Questions and Answers About A Feasibility Study of the Health Consequences to the American Population of Nuclear Weapons Tests Conducted by the United States and Other Nations

Q: What prompted this project?

A: The mission of the Centers for Disease Control and Prevention (CDC) is to promote the health and quality of life of the public by preventing and controlling disease, injury, and disability. In accordance with that mission, CDC, in cooperation with the National Cancer Institute (NCI), has responded to a request from Congress for a feasibility study of the health consequences to the American population from nuclear weapons tests that the United States and other nations conducted.

Q: What do you mean by a "feasibility" study?

A: This is a feasibility study because its purpose is to determine if it is technically possible to perform a detailed study of the health consequences to the American population from nuclear weapons tests that the United States and other nations conducted. In this study researchers analyzed data and information to determine preliminary estimates of dose and the risk of a limited number of health consequences to the American population from radioactive fallout. This feasibility study does not provide any policy recommendations or cost analysis for future implementation; it only shows that it's technically possible to do a more detailed study of health consequences in the future. HHS will make no formal recommendations concerning future fallout-related work until peer review of the draft Technical Report for this feasibility project is complete.

Q: What is fallout?

A: Prior to 1963, the United States and other countries conducted more than 500 nuclear weapons tests in the atmosphere. Fallout refers to the radioactive debris deposited into the atmosphere as a result of each of these tests. Depending on the size and type of weapon detonated, some of this fallout traveled great distances before depositing on the Earth and exposing people to radiation. Any person living in the contiguous United States since 1951 has been exposed to radioactive fallout, and all organs and tissues of the population were exposed to some radiation.

Q: Who was exposed?

A: Any person living in the contiguous United States since 1951 has been and continues to be exposed to the remnants of fallout from nuclear weapons testing.

Q: How was I exposed?

A: Exposure to radioactive material from fallout may occur in several ways: (1) from direct contact with material in the air; (2) from radioactive material deposited on the ground; (3) from ingesting radioactive material deposited or transferred to plants, animals or animal products (e.g., milk); (4) from inhaling radioactive material in the air or resuspended material from the ground. In this study, we estimated external doses from material deposited on the ground and internal doses from ingesting contaminated food, because these are the pathways producing the majority of dose.

Q: Am I still being exposed?

A: Although some shorter-lived radionuclides, such as Iodine-131, no longer contribute to doses, other longer-lived radionuclides, such as Cesium-137, still contribute a diminishing dose to the world population from radioactive fallout.

Q: What was my dose and how does this compare with other sources of radiation exposure such as medical exposures?

A: We are not estimating doses for individuals; we are estimating the average county-level dose from exposure to fallout radionuclides. The estimated external whole body dose averaged over the population of the entire country for people **alive at any time during the years 1951-2000** is about 1.2 mSv. The average annual dose to the American population today from medical X-rays is about 0.39 mSv per year. For comparison with the fallout dose, a person receiving 0.39 mSv per year from medical X-rays over 50 years would receive a total of 20 mSv. Your individual dose will differ from these averages for a number of reasons. For example, external whole body dose from fallout may vary depending on where you lived, how much time you spent outdoors, and other lifestyle and individual factors. Your dose from medical X-rays will vary depending on how many X-ray exposures you received, the body site exposed and shielding provided, age of equipment, and other factors.

Q: What are the health effects from this exposure?

A: At these low-dose levels the most important health effect is likely to be cancer. While some non-cancer diseases have been reported as late effects of radiation, more fundamental research is needed to clarify the biological mechanisms by which low-dose, protracted radiation exposure causes these diseases. Based on the dose data available in this feasibility assessment, the most likely non-cancer health outcomes that may affect the American people are those involving the thyroid gland. Preliminary estimates of dose from fallout radiation indicate that the internal organ-specific dose to the thyroid is much higher than the dose to other organs/tissue evaluated. Internal and external exposures to fallout radiation are unlikely to result in an increase in other non-neoplastic diseases at the currently estimated dose levels. However, it is possible that select individuals may have much greater sensitivity to radiation than has been found on average.

Q: How many cancers could occur as a result of fallout exposure?

A: Based on an average external dose to the American public of 1.2 mGy, we estimate that about 11,000 extra deaths from all cancers may occur among the residents of the United States who were alive at any time during the years 1951-2000. These 11,000 deaths would be spread out over the period extending from the 1950s into the 21st century, and would be in addition to the far larger number of cancer deaths that occur every year in the United States; for example, about 500,000 cancer deaths occurred in 1990 and about 40 million cancer deaths might be predicted to occur over a 75-year period. About 10% of these additional 11,000 cancer deaths from *external* exposure may be predicted to be from leukemia.

Internal exposure to radionuclides in fallout may also result in additional cancers in specific organs and tissues of the body. For example, an additional 550 deaths from leukemia may occur among the people who lived in the United States anytime during and including the years 1951-2000 as a result of internal exposure to the red bone marrow from fallout radionuclides. And, previous estimates by NCI predict between 11,300 and 212,000 thyroid cancer cases may be expected to occur among the United States population from exposure of the thyroid gland to Iodine-131 from the Nevada Test Site. Of those cases, we would expect that the number of deaths from thyroid cancer would be between about 1,000 and 21,000. Consideration of global fallout produced at other locations around the world would likely increase these thyroid cancer estimates by about 10%.

Q: Why are you providing a range of numbers instead of one number for an estimate of thyroid cancers? Why are you not providing a range of numbers for all cancers and leukemia, too?

A: Because we cannot measure actual organ doses in people nor count the actual number of cancers that result from exposure to radioactive materials from nuclear weapons testing fallout, all estimates of risk must be made using mathematical models. Because components of these mathematical models are uncertain, all estimates of risk are inherently uncertain. The estimates of thyroid cancer cases presented in the Progress Report to Congress are based on previous work conducted by NCI in which an attempt was made to account for some sources of uncertainty (specifically, statistical uncertainty in the risk coefficient and uncertainty in the dose). Thus, a range of possible values is presented. The Progress Report to Congress presents results for all cancers and leukemia for illustrative purposes only, and these results may contain considerable error. The draft Technical Report will include a crude quantitative estimate of the uncertainty associated with the estimates of all cancers, and it will discuss the concepts of uncertainty in more detail.

Q: Is a detailed study of the health effects of nuclear weapons testing feasible? Are CDC and NCI going to conduct a more detailed study?

A: The preliminary findings of this feasibility study indicate 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, CDC and NCI have not determined at this time whether or not a more detailed study will be conducted. The draft Technical Report will be available for review and comment by the public, and it will be peer reviewed by the National Academy of Sciences' Committee on Assessment of CDC Radiation Studies. All comments received will be carefully considered in the preparation of the final version of the Technical Report. No formal recommendations concerning future fallout-related work will be provided until peer review of the draft Technical Report for this feasibility project is complete.

Q: How much would a more detailed study cost?

A: The cost of any future work will depend on the level of detail of the additional studies. No cost estimates for possible future fallout-related work have been developed at this time. This feasibility study does not provide any policy recommendations as to whether there should be future work accomplished.

Q.: What does CDC recommend be done regarding a detailed study of the health consequences to Americans of global nuclear weapons testing?

A: The feasibility study found that it is technically possible to do a more detailed study of the health effects of fallout. However, the Department of Health and Human Services, which has the overall responsibility for this study, will make no formal recommendations for future fallout-related work until public and scientific peer review of the detailed technical report for this project has been completed.

Q: What should I do if I am concerned?

A: You have several options if you are concerned about your health as a result of reading this report. First, you should talk to your health care provider. Your health care provider can discuss the signs and symptoms of various cancers and other health conditions with you. Second, you can contact organizations that provide information about cancer and thyroid disease. For example, you can obtain brochures and fact sheets on specific types of cancer, cancer screening, and cancer treatment from the National Cancer Institute's Cancer Information Service by calling 1-800-4-CANCER or by accessing the following web site: www.cancer.gov. The National Institute of Diabetes and Digestive and Kidney Diseases provides links to several organizations concerned with thyroid disease. For more information, access the following Web site: www.niddk.nih.gov/health/endo/pubs/endorg/endorg.htm.