UC 149-2

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INTERNAL CORRESPONDENCE

PLAINTIFF'S EXHIBIT

UC-3670

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WM. C. THURBER

METALS DIVISION

P. O. BOX 579 · 4625 ROYAL AVE., NIAGARA FALLS, NEW YORK 143

To (Name) Messrs.
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T. P. Norris - Long Beach, CA
J. E. Walsh - Atlanta, GA

Date July 18, 1978

Originating Dept. "Calidria" Asbestos

Answering letter date

Subject Governmental Information Campaign on the Hazards of Asbestos Exposure

Copy to Messrs.
G. R. Adams
R. E. Byrne, Jr.
T. W. Carmody
J. F. Collins
R. F. X. Fusaro
J. L. Myers
[redacted] Thurber

File Toxicology

You are all aware of HEW Secretary Califano's April 26, 1978 announcement of a governmental information campaign on the hazards of asbestos and the adverse press that it generated. The next step in this campaign is due to begin about mid-July and continue for a month. It consists mainly of highly emotional radio and TV spots that imply that anyone who has ever been exposed to asbestos is at risk and should immediately obtain a medical examination. This is obviously going to generate another wave of questions and some arbitrary, panic-based decisions. Unfortunately, about all we can do about it is give rational, objective answers to questions received and hope to ride out the storm without too much permanent damage.

The attached Briefing Package is intended to provide you with the information needed to field the questions. It may also be supplied to customers in response to inquiries on a selected basis. If you have any questions, please let me know.

H. B. Rhodes

Harrison B. Rhodes

HBR/rmm
Attachment

UCC 008716

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BRIEFING PACKAGE

UNITED STATES DEPARTMENT OF HEALTH, EDUCATION AND WELFARE PUBLIC INFORMATION CAMPAIGN ON THE HAZARDS OF ASBESTOS

SUMMARY

1. Substantial numbers of workers, particularly those in shipyards, have in the past been heavily exposed to asbestos. These exposures generally occurred many years ago before the hazards were realized and before regulations were enacted to minimize exposure to asbestos fibers.

2. There is a real and substantial health problem from these exposures which, due to the 20-30 years' lag time in the development of asbestos-related diseases, is just beginning to appear.

3. The risk of asbestos-related disease depends on the intensity of exposure and the potential for developing lung cancer is strongly enhanced by smoking. The severity of these historical exposures is not known and the estimate of 5-6 million potential deaths frequently cited is based on a series of assumptions of questionable scientific validity. We believe the number is grossly exaggerated but there is no good scientific basis to select or defend any other figure.

4. The government, after two years of heavy pressure by environmental groups and labor, has embarked on a campaign to inform physicians and workers about the hazards of asbestos exposure. The announcement of the campaign on April 26, 1978 by Secretary Califano stressed risks from past high exposures. The press coverage ignored this distinction and implied significant risk from any exposure. A copy of the announcement is included as Attachment I.

5. A key portion of the information campaign starts in mid-July and continues for about a month. It features extensive use of highly-emotional radio and TV spot announcements which continue to imply that any exposure to asbestos puts a worker at sufficient risk to require an immediate medical examination. Attempts by industry to have HEW modify the approach to a more objective, factual basis were unsuccessful.

6. The overall value of this campaign in the health protection of past workers is a very debatable issue. We believe, however, that there is no question that the manner in which the campaign is being presented is a calloused and irresponsible approach to a very sensitive human problem. Millions of past and present workers and their families who are not at any significant risk are being led to believe that they are likely to contract cancer.

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BACKGROUND

On April 26, 1978 the Secretary of Health, Education, and Welfare, Mr. Joseph Califano, announced a governmental campaign to notify physicians, past workers, and others at risk of the health hazards associated with asbestos exposure. He made an objective presentation of the situation emphasizing past, extremely high exposures that had occurred before the risk was recognized and before regulations were enacted. Shipyard exposure during World War II received particular attention.

This announcement came after several years of pressure by organized labor and a variety of environmental activist groups. A summary of the steps leading to the announcement and the information program planned by the government are given in Attachment II.

The press coverage of this announcement largely ignored the "high exposures well in the past" concept and implied the significant excess risk occurred in all exposures including today's regulated uses. A good response to the inaccurate coverage is provided in a statement prepared by the Johns-Manville Corporation given here as Attachment III.

EXTENT OF THE MEDICAL PROBLEM

There is extensive, undisputed evidence that heat insulation workers in the construction trade are at a very substantial excess risk of developing asbestosis and mesothelioma. Those who smoke also are at very high risk from lung cancer.

Asbestos-containing insulation was also widely used during World War II in ship construction and repair. War-time conditions prevailed with principle emphasis on production. The risks from asbestos exposure were not known and no attempt was made to control exposure. Typically it takes 20 to 30 years from initial exposure for asbestos-related diseases to appear. The critical time period for shipyard workers exposed during World War II is now at hand.

Over the past several years substantial evidence has accumulated that very heavy exposures did occur in the shipyards. They are not only found in the insulation workers but also in other trades who were present in the confined spaces common on shipboard. So far the results in the United States have been mainly seen as asbestosis and in various lung changes in shipyard workers, although some excessive mesothelomias have been found at some locations.

The number of people who may be affected is pure speculation at this time. It is generally agreed that the risk of contracting an asbestos-related disease depends directly on the intensity of exposure. The figures of 8-11 million workers exposed that are quoted apparently include all persons who have ever worked in a shipyard plus those from construction, mining and milling of asbestos and those involved with automotive brakes and brake repair. The insulation trade health experience is then applied to this total to arrive at the "5-7 million people will die of asbestos-related disease" statements that frequently appear in the media. This assumes that all of the millions of workers have been exposed at the intensity of those in the insulation trade and will have the same health response. This is a gross exaggeration due to the assumptions used but there is really

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no scientific basis to speculate on a more correct estimate. The health risk arising from heavy asbestos exposures 20-30 years in the past is real and substantial but the extent is clearly undefined.

THE JULY INFORMATION CAMPAIGN

In his April 26, 1978 announcement Mr. Joseph Califano, Secretary of HEW, made the statement:

> "Scientific studies have demonstrated that asbestos creates an especially high risk of lung cancer and other serious lung disease for workers who have been heavily exposed to this toxic substance." (Emphasis added)

He went on to point out that these exposures generally occurred many years ago, i.e, before the hazard was recognized and before strict governmental regulations were imposed. Particular emphasis was directed towards possible high exposure to shipyard workers during World War II and of the synergistic effect of smoking in increasing risk. Because workers, especially those exposed during the war years, may just now be facing serious health effects, the Secretary announced a systematic government campaign "...to notify physicians, past workers and others at risk of the hazards associated with asbestos exposure."

A key portion of this campaign will start about mid-July and will run about four weeks. It features extensive radio and TV spot announcements backed up by an information card to be included with all Social Security checks sent out next month. The spots expound the following message:

> "Million of workers in parts of the construction, mining, shipbuilding and auto industries have been exposed to asbestos dust. Sometimes it takes 30 years or more for asbestos-related diseases like lung cancer to show."
>
> "The doctor told me asbestos dust can be very dangerous. So all you guys better go see your doctors too."
>
> "Even if you feel good, check with your doctor, stop smoking, and get prompt medical treatment for respiratory illness."

We believe that these spot announcements do not accurately reflect the spirit of Secretary Califano's statements and present a grossly misleading picture of the asbestos health risk. They do not recognize that the degree of risk depends on the intensity of exposure and give the impression

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of greatly increased risk, regardless of exposure. The tremendous difference in health risk between past high exposures and today's closely regulated asbestos use at low exposure levels is not made clear. The construction and auto industries are also implicated in a "broad brush" way although, in fact, only limited segments of these industries show any evidence of significant past exposures.

In addition to these technical inadequacies, an emotional approach is used which plays on human fears. The established fact that many people exposed to asbestos, even those that are extremely heavily exposed, suffer no apparent ill effects is not mentioned. Asbestos is also only one of a multitude of causes of pulmonary problems and many doctors at this time do not have the special training and skills needed to distinguish asbestos-related diseases from those that result from other causes. HEW is setting up courses of instruction for doctors to attempt to alleviate this problem, but it will be many months before its effects are evident. Consequently, a wave of questionable diagnoses could result.

We believe that this campaign is being presented in a calloused and irresponsible manner and will result in millions of people, who are not actually at risk, living the rest of their lives with the fear that any chest pain or shortness of breath they experience is the first sign of asbestosis or asbestos-induced lung cancer. Unfortunately, the attempts to have the campaign moderated to a more objective and less emotional approach were rejected by HEW.

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HEW NEWS

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

FOR IMMEDIATE RELEASE
April 26, 1978

ATTACHMENT 1

STATEMENT OF
SECRETARY JOSEPH A. CALIFANO, JR.
DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Scientific studies have demonstrated that asbestos creates an especially high risk of lung cancer and other serious lung disease for workers who have been heavily exposed to this toxic substance.

The total number of workers exposed to asbestos since the beginning of World War II is estimated at between 8 and 11 million. Of that total, approximately 1.5 to 2.5 million are presently employed, while the remainder -- between 6.5 and 8.5 million workers -- were formerly employed in environments with significant asbestos exposure, including 4.5 million who worked in shipyards during World War II. Of those exposed in the past, a certain number -- which we cannot estimate with accuracy today -- have already died, either from asbestos-related or other causes.

Federal government responsibility for regulating current asbestos exposure is lodged in several agencies -- with the

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Occupational Safety and Health Administration bearing primary responsibility for regulating asbestos levels in the workplace and requiring employers to provide warnings to current employees.

But, to date, there has been no systematic government effort to notify physicians, past workers and others at risk of the hazards associated with asbestos exposure. Such notification is of special importance because the serious diseases associated with asbestos take a long time to develop -- from 15 to 35 or more years -- and because recent studies have underscored that workers exposed in the past, especially those from the war years, may just now be facing immediate, serious health threats.

As part of my responsibility to promote and protect the public health, I am today announcing several steps to inform doctors, workers and others about the increased health risks of asbestos exposure.

- Dr. Julius Richmond, the Surgeon General of the United States, will immediately send an advisory letter to all 600,000 doctors in the nation. This Surgeon General's advisory will set out the nature of the health risk posed by asbestos, describe certain steps doctors may wish to take when diagnosing or treating patients, and tell physicians where they can obtain additional information about

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asbestos-related diseases. [Both the physician advisory and a more detailed National Cancer Institute question and answer paper are attached to this statement.]

- HEW will launch a public information campaign aimed at workers and others exposed to asbestos. Dr. Arthur C. Upton, director of the National Cancer Institute, and Dr. David P. Rall, director of the National Institute of Environmental Health Sciences, will co-chair an HEW team to develop a detailed public information proposal in consultation with other Executive Departments, unions, employers and other interested parties. To the extent possible, the campaign will be targeted on those at the greatest risk. I have spoken with Secretary of Defense Harold Brown, and he has directed the Department of Defense personnel to work with us in taking appropriate steps to inform former military and Federal civilian workers in Naval shipyards.
- The HEW team will consider other measures which the Department might take to deal with the asbestos problem, in addition to preparing the public information campaign. Such measures include: improved surveillance, other means of informing

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affected individuals such as outreach through unions and employers, development of further information for physicians, and additional research.

Asbestos is the term used for a group of fibrous materials that do not burn and are excellent thermal insulators. In the past four decades, asbestos has been used for a great number of purposes -- more than 3,000 uses have been identified -- with two-thirds of all asbestos used in the construction industry. Ship construction has been an activity with especially high use of asbestos, since the substance is effective in insulating boilers, steampipes, hot water pipes and nuclear reactors.

Unfortunately, numerous studies have indicated that exposure to asbestos in settings, like the workplace, where it is concentrated, significantly increases the risk of incurring four serious diseases: lung cancer, asbestosis (a progressively debilitating lung disease that impairs breathing and increases risk of serious illness or death from respiratory infections like pneumonia), mesothelioma (a cancer of the chest and abdominal cavities) and certain gastro-intestinal cancers.

Both the Surgeon General's advisory and public information campaign will suggest certain actions that individuals exposed to asbestos can take to reduce or mitigate the health threat to the greatest extent possible. They will

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stress that no single step has a more important effect in reducing risks from two of the most common diseases associated with asbestos -- lung cancer and asbestosis -- than stopping cigarette smoking.

Our best estimates of the increased risks associated with asbestos exposure are based on HEW supported studies of workers heavily exposed to asbestos before the government began to regulate asbestos in the workplace in the late 1960's and early 1970's. As a result of recent government regulation, current workers, without previous exposure, can be expected to face smaller risks than those exposed in the past.

The risks for past workers regularly exposed to asbestos are estimated to be as follows:

Lung Cancer. A non-smoker who has been exposed to asbestos is three to four times more likely to develop lung cancer than a non-smoker who has not been exposed. However, a smoker who has been exposed to asbestos is up to 90 times more likely to incur lung cancer than a non-smoker who has not been exposed, and up to 30 times as likely to incur lung cancer than a non-smoker who has been exposed.

At present, it is estimated that 20-25 percent of workers, both smokers and non-smokers, exposed to asbestos before the era of government regulation die of lung cancer.

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Asbestosis. Only individuals exposed to asbestos contract asbestosis which afflicts approximately 7 percent of the number of workers exposed in the past. Asbestosis is an irreversible and progressively disabling lung disease that impairs breathing, and individuals with the disease are much more likely to die of respiratory ailments, like pneumonia, than individuals who do not have asbestosis. The Surgeon General advises me that clinical experience indicates a person who smokes and has been exposed to asbestos faces a greater risk of developing asbestosis and of dying from a respiratory ailment that an asbestos exposed individual who does not smoke.

Mesothelioma. As with asbestosis, only those individuals exposed to asbestos appear to contract this disease. Approximately 7-10 percent of those exposed to asbestos in the past die of this cancer.

Gastro-intestinal cancer. Individuals exposed to asbestos in the past are estimated to be about twice as likely to die of gastro-intestinal cancers -- including cancers of the esophagus, stomach and colon -- as non-asbestos exposed individuals. Approximately 8 to 9 percent of asbestos-exposed individuals die of these types of cancer.

In addition to the 4.5 million persons who worked in shipyards during World War II, it is estimated that 500,000 to 1.4 million persons have been employed in shipyards

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since the War. Other occupations in which there has been significant exposure to asbestos include asbestos mining and processing; construction work involving insulation; building demolition; roofing; and automotive work in brake and clutch lining installation and repair.

In addition to the Surgeon General's advisory, information will be available to physicians through other means: Ca-The Cancer Journal for Clinicians, a publication of the American Cancer Society, is publishing this week in its March-April issue an article by Dr. Irving Selikoff and Dr. E. C. Hammond on the effect asbestos exposure has had on shipyard workers; the American Medical Association will be publishing a physician advisory in its Journal; and the attached question and answer background paper prepared by the National Cancer Institute will be made available to doctors through the American Cancer Society, the American Lung Association and all state medical societies, as well as through the National Cancer Institute itself.

The actions I am announcing today with respect to asbestos are based on a number of factors, but two of the most important are: the number of individuals affected who are unaware of the risk and the fact that asbestos is one of the most dangerous and insidious substances in the workplace.

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Given the numbers of unaware individuals affected and the serious risks involved, it is imperative that HEW -- the Executive Department primarily charged with developing health policy -- work closely with other Executive Departments and Agencies in devising all appropriate steps to protect the health of our citizens.

If individuals have questions about what they should do in addition to stopping smoking, they should consult their personal physicians.

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DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
WASHINGTON, D.C. 20201
April 25, 1978

SURGEON GENERAL
OF THE
PUBLIC HEALTH SERVICE

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PHYSICIAN ADVISORY - HEALTH EFFECTS OF ASBESTOS

The results of recent studies of shipyard workers have increased concern about the health effects associated with previous occupational exposure to asbestos. This advisory notice will assist you in dealing with inquiries from your patients and other members of the public.

Asbestos refers to a group of widely used fibrous minerals. Significant exposure of men and women employed in shipyards is known to have occurred, even among those not directly working with asbestos. Exposure to asbestos can also occur in many settings, such as, direct mining and manufacturing; construction; insulation; roofing; demolition; brake lining; and the manufacture and installation of asbestos pipe, sheets, panels, paper products, friction materials, textiles, floor tiles, paints, and gaskets. The risk has been documented extensively for certain occupational exposures, and there are reports that asbestos-associated disease also occurs in household contacts of asbestos workers.

The primary effects of past asbestos exposure are asbestosis, a lung disease, and certain types of cancer, primarily lung cancer and pleural and peritoneal mesothelioma and, less frequently, gastro-intestinal and other cancers. It is now known that the health effects of asbestos appear after a long latent period (15, 25, 35 or more years) after the initial exposure. Exposures as short as a month may result in disease many years later, because the inhaled dust, being mineral, tends to remain in the tissues. It has been noted in studies of heavily exposed workers that approximately 20 to 25 of each 100 deaths among asbestos workers 20 or more years from onset of exposure are found to be from lung cancer, 7 to 10 from mesothelioma, 4 from cancer of the esophagus, stomach, colon/rectum, and some excess cancers of other sites (oropharynx, larynx, and kidney). In addition, in some groups, as many as 7 percent of workers die of a form of pneumonoconiosis, asbestosis. Cigarette smoking significantly increases the lung cancer risk of asbestos exposure and aggravates asbestosis.

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In dealing with your patients or other individuals who worked in shipyards or believe that they were otherwise exposed to asbestos, you may wish to consider the following issues:

1. Occupational or Exposure History -- A detailed, lifetime history must be obtained. This is time consuming, but important because significant exposures may have been brief (one month) and may have occurred many years ago (i.e., during World War II). Because the World War II work force was comprised of many women as well as men, the potential for female patient involvement should not be overlooked.

2. Careful Management of Lung Disease -- A detailed history for symptoms such as shortness of breath or exertional dyspnea, physical examination, chest x-ray, and pulmonary function tests may be helpful in diagnosing the pneumoconioses associated with asbestos. Early x-ray changes are often subtle so x-rays must be reviewed carefully by experienced readers. Such readings should include a thorough search for pleural changes. Careful attention to and aggressive treatment of respiratory infections may be important in patients with asbestosis. The use of currently effective influenza and pneumococcal vaccines should be considered.

3. Emphasis on Smoking Cessation -- Discontinuation of smoking is an important step in the control of the sequelae of asbestosis and will assist in the prevention of lung cancer. Individuals who smoke and who have been exposed to asbestos have 30 to 90 times the risk of getting lung cancer of individuals who neither smoke nor have been exposed to asbestos and 7½ to 30 times the risk of the non-smoking asbestos workers. Data are available which show that cessation of smoking will significantly diminish the risk of developing lung cancer among asbestos workers.

4. Cancer Surveillance -- The usefulness of screening asymptomatic, exposed individuals for lung, gastro-intestinal and other cancers is now under study in clinical trials. Individuals, however, should be carefully questioned regarding possible symptoms which could be related to cancer: chest pain, hoarseness, hemoptysis, weight loss, melena, etc. If such symptoms are present, an appropriate diagnostic workup should be undertaken.

It is important to note that many people exposed to asbestos -- perhaps a majority -- suffer no apparent ill effects. It is hoped that most of your patients will be in this category.

Current use of asbestos is regulated, but attention must be given to proper ventilation and engineering controls and the use of respirators -- all measures of primary prevention. In the past the dangers of asbestos exposure were not fully appreciated; much exposure occurred in previous decades, particularly in shipyards, where individuals often worked in confined quarters.

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A discussion of asbestos and its health effects appears in the March/April issue of Ca, The Cancer Journal for Clinicians and is available through the American Cancer Society, 777 Third Avenue, New York, New York 10017. A more detailed physician information alert will be distributed by the National Cancer Institute through a number of medical journals within the next two or three months including the Journal of the American Medical Association. Additional information including a more detailed series of questions and answers can be obtained by writing to Asbestos, National Cancer Institute, 9000 Rockville Pike, Bethesda, Maryland 20014.

Sincerely,

Julius B. Richmond, M.D.
Surgeon General
Assistant Secretary for Health

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QUESTIONS AND ANSWERS

ABOUT EXPOSURE TO ASBESTOS

April 26, 1978

National Cancer Institute
Office of Cancer Communications
Bethesda, Maryland 20014

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QUESTIONS AND ANSWERS
ABOUT EXPOSURE TO ASBESTOS

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19. What can be done to treat diseases that may be associated with asbestos?----------page 7

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21. In addition to research on developing better detection methods and treatments, what steps are Federal agencies taking about the asbestos problem in shipyard workers?----------page 8

22. Where can a worker go for more information about cancer and other asbestos-related diseases?----------page 9

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National Cancer Institute
Office of Cancer Communications
Bethesda, Maryland 20014

QUESTIONS AND ANSWERS ABOUT EXPOSURE TO ASBESTOS

1. Who may be at risk of developing asbestos-related diseases?

Workers in many occupations, particularly in asbestos mining and processing, shipyards, construction, and workers in automotive brake lining repair commonly are exposed to asbestos, and may inhale or perhaps swallow dusts contaminated with concentrations of this substance.

Risks of disease due to asbestos exposures have not been defined clearly for all occupational groups known to have significant exposure. Firm scientific data are available only for heavily exposed insulation workers. Over the past several years, evidence has accumulated that asbestos insulation workers previously employed in shipyards and elsewhere are experiencing asbestosis, a progressive and disabling lung disease, and markedly increased rates of cancer. Workers who manufactured the asbestos insulation materials used in shipyards also have increased asbestos-related disease.

There is evidence that the problem may be more widespread than previously believed. Workers from a variety of trades who have been employed in shipyards, presumably in or near areas contaminated by asbestos dust, are now beginning to show signs of X-ray abnormalities in the lungs typical of asbestos exposure. These include painters, electricians, carpenters, machinists, boilermakers, and welders who may not realized they were exposed.

Large numbers of persons worked around asbestos in shipyards during and since World War II. During the peak war years, 1940-44, an estimated 4.5 million persons worked in shipyards in the United States, and even those not directly exposed to asbestos dust may have a higher risk of asbestos-related disease. In the last 15 years, the number of shipyard workers has stabilized to an annual workforce of approximately 200,000. Because of the high turnover in jobs during the war and afterward, no one really knows how many many people experienced significant asbestos exposure in their work in the shipyards.

The total number of workers exposed to asbestos since the beginning of World War II, including shipyard workers is estimated between 8 and 11 million.

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2. What diseases may be caused by asbestos?

Asbestos can cause asbestosis and certain forms of cancer. Among some groups of workers who were heavily exposed to asbestos, as much 20-25 percent of all deaths are due to lung cancer. This rate is much higher than would be expected from the effects of cigarette smoking alone. In the general adult population, about 4-5 percent of all deaths are due to lung cancer. In addition, asbestos workers are at increased risk of mesothelioma, an otherwise uncommon type of cancer not associated with smoking and rarely observed in the general population. Above-average rates of cancers of the digestive system (esophagus, stomach, colon, rectum) have been found in groups of asbestos workers. Cancers of a number of other body sites also are thought to be associated with occupational exposure to asbestos, but these are less common.

3. What is the role of cigarette smoking?

Asbestos and cigarette smoking together produce more lung cancer than either factor acting alone. For example, investigators at the Mt. Sinai School of Medicine in New York City, together with epidemiologists at the American Cancer Society, have found that asbestos workers who smoke have a risk of lung cancer 8 times the risk of smokers in the general population. Cigarette smoking also increases the risk of other types of cancer and disabling lung diseases (emphysema, bronchitis).

Some information suggests that quitting smoking can reduce this extremely high risk in asbestos workers.

Although nonsmoking asbestos workers have more lung cancer than nonsmokers in general, this is still a comparatively low risk. They do not experience the extremely high risk of lung cancer of asbestos workers who smoke. However, they still are at increased risk of gastrointestinal cancers.

4. Are there other work-related exposures that may aggravate risk of disease in workers previously exposed to asbestos?

Whether exposures from operations such as welding, and substances such as volatile solvents interact with asbestos to increase risk of diseases such as cancer is not known at this time. However, workers should be aware of health hazards in the workplace and protect themselves from unnecessary exposure.

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5. How does asbestos cause disease?

The answer is not known. Asbestos fibers too fine to be seen by the human eye become airborne during various industrial processes and are inhaled and subsequently may be swallowed. Scientists believe the most harmful fibers are so fine that an electron microscope is needed to see them. Because of their size and shape, asbestos fibers can penetrate body tissues. Because of their durability, they remain in the body for many years after entry.

6. How much asbestos exposure is hazardous?

The answer is not known. In the case of asbestosis and lung cancer, the risk increases with increasing amount of exposure. Asbestos-induced disease is not likely to appear until 15 to 35 or more years after first exposure. The time between first exposure and the appearance of disease appears related both to the amount and duration of exposure: more intense exposure sometimes results in asbestos-related disease within 15 years. However, one study of workers in an asbestos plant showed that some workers who were exposed only a month or two have developed asbestos-related diseases many years later.

Typically, the first 10 to 15 years after initial exposure are free of signs or symptoms. Early X-ray changes may appear in lung tissue after 10 to 15 years, but may not be accompanied by other significant symptoms. Some investigators have reported evidence of impaired lung function in workers with less than 10 years of exposure to asbestos.

7. What is asbestos?

Asbestos is the common name for a group of natural minerals that occur as masses of compact or relatively long, silky fibers. Six fibrous minerals, members of a family called silicates, are recognized as asbestos: chrysotile (white asbestos) and actinolite; amosite (brown asbestos), anthophyllite, crocidolite (blue asbestos) and tremolite.

Commercially, chrysotile is the most important form of asbestos, with most chrysotile used in the United States being imported from Canada. All forms have a tendency to break into a dust of tiny fibers that can float in the air and be inhaled or swallowed.

8. How much is used?

Asbestos has been used in small amounts for thousands of years. Modern industrial use in the United States dates from about 1880, when mining of the Quebec chrysotile deposits began. Gradual increases in production and use occurred during the next 50 years, followed by accelerated use more recently. From 1970-75, the amount of asbestos fiber used in the United States averaged some 800,000 tons annually, according to the U.S. Bureau of Mines.

Amosite from South Africa has been used in the U.S. in smaller quantities in industries such as shipbuilding.

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9. How is it used?

Asbestos has about 3,000 different uses, with about two-thirds being used in the construction industry in building products, insulation, friction materials and textiles. Manufactured products have included reinforced asbestos cement sheets and pipes, patching and taping compounds, floor and ceiling tiles, as well as paints, coatings and sealants containing asbestos as reinforcing fillers, pipe linings and fillers for various liquids.

Friction products include clutch facings and brake linings for automobiles, railroad cars, airplanes, and industrial machinery. A variety of other uses are known, including theatre curtains, fireproof "blankets," filtration materials, and until recently, artificial ashes in false fireplaces and dry-wall patching compounds.

Once incorporated into manufactured items, the hazard resulting from asbestos is less serious, as long as the substance is not disrupted in any way. However, the fibers are nearly indestructible. A potential health risk arises whenever asbestos fibers are set free, resulting in asbestos dust.

10. How has asbestos been used in shipyards?

Asbestos has been used extensively in shipyards to cover pipes and surfaces in new construction, repair and refitting. Major sources of exposure to asbestos in shipyards have been in fabrication of asbestos materials (such as pipe-coverings), their installation, and their removal during repair and refitting work.

Asbestos has been included in insulation materials such as boards, mattresses, and cloth for engines, hulls, and decks; covering of ventilation and water pipes; coatings for cables and electric wires; wall boards and tiles; and putties, caulks, paints, joint fillers, and cement products. It may also be present in construction materials such as gaskets, rings, tape, tubing, twine, webbing, washers and coated electric wires.

Asbestos exposure in shipbuilding probably is now far less than it was in the past, due largely to improvements in engineering and industrial hygiene methods and the introduction of other insulation materials into construction.

11. What are the signs and symptoms of asbestosis?

Asbestosis is a chronic lung disease whose signs and symptoms result from permanent changes in lung tissue due to asbestos exposure. The earliest and most prominent sign is shortness of breath on exertion.

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It rarely becomes apparent until at least a decade after first exposure. The disease process usually has to be rather advanced to produce shortness of breath, however.

A dry, crackling sound (rales), coming from the lungs during inhalation, is the most characteristic physical sign of asbestosis. Clubbing of the fingers is sometimes found, usually late in the disease. A bluish discoloration of the skin and the lining of the mouth and of the tongue also may occur in the later stages of the disease. A physical exam with X-rays will show diffuse scarring of the lungs as asbestosis develops, and lung function tests will show impairment of the maximum volume of air a worker can inhale.

12. Does asbestosis lead to lung cancer?

Scientists do not believe asbestosis necessarily leads to lung cancer, but the presence of this disease does indicate that a worker received considerable asbestos exposure and has a greater risk of developing asbestos-associated cancers than an unexposed person.

Both types of disease can be caused by the same environmental agent, and the development of each may be independent of the other.

13. What are the symptoms of lung cancer?

A cough, or a change in cough habit, is found in most lung cancer patients. Chest pain is the second most common symptom. It is usually felt as a persistent ache unrelated to cough and is commonly experienced on the side on which the tumor is located. Blood-streaked sputum, coughed up from the lungs, is the initial symptom of a small percent of lung cancers.

14. How is lung cancer diagnosed?

Initial diagnosis is by chest X-ray examination. Confirmation is by means of medical procedures such as sputum cytology, or biopsy by means of fiberoptic bronchoscopy, mediastinoscopy or by thoracotomy.*

15. What is mesothelioma?

Mesothelioma is an extremely rare cancer in the general population, but is common among asbestos workers. It affects the pleura, a membrane lining the chest cavity, or the peritoneum, a similar membrane lining the abdominal cavity. A large proportion of mesothelioma cases can be traced to prior asbestos exposure.

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*More information is available in a brochure, "Progress against Cancer of the Lung," available from the Office of Cancer Communications, National Cancer Institute, Bethesda, Maryland 20014. Living with Lung Cancer, a book in paperback form for patients, also may be helpful, and is available at nominal cost from Schmidt Printing, Inc, P.O. Box 6006, Rochester, Minnesota 55901.

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Only 120 cases of mesothelioma of the pleura and peritoneum were reported in the National Cancer Institute's Third National Cancer Survey of 1969-71, compared to 24,049 cases of lung cancer. The nine areas surveyed represented approximately 10 percent of the United States population. There is some indication from recent scientific reports that mesothelioma is becoming a more common diagnosis.

16. How is mesothelioma detected and diagnosed?

The most common first symptom may be shortness of breath or pain in the wall of the chest which is aggravated by deep breathing, or abdominal pain, which may vary from vague discomfort to severe spasms, sometimes located in the upper right region of the abdomen. Occasionally, this pain is accompanied by a need to urinate or defecate. Although chest X-ray is of some help in diagnosing mesothelioma when it occurs in the lining of the lung, precise diagnosis of this unusual cancer is difficult and requires an exploratory operation of the chest or abdomen, depending on the patient's symptoms, to provide tissue for microscopic examination.

17. If a worker currently is exposed to asbestos, what can he do to protect himself?

He can take steps to make sure his employer is aware of and following the asbestos exposure and related industrial exposures regulations of the Occupational Safety and Health Administration (OSHA). First, he can request a copy of the Standard on Worker Exposure to Asbestos from the Office of Information, OSHA, Washington, D.C. 20210 or from regional offices in Boston, New York, Philadelphia, Atlanta, Chicago, Kansas City (Mo.), Dallas, Denver, San Francisco and Seattle.

After studying the standard, a worker may wish to discuss apparent shortcomings with his employer or union representative to try to get them corrected. He also may initiate a complaint of workplace hazards with OSHA for investigation.

A booklet, Good Practices Manual for Insulation Installers, also is available and may be ordered from the Clearinghouse for Occupational Safety and Health Information, National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, Ohio 45226. This publication describes recommended procedures for working with asbestos.

Recommended practices for demolition operations have been published by the EPA. "Sprayed Asbestos-Containing Materials in Buildings: A Guidance Document" is available from the Standards Development Branch, U.S. Environmental Protection Agency, Research Triangle Park, N.C. 27711.

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18. What else can a worker who was exposed occupationally to asbestos do to protect his health?

First, if still working around asbestos, he should take immediate steps to avoid additional exposure.

Second, if he hasn't smoked cigarettes he should never start. If he has, he should quit. This will reduce the risk of lung cancer, no matter how many years he has smoked. He should also be alert to other potential health hazards in the workplace.

Third, he should get regular health check-ups. His doctor should be made aware of his occupational history (for example, that he once worked in a shipyard), and provide a physical examination, that includes a chest X-ray, a lung function test, a rectal examination, and a sputum analysis. (Sputum cytology, the examination of cells in deep cough sputum samples, is a procedure still under study as a diagnostic method for lung cancer and is not widely available. However, it has shown some usefulness in studies of asbestos workers as an aid in identifying exposure.)

Lung cancer, mesothelioma, asbestosis and other serious complications of asbestos exposure are late results of asbestos-induced disease. Early X-ray changes often precede these serious consequences.

Absence of X-ray change is no guarantee of future safety. Some workers have had enough asbestos exposure to cause mesothelioma without showing earlier X-ray changes. However, in general, absence of X-ray change many years after initial exposure provides evidence of limited exposure.

19. What can be done to treat diseases that may be associated with asbestos?

Asbestosis: Most deaths from asbestosis are due to superimposed respiratory infections such as pneumonia and bronchitis, rather than to direct effects of the disease itself. These infections usually can be treated, but it is important to get medical attention early.

Lung and Esophageal Cancer: Treatment of these cancers depends on the type and amount of tissue affected. Lung cancer may be treated by surgery, drugs, radiation, or combinations of these treatments. Esophageal cancer is treated most often with radiation. As with most cancers, the treatment must be tailored to the individual patient.

Cancer of the Colon and Rectum: Surgery is curative in many cases and early diagnosis increases the likelihood of cure. Methods are available to improve the frequency of early diagnosis.

Mesothelioma of the Pleura or Peritoneum: Effective treatment is not yet available. Research is underway in the United States, Great Britain, and France to improve the treatment.

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Cancer of the Stomach: Detection has been improved by development of the flexible gastroscope and gastric camera. Treatment is usually by surgery. New treatment regimens using drugs are improving the outlook for patients with this cancer.

Cancers of the Kidney, Throat, and Nasal Passages: Physician awareness of the possibility of occurrence improves chances for early diagnosis. These cancers often can be treated effectively by surgery and/or radiation therapy.

20. What federal agencies are concerned with the effects of asbestos exposure?

The National Cancer Institute (NCI) and National Institute of Environmental Health Sciences (NIEHS) are conducting or sponsoring research on the health hazards of asbestos. The National Institute for Occupational Safety and Health (NIOSH) also is responsible for research on the documentation of hazards, and operates an information service to answer workers' questions about occupational safety.*

The Occupational Safety and Health Administration (OSHA) regulates worker exposures. This Agency is part of the U.S. Department of Labor. The Environmental Protection Agency (EPA) is charged with monitoring levels of asbestos in air and water. The Food and Drug Administration (FDA), a part of the U.S. Department of Health, Education and Welfare, is concerned with asbestos contamination of foods, drugs, and cosmetics, such as might occur during the manufacturing process.

The Consumer Product Safety Commission (CPSC) recently has banned the use of asbestos as artificial ash for ceramic logs in gas-burning fireplaces, consumer clothing made of asbestos, and the manufacture of dry-wall patching compounds containing asbestos.

21. In addition to research on developing better detection methods and treatments, what steps are Federal agencies taking about the asbestos problem in shipyard workers?

An Asbestos Subcommittee of the Armed Forces Epidemiology Board has been established and currently is reviewing programs which might be recommended to the Secretary of Defense concerning asbestos-related disease among civilian employees of the Armed Forces, as well as veterans and men and women currently in service. At the request of this Subcommittee, additional information is being gathered to assess the health risks of shipyard workers in various U.S. locations.

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*Address is in question #17.

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Investigators of the Environmental Sciences Laboratory, Mount Sinai School of Medicine of the City University of New York and the American Cancer Society, are collaborating in a number of studies of shipyard workers, funded partly by the National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina. NIEHS also is sponsoring a study in rodents on ingestion of asbestos minerals with partial support from the EPA.

The National Cancer Institute (NCI) has planned an analysis of respiratory cancer in several shipbuilding areas along the east coast of the United States. Currently, NCI is completing an interview analysis of lung cancer cases and controls along the southeastern Atlantic seacoast where elevated lung cancer death rates were found in a nationwide study of geographic cancer patterns.

An educational program for physicians and the public is being developed by DHEW in cooperation with the voluntary health agencies, concerned unions, and the asbestos industry.

22. Where can a worker go for more information about cancer and other asbestos-related diseases?

- Sixteen Cancer Information Service (CIS) offices provide toll-free telephone sources of information. These offices can help with a variety of questions about cancer, including causes, prevention, detection, diagnosis, treatment, rehabilitation assistance, medical facilities available in a particular region, home-care assistance programs, financial assistance for cancer care, emotional counseling services, and patient referrals. These offices also can provide information about local smoking cessation clinics.

- CIS offices do not diagnose cancer or recommend treatment for individual cases. They do provide facts, understanding and rapid access to the latest information on cancer and local resources. The locations of the CIS offices are indicated on the attached brochure.

- Workers may wish to contact their international unions, or the Industrial Union or Metal Trades Departments of the AFL-CIO, 815-16th Street, N.W., Washington, D.C. 20006 for specific source of medical help, information on asbestos control, and insurance matters.

- Individuals who once worked in the Navy shipyards may wish to contact the Department of Defense, Public Correspondence, Directorate for Management, Washington, D.C. 20301.

- Inquiries concerning environmental exposures such as those occurring during building demolition, or other air and water concerns may be answered by the Public Information Center, PM-215, U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460.

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- The Consumer Product Safety Commission (CPSC) operates a "hot-line" for answering questions about potential hazards of commercial products: (800) 638-2666 except Maryland residents, who should call (800) 492-2937.

- For information on current federal regulations concerning the workplace, workers may contact the Occupational Safety and Health Administration, Office of Information, Washington, D.C. 20210.

- The Office of Cancer Communications, National Cancer Institute, Bethesda, Maryland 20014, will answer questions about health risks associated with asbestos exposures.

- For specific information on how to quit smoking, a worker may contact the Office on Smoking and Health, Room 6222 Humphrey Building, 200 Independence Avenue, S.W., Washington, D.C. 20201.

- Civilian employees of the Navy may direct specific inquiries concerning compensation to the Department of Labor, Office of Workers' Compensation Programs, Employment Standards Administration, 200 Constitution Avenue, N.W., Room S3524, Washington, D.C. 20210. Employees of private contractors in the shipyards should contact their unions for advice, or the office of workers' compensation programs of the State government.

- Other sources of information on how to quit smoking, lung diseases, and cancer are provided by local offices of the American Lung Association and the American Cancer Society. These organizations have local offices throughout the United States that may be identified from the telephone book.

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Asbestos-associated Disease in United States Shipyards

Irving J. Selikoff, M.D. and
E. Cuyler Hammond, Sc.D.

CLINICAL LATENCY OF ASBESTOS-ASSOCIATED CANCER

During the past 15 years the important disease potential of asbestos exposure has been clarified. The principal hazards have been demonstrated to be cancer of a number of sites, and asbestosis. Among asbestos workers, approximately 20 percent of all deaths are due to lung cancer, six percent or seven percent to pleural and/or peritoneal mesothelioma, and there is an excess found in several other categories (e.g., cancer of the esophagus, stomach, colon-rectum, oropharynx, larynx, kidney). Table I provides an analysis of causes of death among 17,800 asbestos insulation workers in the United States and Canada followed prospectively from January 1, 1967 to January 1, 1977.

Risk of asbestos-associated disease has also been observed in workers in other trades where asbestos exposure occurs—for example, where individuals simply working near "asbestos workers" are exposed to the same dusts. Risk extends even to individuals not employed in an asbestos-contaminated environment; mesothelioma has been found among family contacts of asbestos workers residing in the same households, as well as among people living within a quarter of a mile or so of asbestos plants or other facilities which have used asbestos-containing materials.

Although mesothelioma is not necessarily the most common disease resulting from asbestos exposure, it provides a very useful index of such problems, since it is only uncommonly seen as a result of exposure to other agents or without identified cause. Large scale investigations of series of cases of mesothelioma in France, Great Britain, the Netherlands[1,2] and elsewhere have demonstrated that the large majority of these cases can be traced to prior asbestos exposure.

For these neoplasms, as for all cancers due to asbestos exposure (and, indeed, for extensive asbestosis as well), a rather uniform characteristic has been found: the disease usually does not become clinically evident for 15, 25, 35 or more years from onset of asbestos exposure. The initial decades are periods of grace with no illness or disability. While some early X-ray changes may be seen after five to 15 years, they are limited in extent and not usually accompanied by significant symptoms. They merely dem-

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This is a special report from the Environmental Cancer Research Project, American Cancer Society and the Environmental Sciences Laboratory of the Mount Sinai School of Medicine of the City University of New York.

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TABLE 1
Deaths among 17,800 asbestos insulation workers in the United States and Canada January 1, 1967–January 1, 1977

Number of men	17,800
Man-years of observation	106,855

	Expected*	Observed
Total deaths, all causes	1,000.95	1,270
Total cancer, all sites	379.90	661
Lung cancer	105.97	485
Pleural mesothelioma	**	85
Peritoneal mesothelioma	**	109
Cancer of esophagus	7.01	18
Cancer of stomach	14.23	22
Cancer of colon-rectum	37.86	59
All other cancer	154.83	225
Asbestosis	**	162
All other causes	1,351.00	1,114

*Expected deaths are based upon white male age specific mortality data of the U.S. National Center for Health Statistics for 1967–1975 and extrapolated to 1976.

**There are rare causes of death in the general population.

The membership of the International Association of Heat and Frost Insulators and Asbestos Workers, AFL-CIO, CLC, was enrolled on January 1, 1967, and has been observed since

onstrate that enough asbestos exposure has occurred to produce such changes. In this sense, they are harbingers of future risk of clinical disease.

Tables 2-5 illustrate the characteristic latency of asbestos disease. In one group of 1,117 asbestos insulation workers in the New York metropolitan area, most of 722 workers with less than 20 years from onset of exposure (Table 2) had normal X-rays. When changes were present, they were minimal in extent. On the other hand, after the 20-year point, most X-rays were found to be abnormal, frequently extensively so.* Tables 3-5 show that few mesotheliomas and little excess cancer of the lung occurred less than 20 years from onset. Most occurred 30 or more years from onset of exposure. A young man may begin work at the age of 18; his risk of asbestos-associated cancer does not become substantial until he is 40, 50 or older.

EARLY STUDIES: MESOTHELIOMA IN SHIPYARDS

In 1968, the first warning that asbestos

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TABLE 2
X-ray changes in asbestos insulation workers[4]

Onset of exposure (yrs.)	No.	% Normal	% Abnormal	Asbestosis (grade) 1	2	3
40+	121	5.8	94.2	35	51	28
30-39	154	12.9	87.1	102	48	18
20-29	77	27.2	72.2	35	17	4
10-19	279	55.9	44.1	108	9	0
0-9	346	89.6	10.4	36	0	0
Total	1,117	51.5	48.5	366	126	50

disease might be a serious problem in shipyards was sounded by Harries[5] in Great Britain and Stumphius[6] in the Netherlands when they reported instances of mesothelioma among shipyard workers. What was worrisome was that the men were not "asbestos workers" but rather, individuals employed in other trades. At the Devonport shipyard of the Royal Navy, for example, mesothelioma in a boilermaker, a fitter, a shipwright, a welder and a laborer were described.

This raised the important question of whether asbestos use in shipyards might result in the exposure of the workers employed in many trades, to dust derived from the few "asbestos workers" in their midst. In 1943, in the United States, for example, approximately one in 500 shipyard workers was an insulator. The other 499 included welders, shipfitters, machinists, pipefitters, electricians, boilermakers and painters (Table 6). The significance of this question is made apparent by the fact that during World War II, approximately 4,500,000 men and women worked in our shipyards, many of them under conditions in which exposure to asbestos was possible. After World War II the total number of shipyard workers rapidly decreased from a high of 1,700,000 in the last months of 1943 to 200,000 or so. During the period of 1946-1976, total employment remained in this range, fluctuating with economic conditions and the country's shipbuilding program. The 200,000-250,000 figure characterized the total number in the yards at one time; however, there was much turnover, and the total number of different individuals was much larger. There are no accurate data readily available which could tell us how many different people—carpenters, riggers, electricians, draftsmen, welders, etc.—were so employed. Nevertheless, the early observations (soon augmented by later studies[7,8]) pointed to a potentially serious problem.

Harries has recently published his further observations at Devonport, through 1973.[9] By the end of the year, he had observed 55 cases of mesothelioma in that shipyard alone. Again, trades other than "asbestos workers" gave evidence of the hazard. Only two of the 55 worked directly with asbestos (lagger, sprayer). The other 53 included 14 shipwrights, nine boilermakers, eight fitters and eight electricians (Table 7).

John Enge of High Carley Hospital has published similar data from shipyards in Barrow (Table 8)[10]; his most recent observations are particularly disturbing.[11] In Barrow, 429 individuals were seen, be-

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TABLE 3

Deaths among 17,800 asbestos insulation workers in the United States and Canada January 1, 1967-January 1, 1977: Analysis by duration from onset of employment

	12,083 89,486	12,051 77,329
Total men Man-years of observation	Before 20 years from onset	20 or more years from onset
	Expected* Observed	Expected* Observed
Total deaths, all causes	283.93 324	1,377.01 1,946
Cancer, all sites	42.65 83	272.25 911
Lung cancer	12.03 35	93.94 449
Pleural mesothelioma	** 2	** 64
Peritoneal mesothelioma	** 3	** 106
Cancer of esophagus	0.66 1	6.35 17
Cancer of stomach	1.56 1	12.67 21
Cancer of colon-rectum	4.07 4	33.79 85
Asbestosis	** 8	— 154

*Expected deaths are based upon white male age specific mortality data of the U.S. National Center for Health Statistics for 1967-1975 and extrapolation to 1976.

**These are rare causes of death in the general population.

twoen 1964 and 1971, with radiologically evident pleural plaques; these plaques were considered to signal prior shipyard employment. Controls were 429 men from a neighboring city (Carlisle), matched for age and date of X-ray; they had no plaques on their roentgenograms. Both groups were observed through 1976, i.e., for a minimum of five years. Among the 429 men with pleural plaques, there were 127 deaths; those with no plaques suffered 74 deaths. The excess was primarily in two categories, lung cancer and mesothelioma. There were 19 deaths from lung cancer and 23 from mesotheliomas among the former shipyard workers. As for the controls, four died of lung cancer and none died of mesotheliomas.

Findings of an extraordinary increase of mesotheliomas were also reported last year from the French shipyard area in Western Brittany. Lajmore et al. analyzed cases of pleural mesotheliomas in Nantes. In the period 1957-63, there were two cases; from 1964-1970 there were 12; and from 1971-1974 there were 24.[5] This was interpreted as consistent with the markedly increased shipbuilding program during and after World War II, and with its attendant risk of asbestos exposure.

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TABLE 4
Deaths among 17,800 asbestos insulation workers in the United States and Canada, Jan. 1, 1967-Jan 1, 1977: Analysis by duration from onset of employment

Duration from onset (years)	Number of men	Person-years of observation	Lung cancer		Pleural mesothelioma No./1000 person-years	Peritoneal mesothelioma No./1000 person-years
			Expected*	Observed		
<10	5,552	25,393	0.69	0	0	0
10-14	9,083	39,803	2.77	7	0	0
15-19	5,948	34,699	8.57	29	0.06	0.09
20-24	6,837	31,269	17.03	59	0.19	0.10
25-29	6,693	23,657	21.04	104	0.72	0.87
30-34	3,547	11,558	18.48	112	0.86	1.90
35-39	2,319	5,401	11.47	66	2.95	3.33
40-44	1,103	3,160	8.12	39	1.27	5.06
45+	1,030	5,205	17.82	69	2.48	5.47

*Expected deaths are based upon white male age specific mortality data of the U.S. National Center for Health Statistics for 1967-1975 and extrapolation to 1976: Smoking has not been taken into account.

ASBESTOS DISEASE IN U.S. SHIPYARDS

There has been comparatively little written concerning the potential for asbestos-disease hazards in U.S. shipyards. In part, this may have been due to the fact that in the latter part of World War II a survey directed to this question failed to demonstrate the prevalence of significant asbestos disease. At that time, 1,074 insulation workers employed in U.S. yards were examined and, with few exceptions, no evidence of disease was found.[13] Unfortunately, the significance of the fact that the very large majority of men had begun working only a short time before was not appreciated; neither was it understood that X-ray evidence of disease could not be expected to appear until one or two decades later.

During the 1960's, evidence accumulated that "asbestos workers" (insulation) employed in shipyards had unhappy disease experience, with markedly increased death rates of cancer (lung cancer, pleural mesothelioma, peritoneal mesothelioma, gastrointestinal cancer) and asbestosis.[14] These observations, however, were confined to insulation workers, and while they pointed to a possible accompanying difficulty among other shipyard trades, especially in view of British experience, detailed observations concerning other workers were not available.

The potential for asbestos disease in U.S. shipyards was further highlighted by accumulating knowledge that the workers who manufactured the asbestos insulation materials used in U.S. yards during and after World War II were themselves found to suffer serious asbestos disease. Investigations of these employees at one such plant showed markedly increased risk of neoplastic disease and asbestosis, including increased risk of death of cancer with as little as one month of employment.[15,16]

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Fig. 1 S.P. & J.M. Extensive bilateral pleural calcification in former shipyard workers. Asymptomatic. No part of pleura is mesothelioma; discovered incidentally. Bilateral calcification of this sort rarely seen except with prior asbestos exposure.

Even wives and children of the employed workers showed evidence of asbestos disease, indicating that exposure of lesser intensity might be seriously hazardous as well."

RECENT SURVEY OF SHIPYARD WORKERS, GROTON, CONNECTICUT

Cases of asbestos-associated disease among workers employed in a shipyard in Groton, in 1974-1975, were brought to our attention. Against the background of what was already known concerning the potential for asbestos disease in shipyards, it appeared useful to obtain information concerning whether there was the likelihood of a high incidence of such disease or whether the cases seen were isolated, random exceptions.

Lung cancer, mesothelioma, extensive asbestosis and other serious complications of asbestos exposure are late findings. Limited X-ray change (parenchymal, with-

in the lung, or pleural) often precede these serious consequences. While such changes may occur to an extent visible by X-ray without subsequent cancer or disabling asbestosis, their appearance among a group of workers provides evidence of prior significant asbestos exposure. Absence of such X-ray changes is no guarantee that important asbestos exposure has not occurred. Many workers may have had asbestos exposure sufficient to cause death from mesothelioma, for example, without showing X-ray change. Nevertheless, taken as a whole, absence of X-ray change in a group of workers suspected of having been exposed to asbestos provides some evidence that the exposure was limited. On the other hand, the presence of characteristic asbestotic X-ray abnormalities is prima facie evidence that, overall, there was important asbestos exposure in the group.

In light of this, we sought to ascertain whether there was significant prevalence of asbestos X-ray abnormalities among Groton shipyard workers. Examinations

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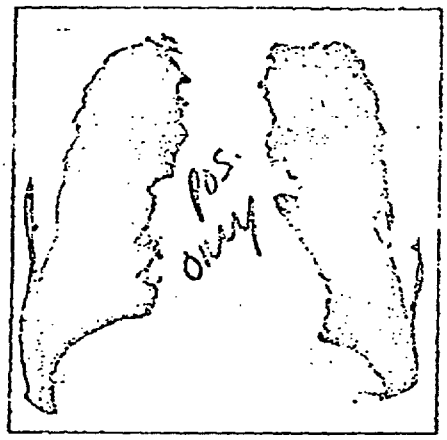


Fig. 2 J.B. Both fibrotic plaques and pleural calcification in x-ray of former shipyard worker. Asymptomatic. Their presence is merely evidence of prior asbestos exposure and not indicative that mesothelioma will necessarily follow.

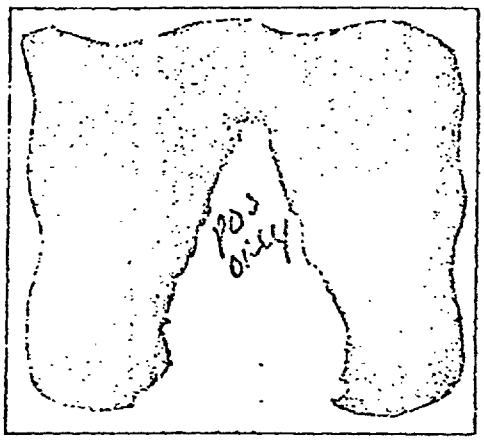


Fig. 3 J.W. Age 49, 1975. Truck driver until 1950, when he became "pipe coverer" in a shipyard. X-ray, fifteen years later, shows reticular (irregular) opacities of moderate profusion (2/2 in the ILO U/C Classification). Some shortness of breath on exertion. Note: infiltrate in lower lung fields, upper lobes clear. This is common.

were largely limited to those whose employment had begun 15 or more years before; all were volunteers. A caveat is in order: there is no way of knowing, under these circumstances, whether those who volunteered were necessarily representative of the entire work force, or even of their specific employment category. Altogether, 1,000 men were examined, including 157 boilermakers, 121 pipefitters, 73 insulators, 82 painters, 69 carpenters, 117 welders, 104 electricians, 108 outside machinists, as well as laborers, molders, lead bonders, office workers, draftsmen, guards, and decontamination technicians.

Films were categorized using the International Classification of Radiographs of Pneumoconioses (ILO U/C) (Appendix I).

Overall, approximately half of the workers examined showed X-ray evidence of pulmonary and pleural changes of the sort regularly seen following direct or indirect occupational exposure to asbestos (pulmonary asbestosis, pleural asbestosis). The findings are outlined in Tables 9 and 10. One or another abnormality was present in 274 of 636 workers with less than 20 years from onset of exposure (43.1 percent) and among 185 of 364 shipyard workers 20 or more years from onset (50.8 percent). Parenchymal disease was seen in 29.6 percent of the former group and 36.8 percent of the latter. Pleural changes were found in 23.1 percent of the less experienced workers and in 29.7 percent of the men with longer experience. The high prevalence of pleural changes was not unexpected, having been found previously among shipyard workers in Britain and elsewhere.[5]

The importance of duration from onset of exposure is clearly seen in Table 10, where it is found that among 303 workers who began work only in 1951 or later, 115 (38.0 percent) had abnormalities on X-ray. In contrast, among 166 workers whose employment began in 1937 or before, 85 (51.2 percent) were abnormal.

No trade was immune to changes. Tables 11 and 12 indicate that this was as true for painters as it was for electricians, for carpenters as for machinists, and for

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TABLE 5

Deaths among 17,800 asbestos insulation workers in the United States and Canada, Jan. 1, 1967–Jan. 1, 1977: Analysis by duration from onset of employment

Years from onset of employment	Total deaths	Lung cancer	Mesothelioma: Pleural	Mesothelioma: Peritoneal	Mesothelioma: Total	Percent of all deaths
<10	51	0	0	0	0	
10–14	29	8.24	0	0	0	
15–19	168	16.67	1.09	1.09	2.09	
20–24	220	18.64	1.82	1.82	2.27	
25–29	388	26.80	3.86	0.64	4.45	
30–34	340	22.94	2.94	0.47	3.41	
35–39	253	26.09	6.32	1.11	12.65	
40–44	203	19.21	1.97	1.82	3.86	
45+	442	15.61	2.94	0.68	3.50	
Total	2270	21.37	2.90	0.90	7.70	

boilermakers as for welders. Review of work practices makes this quite understandable, of course. The conditions of shipyard work have been such that it is likely that asbestos exposure would have occurred among all individuals at a work site where the material was being installed, repaired or removed. Data are less certain for the less common crafts, where fewer workers were examined. Although evidence of asbestotic changes was found among some of these men and women as well, one can estimate a proportion only with less assurance.

Thus, exposure to asbestos under past conditions, of an intensity sufficient to cause significant asbestotic X-ray change, was common at the shipyard in Groton. As a result, a large number of workers now have pulmonary changes associated with such exposure. The prevalence of such a high proportion of asbestotic X-ray changes raises the question of increased risk of asbestos-associated neoplasms in the future. Those to be considered include cancer of the lung, pleural mesothelioma, peritoneal mesothelioma, and esophageal, stomach, colorectal, oropharyngeal, laryngeal and renal cancer. The extent of this risk is not now known.

CURRENT SITUATION

In terms of public health, the overwhelming problem is the undoing, ameliorating or modifying of both current and anticipated results of past mistakes. The problems are straightforward and, simultaneously, complex. To a considerable degree, the complexity derives from the fact that we have had little experience to guide us in such matters, especially on the scale found in the present situation.

The following recommendations —

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necessarily incomplete and tentative — are offered:

1. Knowledge concerning asbestos exposure:
   - *Dissemination of information:* understanding the disease potential of asbestos exposure (past and future) would be valuable for both worker and management.
   - *Avoidance of additional exposure:* appropriate engineering and industrial hygiene methods are crucial; removal or repair of asbestos materials now in place presents a problem for the future.
2. Medical surveillance programs:
   - *Asbestosis:* awareness of the presence of this disease by both the patient and the treating physician would be important, since most deaths of asbestosis are due to intercurrent respiratory infections, rather than to progressive pulmonary fibrosis. Pulmonary infections can be well treated, and experience has shown that many lives can be saved.
   - *Lung cancer:* early diagnosis can increase the likelihood of successful treatment to some extent (by no means as much as we would like). It is not known whether more energetic surveillance (as with frequent sputum cytology examination) will increase the percentage of those successfully treated. Studies are now in progress to investigate this possibility.
   - *Colorectal cancer:* early diagnosis increases the likelihood of cure.
   - *Oropharyngeal, laryngeal or renal carcinoma:* awareness of the increased risk of these cancers improves chances for early study and diagnosis of the presence of these conditions, which can be cured in many cases.
   - *Pleural and/or peritoneal mesothelioma:* effective therapy is not now available and early diagnosis does not significantly increase the likelihood of survival. However, research concerning therapy is now underway in the United States, Great Britain and France, and it may be hoped that improved treatment methods will become available.
   - *Education programs:*
     Smoking: lung cancer risk is greatly multiplied by asbestos exposure.[19] It is urgent that this information become available to workers who have been exposed to asbestos, and that every assistance be afforded them to help in their efforts to control and eliminate smoking, especially cigarette smoking. Some data are also available suggesting that cessation of smoking will, after a number of years, reduce the risk of lung cancer, even with a history of prior cigarette smoking. Should these experiences be confirmed, it will be even more urgent to identify and alert former shipyard workers, to acquaint them with the important risk of lung cancer should they continue cigarette smoking. Cigarette smoking also increases the risk of serious disability associated with pulmonary fibrosis, and of the develop-

TABLE 6
Percentage distribution of trades in private shipyards, June 1943

Trade	Percentage
Welders	15.3
Shipfitters	11.0
Machinists	8.1
Pipefitters	7.2
Electricians	6.6
Carpenters	6.1
Laborers	5.5
Burners	3.8
Painters	3.1
Sheetmetal workers	3.0
Riggers	2.8
Chippers and caulkers	2.8
Boilermakers	2.3
Crane operators	1.3
Pipe coverers	0.2
All other	21.1

Source: Bureau of Labor Statistics, Bulletin 824

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TABLE 7

Mesothelioma tumors in Devonport Dockyard, England, 1964–1973*

Asbestosis (diagnosis)		Occupation	Mesothelioma (deaths)	
No.	%		No.	%
16	10.3	Sprayers	1	1.8
36	23.1	Laggers	1	1.8
15	9.6	Shipwrights	14	25.5
4	2.6	Boilermakers	9	16.4
15	9.6	Engine fitters	8	14.5
11	7.1	Electricians	5	9.1
6	3.8	Caulkers-Riveters	3	5.5
5	3.2	Yarders	2	3.6
48	30.8	All others	11	20.0
156			55	

*Harries, P.G., Brit. J. Ind. Med. 33:261-262, 1976.

TABLE 9

X-ray abnormalities among workers employed in shipbuilding and ship repair

TYPE OF ABNORMALITY	Less than 20 years from onset of shipyard employment (559)		20 or more years from onset of shipyard employment (364)		Total	
	Number	%	Number	%	Number	%
Any abnormality	274	49.1	185	50.8	459	45.9
All parenchyma	166	29.8	134	36.8	300	32.2
Parenchyma or	127	20.0	77	21.1	204	20.4
Parenchyma & pleura	61	9.6	57	15.7	118	11.8
All pleura	147	23.1	106	29.7	253	25.5
Pleura only	86	13.5	51	14.0	137	13.7

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TABLE 8
Mortality experience of 429 shipyard workers in Barrow, England with pleural plaques on x-ray (1964-1971) compared with control men in Carlisle, without pleural plaques

Tracing to December 31, 1976	Plaques	Controls
Alive	299	347
Dead	127 (30%)	74 (17.2%)
Not traced	3 (0.7%)	8 (1.9%)
	429	429
Causes of death	**Plaques**	**Controls**
Lung cancer	19	4
Mesothelioma	23	0
G. I. cancer	7	4
All other cancer	13	7
Ischemic heart disease	34	29
Chronic bronchitis	9	5
All other causes	22	21

TABLE 10
X-Ray abnormalities among workers employed in shipbuilding and ship repair, analysis by duration from onset of work

Onset of work	Total	NORMAL		ABNORMAL	
		No.	%	No.	%
< 1950	166	81	48.8	85	51.2
1951-1955	198	98	49.5	100	50.5
1956-1960	330	174	52.7	156	47.3
> 1961	303	188	62.0	115	38.0
	1000	541	54.1	459	45.9

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TABLE 11

X-Ray abnormalities among shipyard workers employed in shipbuilding and ship repair: major crafts

CATEGORY	Years from onset of shipyard work				
	All groups		20 or more years		
	Number	Abnormal		Abnormal	
		Number	%	Number	%
All crafts	1009	459	45.9	185	32.6
Painters	82	44	53.7	10/25	40.0
Machinists (outside)	108	58	53.7	12/32	37.5
Pipefitters	121	65	54.5	25/34	73.6
Insulators	73	38	52.0	2/7	28.6
Electricians	104	55	52.9	23/34	67.6
Boilermakers	157	80	51.0	41/64	64.8
Welders	117	42	35.9	25/68	52.1
Carpenters	69	38	55.1	12/33	36.4
	831				
Total	1009	459	45.9	185/364	50.8

ment of cancer of the esophagus. Again, educational programs would be of value.

3. Assessment of the potential for shipyard asbestos disease:

a. Nonsmoking contract workers developed lung lesions with appreciable amounts of asbestos in the past, and whether this has resulted in disease risk. Such information is required for proper clinical surveillance.

b. Necessary additional data: appropriate studies of mortality experience, status of retired workers and effects of minimal exposure are required for complete evaluation of the potential for future shipyard asbestos disease. Nevertheless, enough is now known to warrant rapid development of effective medical surveillance programs. Further research can proceed apace.

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TABLE 12

X-Ray abnormalities among workers employed in shipbuilding and ship repair: less common crafts

	No.	Abnorma	%
Heavy equipment operators	13	8/13	62
Laborers	7	1/7	14
Inside machinists	30	15/30	50
Molders	12	4/12	33
Lead burners	21	7/21	33
Decontamination technicians	12	5/12	42
Guards w/o previous job in yard	12	3/12	25
Office workers – Draftsmen w/o previous job in yard	37	16/37	43

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6 July 1978

ATTACHMENT II

MEMORANDUM FOR: MEMBERS

SUBJECT: HEW Public Awareness on Asbestos Exposure Campaign

REFERENCES: A. Memorandum to Members, April 27, 1978
B. "News & Notes" April 29, 1978

In his April 26 statement on risk of lung cancer and other serious diseases for workers who have been heavily exposed to asbestos dust, Secretary of HEW Califano announced several steps that would be taken "to inform doctors, workers and others about the increased risks of asbestos exposure."

Secretary Califano's action stemmed from communications beginning in October 1977 from the Health Research Group (a Nader affiliated organization) with the Secretary of Defense recommending that the Navy "stop proposing more research and act immediately to notify and compensate past and present shipyard employees who were likely to have been exposed to asbestos." An asbestos subgroup of the Armed Forces Epidemiological Board recommended that the Navy should notify the "four million former shipyard employees."

Upon being advised by the Navy that the Veterans Administration, the Civil Service Commission "or some other agency should accept the duty of notification," the Health Research Group wrote the Secretary of the Navy stating that "the Navy has not acted to protect the health and welfare of thousands of present and former shipyard workers who have already or soon will develop cancer or lung disease due to their (asbestos) exposure" and urged mass media such as TV, radio and newspapers should be used in addition to efforts toward personal contact by letter to each potential asbestos victim's home.

On April 13, the Health Research Group in a news release called the Navy's delay in an active information program "grossly irresponsible and inexcusable". The broadening issue was influenced by the government's settlement in the amount of $5.7 million in the highly publicized Tyler, Texas case.

Information gathered from various federal regulatory agencies resulted in an estimate of between 8 and 11 million workers exposed to asbestos since the beginning of World War II of which 1.5 to 2.5 million are presently employed while the remainder - between 5.5 - 8.5 million were formerly employed in environments with significant asbestos exposure including the more than 4 million WW II shipyard workers.

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Explaining in his announcement that there has been no systematic government effort to notify the public of the hazards of excessive exposure to asbestos, Mr. Califano advised that as part of his responsibility to promote and protect public health he would assume responsibility for a comprehensive public information program. He designated the directors of the National Cancer Institute and the National Institute of Environmental Health Sciences to co-chair the HEW team for the information program. Here is what has happened or is scheduled to happen in connection with this effort:

a. Advisory letter to 400,000 physicians prepared by Surgeon General mailed on April 26. Questions and answers about exposure to asbestos along with addresses and telephone numbers for agencies which could provide additional information issued same date.

b. A discussion of asbestos and its health effects appeared in the March/April issue of Ca, the Cancer Journal for Clinicians, and a commentary on subject was included in the June 9 Journal of American Medical Association.

c. A special insert on subject is to be included in current month Social Security mailings.

d. Commencing the latter part of July or first part of August, special public service radio and television spot announcements will be made available to outlets throughout the nation.

e. Three mass distribution publications will be available to the public at end of July. These include "Asbestos Exposure: A Desk Reference for Communicators," "Asbestos Exposure, What It Means, What To Do" and "Clearing the Air - A Guide to Quit Smoking".

f. Articles to be made available for placement in various publications with emphasis on union, government and other periodicals.

g. Distribution of public service advertisements to high priority areas such as those having shipyards, the Detroit automobile manufacturing area, etc.

h. Professional education program for radiologists, chest physicians, pathologists, and primary physicians. Program would include special seminars, brochures, and films. American Medical Association and American Academy of Family Physicians, American Osteopathic Association, American Lung Association, are among groups expected to participate in Public Health Service sponsored program.

This memorandum is written to provide members with advance notice of what may be expected in the way of the federal government's mass communication effort on the asbestos-health issue in the coming months. You may wish to inform your employees and others of this program.

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ATTACHMENT III

Johns-Manville News April 28, 1978. Statement of John A. McKinney, President, and Chief Executive Officer, Johns-Manville, Corporation

This statement is made in response to media reports on a press conference held Wednesday (April 26) by Secretary, Joseph A. Califano of the Department of Health, Education, and Welfare and refers to his printed statement which was distributed at the time of the conference.

Past conditions in which workers were exposed to asbestos bear no relationship whatsoever to regulated conditions under which we work today.

We believe Secretary Califano's statement represented an objective analysis of asbestos-related health problems. It is regrettable that media reports we have seen failed to reflect the real substance of his approach.

At no time did he refer to asbestos-related health problems except in the context of persons "heavily exposed to asbestos before the government began to regulate", or those "exposed in the past, especially those from the war years," or "past workers." These three important qualifiers are repeated throughout the text of his presentation, yet they are almost studiously absent in the media reports.

The numerical projections contained in the Secretary's statement are extremes that are clearly based on past conditions virtually non

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our employees' risk of contracting lung cancer to that which can be expected in the general non-smoking population.

Dr. Kotin, who is a leading authority on cancer, has emphasized repeatedly that non-smoking asbestos workers are at minimal risk to the development of lung cancer when compared with the non-smoking general public.

Secretary Califano unfortunately combined smokers and non-smoker in his projection of a "20-25 per cent" attack rate for lung cancer in workers exposed to asbestos. Actually, only a very small percent of non-smoking asbestos workers have developed lung cancer.

Again referring to the past and present, reference in the Secretary's statement to asbsetos as a "dangerous and insidious" material clearly relates to past exposures. Indeed, as Drs. Selikof and Hammond point out in their medical paper, which was distributed with the Secretary's statement, "In terms of public health, the overwhelming problem is the undoing, ameliorating or modifying of both current and anticipated results of past mistakes." (Emphasis added.)

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