysis do not provide a risk-based rationale for conducting a large-scale, nationwide communications campaign, public right-to-know and social justice issues may affect the scale and reach of the campaign. In addition, other factors must also be considered in developing resource estimates. Some of these factors include:

- ◆ Planning and implementing a campaign with public involvement. To plan, design and conduct a campaign in a public and participatory manner takes more time, requires more staff and requires more funding (i.e., establishing and providing logistical support for an advisory group, for public meetings, workshops, and consensus decision-making).
- ◆ Conducting formative research. The more segmented the affected audiences and populations are (e.g., there are over 500 recognized Native American tribes), the more complex the campaign becomes, requiring additional funds and staffing resources to conduct formative research for audience profiling, message development and dissemination strategies.
- ◆ The communication channels chosen to disseminate campaign messages and materials. Associated costs and staffing resources could range from low-end (internet and automated toll-free phone/fax system) to high-end (mass mailings and print and television publicity).
- ◆ The scale of health care provider training. Associated costs and staffing resources vary greatly when comparing a passive education program (fact sheets available

through the internet) to an active education program (for example, Continuing Medical Education provided through satellite training).

- ◆ Building capacity within state and local health departments and/or other partners. This may entail low-end efforts of merely disseminating research results and information materials to state and local health agencies. Or efforts may be on the higher end and entail such activities as developing and disseminating model educational protocols; increasing the resources and infrastructure needed at the state and/or local level to implement the communications and education campaign as well as to evaluate its reach and success; or providing technical assistance, resources and training on risk factors for disease to public health workers at state and local levels.

For example, for CDC and NCI's diethylstilbestrol (DES) National Education Campaign (a smaller-scale national campaign specific to individuals exposed to DES *in utero* and their health care providers) it is estimated that the planning phase alone will cost \$3 million to \$5 million. Funding and resource needs for the implementation phase for the DES campaign are expected to increase exponentially during the implementation and distribution phase. In another example, in the late 1980's, CDC mailed information on Acquired Immune Deficiency Syndrome (AIDS) to every household in the United States. This mailing cost over \$30 million. Planning for the NCI ¹³¹I/NTS Communications Project has cost approximately \$1 million dollars; this does not include additional costs such as development and maintenance and dissemination of print materials and the Web site.

Public involvement is a significant component of all DHHS projects associated with the historic development, production, and testing of nuclear weapons. ACERER has provided advice to DHHS during the course of this feasibility study. However, there are many issues that have been raised by stakeholders that transcend the mandate of DHHS. For example, the Department of Energy is responsible for maintaining many of the environmental monitoring records that are needed for a detailed study; only the Department of Defense can grant access to classified records that would allow improvement of some of the dose estimates. Therefore, if this option is mandated, a project-specific, trans-federal advisory committee should be established to provide advice on the conduct of additional activities related to the health effects of nuclear weapons testing fallout. This committee of 10–15 people could be composed of representatives from state public health agencies and various public stakeholder groups, and independent scientists familiar with technical aspects of the proposed activities. In addition, there would be ex-officio members representing appropriate federal agencies.

For the past 8 years, CDC's National Center for Environmental Health has been actively working with committees chartered in accordance with the Federal Advisory Committee Act, including ACERER. Although ACERER's charter has expired and the committee is no longer in existence, the annual cost of each of the remaining advisory committees is approximately \$500,000. In addition, the equivalent of two full-time professionals and one or two support staff members are required to support the activities of each advisory committee.

NAS recommendation: the Committee implicitly rejected Option 5. However, with respect to communication issues, the Committee recommended the following:

- “Develop a detailed public summary and a communication plan for its distribution. The public summary should provide information that can be readily understood by the lay public, including comparison of background radiation with the radiation doses discussed in the report of the feasibility study and a description of the important uncertainties (related to dose and risk) that apply to the feasibility study.
- Phase information from the feasibility study into the I-131/Nevada Test Site Communication Plan in a timely fashion to give interested American citizens a more complete picture of their exposure to NTS and global fallout with appropriate explanations of relative health risks.
- If Option 5 is adopted and important new scientific work develops, produce a timely major educational effort that builds on the efforts of the communication plan for the I-131/Nevada Test Site study.
- Make studies on radiation exposure of US citizens transparent and accessible to interested individuals. The committee recommends that interested citizens take part in the study process and, with scientific and social science experts, serve as members of advisory boards for such studies.
- Hold a follow-up conference, similar to the one sponsored by NCI on risk communication (January 2000), as part of the continuing CDC effort to develop effect guidelines for communicating radiation risk to the American public.”

These recommendations are from “Exposure of the American Population to Radioactive Fallout from Nuclear Weapons Tests: A Review of the CDC-NCI Draft Report on a Feasibility Study,” National Research Council of the National Academies of Science, Washington, D.C.: The National Academies Press, 2003.

6.3 Conclusions

The findings of this feasibility study suggest that the health risks from exposure to fallout from past nuclear weapons tests may be small, but this study also demonstrates that conducting a detailed study of the health impact on American people as a result of exposure to radioactive fallout from the testing of nuclear weapons in the United States and abroad is technically possible.

The recommendations of the Committee of the National Academy of Sciences that reviewed that report are that:

- 1) An effort should be made to retrieve and archive additional relevant material about the nuclear weapons testing program;
- 2) CDC and NCI should consider performing a reanalysis of the ¹³¹I exposure to the American public that would incorporate new dosimetry-related information from Chernobyl and elsewhere, the

contribution of global fallout, a more comprehensive uncertainty analysis, and correction of acknowledged errors in the dosimetry;

- 3) CDC should (1) develop a detailed public summary and a communication plan for its distribution, (2) make studies of radiation exposure of U.S. citizens transparent and accessible to interested individuals; and (3) hold a follow-up conference, as part of the effort to develop effective guidelines for communicating radiation risk to the American public.

References

- AACE. American Association of Clinical Endocrinologists. "Thyroid Awareness Month: Neck Check;" 1999.
- Harris Interactive. *The Harris Poll*[®] #21, May 1, 2002. [www.harris interactive.com](http://www.harrisinteractive.com).
- IOM. Institute of Medicine. National Research Council. *Exposure of the American people to Iodine-131 from Nevada nuclear-bomb tests. Review of the National Cancer Institute Report and Public Health Implications*. National Academy Press; Washington, DC; 1999.
- Ladenson, P.W., Singer, P.A., Ain, K.B., Bagchi, N., Bigos, S.T., Elliot, G.L., Smith, S.S., and Gilbert, H.D. American Thyroid Association Guidelines for Detection of Thyroid Dysfunction, *Arch. Intern. Med.* 160:1573-1575; June 12, 2000.
- NCI. National Cancer Institute. *Estimated Exposures and Thyroid Doses Received by the American People from Iodine-131 in Fallout Following Nevada Atmospheric Nuclear Bomb Tests*. Bethesda, MD, 1997.