March 2, 2001

Expert report of David S. Egilman MD, MPH

I am a medical doctor and Clinical Associate Professor of Community Medicine at Brown University. I am board certified in Internal Medicine and Preventive-Occupational Medicine. My curriculum vita sets forth more fully my qualifications.

I received a Bachelor of Science from Brown University in Molecular Biology in 1974. I received a medical degree from Brown University in 1978. I completed a three-year medical residency in Internal Medicine at Strong Memorial Hospital in Rochester, New York, in 1981. I completed a three-year training program in epidemiology, called the National Institutes of Health Epidemiology Training Program, in 1984. As part of this program, I completed a Master's in Public Health at the Harvard School of Public Health. At Harvard, I studied epidemiology, statistics and occupational medicine, industrial hygiene, warnings and occupational and environmental law. I completed a third residency in preventive medicine in 1994.

I served two years at the National Institute for Occupational Safety & Health (NIOSH), designing and conducting small and large epidemiologic studies. I was responsible for interpreting and implementing aspects of the OSHA act of 1971.

Since 1978, I have published a variety of letters and medical articles on the issues that relate to the manner in which cause-effect determinations are made in medicine (the epistemology of medicine). I have discussed the normal, accepted process of causal determination in medicine in several peer-reviewed articles. In addition, these ideas were accepted for presentation and were presented at the American Public Health Association meetings in 1984. I have also studied, taught and published articles on the history of medical ethics and the duty to warn. I have taught and done research on the history of the development of medical and corporate ethics during the 20th century. I have, on two occasions, testified before congressional committees on the issue of medical ethics and corporate responsibility. My testimony concerned the history of informed consent. In addition, I have published two papers on the topic of the history of the development of medical ethics.

For the past eight years, I have taught a course at Brown University, called the Development of Medical and Scientific Knowledge in the 20th Century. This course deals specifically with the issues outlined in this report: the history of the development of knowledge of the health effects of asbestos including corporate knowledge, the history of the development of government regulations on occupational and environmental safety, and the history of the development of product warnings. My views on medical epistemology have been cited by the Massachusetts Supreme Court and been adopted by the Wyoming Supreme Court. I have also published on these topics. I served as guest faculty, at the Appellate Judges Seminar Series, on issues related to medical epistemology and Daubert. I have testified on the issues discussed in this report in over sixty cases over the past 16 years.

My qualifications and opinions are also based in part on my clinical experience and awareness of the ways that normal physicians in normal medical practice make decisions about causal relationships that affect patients' lives every day. Much of my time is devoted to direct patient care and consulting for corporations. I served as an expert on asbestos state of the art issues at the request of both plaintiffs and companies.

Summary of Opinions

The health effects of asbestos on human beings are related to the inhalation of asbestos dust.

Since 1930 it has been recognized that asbestos dust was a hazard wherever visible dust could be seen. As stated by Merewether in 1930, "If there is visible asbestos dust, then the invisible dust is in dangerous concentration."

The protective measures necessary to prevent asbestos induced disease did not differ according to the type of disease asbestos might produce: asbestosis, lung cancer, mesothelioma or other malignancy. A company that protected its work force against any asbestos induced disease would have protected its work force against all asbestos induced diseases.

Since the beginning of this century the protective measures that a company should take to protect its workforce from exposures to toxic dust have included:

- Maintaining a clean workplace and effective ventilation
- Arresting dust at place of origin and prevent entrance to the nose and mouth
- Using less dangerous processes (substituting safer materials for more hazardous materials)
- Instructing workmen on hazardous substances and giving out warning leaflets
- Repeating instructions frequently

- Posting warnings and providing constant supervision of working conditions

- Providing showers and separate lockers for street and work clothing, and frequent cleaning of clothing

- Periodic medical examination of the workers

If implemented, these measures would also protect spouses and children from exposure to toxic substances that might be brought home on workmen's clothes. It was reasonably foreseeable that this could occur from at least 1930.
It was also know at this time that respirators provided workers with a false sense of security and the use of respirators was not a substitute for effective prevention of dust creation and ventilation.

Newhouse and Thompson presented a paper on the health effects of asbestos in people who were exposed at home from asbestos that was carried home on the clothing of their spouses in October 1964, at a meeting sponsored, organized, and run by Dr. Selikoff.

The knowledge of home risk was so well accepted at Mt. Sinai that physicians at Mt. Sinai wrote about the risk to inform union members of the need to shower before they went home.

In 1966, Selikoff's views were published in a widely circulated NY Times wire service article written by Jane Brody:

> Asbestos potential cause of cancer.
>
> "The report very strongly suggests that those who work with asbestos have a better than 50% chance of dying of cancer…"
>
> Attached article:
>
> Brody NY Times Article
>
> "The dangers, he said [Dr. Selikoff], extend to workers in 'contiguous trades,' such as other construction workers and their families."

Dr. Selikoff informed asbestos workers of the possible risk of home exposures from workplace contamination on clothing in 1970. He noted that the Cape Asbestos Company provided a "'clean room' for taking off (and later putting on) street clothes and a 'dirty room' for putting on (later taking off) work clothes. Shower facilities are available for use after work."

During World War II, many shipyards had shower facilities for asbestos insulation workers. These showers were not put in place because of the need to have a good smelling workforce. They were implemented to prevent workers from bringing toxic dust home.

In his 1967 paper, Lieben (the head of occupational health for the state of Pennsylvania) reported on mesothelioma in three relatives of asbestos workers and in eight individuals who lived or were employed in the vicinity of an asbestos factory.

The home exposures reported by Lieben, Newhouse and Thompson were in turn reported on by The New Yorker on October 12, 1968.

The first government regulations to deal specifically with asbestos health effects came into effect in 1972 and specifically required the use of change rooms, shower facilities, and the specific bagging and labeling of asbestos laden clothing. OSHA did not write the regulations for showers because they were concerned about the body odor of asbestos workers. Instead, they were concerned that clothing covered with asbestos was a hazard to spouses and laundry staff.

I quote the relevant sections of the 1972 OSHA regulations here:

(3) Special clothing: The employer shall provide, and require the use of, special clothing such as coveralls or similar whole body clothing, head coverings, gloves, and foot coverings for any employee exposed to airborne concentration of asbestos fibers which exceed the ceiling level prescribed in paragraph (b) of this section.
(4) Change rooms: (i) At any place of employment exposed to airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section the employer shall provide change rooms for employees working regularly at the place.
(ii) Clothes lockers: The employer shall provide two separate lockers or containers for each employee, so separated or isolated as to prevent contamination of the employee's street clothes from his work clothes.
(iii) Laundering: (a) Laundering of asbestos contaminated clothing shall be done so as to prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section.
(b) Any employer who gives asbestos-contaminated clothing to another person for laundering shall inform such person of the requirement in (a) of this subdivision to effectively prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section.
(C) Contaminated clothing shall be transported in sealed impermeable bags or other closed impermeable containers and labeled in accordance with paragraph (g) of this section.

The fact that many companies were aware of risks of asbestos being brought home on clothing and had implemented shower programs before 1975, and the fact that government regulations acknowledged these risks before 1975, indicate that the medical epistemology of the time period relied on case reports and reasonable inference. Clearly,

physicians at this time period were making decisions about risk based on what they knew about possible exposure levels and health effects and not on the epidemiologic studies. The causal relationship between asbestos and mesothelioma was based on case reports and case series not on epidemiologic data.

More importantly, once it was recognized in the 1920's that asbestos was a toxic dust, it was known that as a general rule this dust (a toxic dust) should not be brought home to contaminate family members. This information appears over and over in medical and occupational hygiene literature. Had Bendix implemented programs to control toxic dust on the clothing of their workers to prevent asbestosis or lung cancer, those controls would also have protected their spouses and children from the development of mesothelioma. Whether or not it was known in the medical community that mesothelioma was a specific disease that could occur from asbestos exposure is irrelevant. The recognition of the association between asbestos and mesothelioma did not change the protective measures that a company like Bendix should have taken to protect its workers against any asbestos related disease, nor did it change the kind of measures that Bendix should have taken to protect its worker's spouses and children from asbestos dust on their clothing that might have been carried home. Occupational protections implemented to protect against asbestosis would also have protected children against mesothelioma from exposure to dust on their parent's clothes. It has also long been known that children jump into the arms of their parents when their parents return home from work. It has long been known that companies had an obligation to prevent those children from suffering a painful death as a result of the expression of their love for their parents.

From industrial hygiene, occupational medicine and public health perspectives, it was known since 1924 that workers exposed to toxic dust should be provided with change rooms and showers so they would not bring the toxic dust home with them. It has been known by companies that asbestos was a toxic dust for over 100 years and this has been known in the published medical literature for at least 75 years. From a medical standpoint the key issue was whether or not a dust could kill someone if they inhaled it. It didn't matter who the someone was or how they came in contact with the dust; their job title was irrelevant. The only relevant factor was whether or not they inhaled the dust. It has been known since the early part of the century that people exposed to toxic dust at work should not bring it home because they could potentially injure their spouses and children.

In 1975, John's Manville, the largest asbestos product manufacturer in the United States, testified to OSHA in reference to the Anderson and Selikoff paper:

> this [OSHA] paper reports the next "key" paper cited by OSHA in the proposal is reference 15, by Drs. Anderson and Selikoff et al which is still in press. This paper reports the appearance of mesothelioma in family members of asbestos workers. Here again, the erroneous and ill-founded assumption was made that exposure in the home would appear at least upon superficial observation to be a light exposure. After all, the members of the family were not in the workplace. Over and above other deficiencies in this study, is the

> erroneous assumption that household exposures to asbestos have been minimal in dose relationship concept. The precise opposite is more likely the truth. As recognized by Selikoff and others, the impregnation of drapes, rugs, furniture, etc., with asbestos fibers and the constant re-suspension of fibers in the respirable range creates an exaggerated hazard. Once the workman carries asbestos home, it accumulates in the home, and its presence in the home is likely to be permanent. Once it gets into the rugs, for example, it becomes re-suspended by movement such as brushing and walking and therefore, family members are getting a 24-hour a day, 7-day a week exposure, relatively speaking, rather than a partial exposure. Of greater concern, is that the fact that the entire population of the family, including the very young and the very old, are exposed. Experimental and clinical data on the induction of cancer established that the very young are more susceptible to the effect of carcinogens. This fact provides the basis for regularly using young animals in the laboratory and testing agents for their ability to induce cancer. Furthermore, in the home environment, an exaggerated opportunity is present for co-factors to be operating, such as smoking and household pulmonary irritants. These household exposures also provide an opportunity for repetitive high, short peak exposures due to the shaking out of work clothes. Lacking specific dust counts over the appropriate time period, any conclusion that the exposures were minimal is totally unacceptable. In summary, not only has this paper not produced any "new information" which was not available prior to 1972, it has made erroneous assumptions regarding household exposures which fatally flaw the conclusion reached by the office at OSHA. [Emphasis in original]

I have reviewed certain documents produced or otherwise discovered in asbestos litigation for the purpose of assessing the historical knowledge available to Bendix concerning the hazards of exposure to asbestos and how that knowledge compared or related to the information available in the open medical literature.

Bendix had access to information on asbestos health hazards from Dr. AJ Lanza in 1932. This included information on risks from asbestos containing brake manufacturing and inferentially, the risks of such brake use.

Bendix antecedent Marshall Asbestos Corporation was a member of the US government sanctioned "Asbestos Industry" as of 1933.

Bendix knew or should have known by 1939 that exposures to asbestos during use of brake products resulted in exposures above 10 mppcf.

Bendix was one of a group of brake product manufacturers in the BLMI that engaged in illegal concerted activities to make money. These included price fixing and hiding the health effects of exposure to asbestos dust. Bendix is a convicted felon for activites relating to their conspiring to make money. The concealed information included:

- Information on cancer
- Information on the inadequacy of the TLV
- Information on the health effects of Chrysotile (Braun-Truan)
- Information from Enterline in regards to the AIA

Bendix used amosite asbestos in some products.

Specific information on the health hazards from asbestos use was available in published literature in 1948.

Bendix developed asbestos free brakes in the 1950's.

Asbestos free brakes were used and available as early as 1936.

Bendix did not follow well-established occupational and public health procedures for protecting worker health.

Bendix' expressed policy for protecting workers health was contrary to the accepted public and occupational health policies for worker protection that have been in existence since Biblical times (see Deuteronomy), as is evidenced by the following 1966 letter.

> **"Just to be sure you have a copy, an article that appeared in Chemical Week magazine is enclosed. So that you'll know that Asbestos is not the only contaminant, a second article from O. P. & D. reporter assess a share a share of the blame on trees.**
>
> **My answer to the problem is: if you have enjoyed a good life while working with asbestos products, why not die from it. There's got to be some cause.**
>
> **Director Of Purchases E. A. Martin"**

Use of asbestos containing brakes releases friable asbestos that can result in asbestosis and cancer in workers, bystanders and family members.

Chrysotile asbestos causes mesothelioma. As Dr. Lanza stated so eloquently, 64 years ago, "I do not know what to say about Mr. Dewey's opinion [that some fibers are more hazardous than others] and I cannot imagine upon what the opinion is based. Of course, the asbestos people in Canada have advanced that idea for some time as an explanation of why asbestos seems to be more clinically severe in England than in this country but I have always had the feeling that their argument was motivated by self-interest rather than to make a scientific contribution."

Forsterite is likely to be a cause of mesothelioma.

Asbestos brake decomposition products are toxic.

Bendix had access to additional knowledge of the adverse health effects of asbestos through its membership in the Friction Materials Standards Institute. Knowledge gained through FMSI included information on the results of a FMSI study on fiber emissions in friction work (produced by the Illinois Institute of Technology and circulated in June 1972). The study concluded that "considerable" amounts of asbestos fibers were released from work on friction materials. The author of this report, Dr. Colin Harwood, supported the banning of the use of asbestos in friction materials in Illinois, and the members of the Asbestos Study Committee had access to this information.

Members of FMSI (including Bendix) discussed the asbestos "problem" with regards to the use of end products, specifically, the cutting, grooving, drilling, and grinding of end products. They concluded that such operations "can produce airborne concentrations of asbestos fibers in excess of the current exposure limits (5 fibers/cc TWA or 10 fibers/cc ceiling)."

In June 1974, Bendix continued to acquire knowledge of dust hazards produced by users of end products. At an FMSI meeting, a paper by Rohl, Anderson, Nicholson and Langer entitled "Asbestos Exposure During Break Lining Maintenance and Repair" was presented. The paper describes "deplorable" working conditions in several New York City brake shops. The Asbestos Study Committee concluded that these conditions were probably "common" for end-product users and that the industry must do more to change these conditions.

I agree with the CMA warnings position as stated in their 1972 letter to OSHA.

I agree with Mr. Swetonic's assessment of the effectiveness of asbestos industry influence over OSHA and the EPA and with his assessment of the "good news' from his 1973 speech to the ATI. I believe his speech underestimates the total number of injured workers.

I agree with Mr. Weaver's assessments of risk, adequacy of warnings, exposure levels during asbestos brake use, the need for warnings, and the corporate responses to these facts, as expressed in his June 27, 1973 speech.

Epistemological framework

a) Bayesian Analysis

For diseases with multiple or unknown causes, Bayesian analysis can be used to judge the role of each suspected cause in influencing the population-level occurrence of disease. Bayesian analysis follows in form and in practice the same basic principles governing Bayesian decision-making.[i] Each integrates different forms of medical evidence into a single assessment of causal probability. In short, Bayesian analysis aims to incorporate all the available medical evidence – from case reports to animal studies – into one

updated and standardized assessment that measures the overall strength of causal certainty.[ii] Each type of evidence is hierarchically arranged according to the overall credence the evaluator places on particular types. A summary of all the available evidence is provided in a number usually given on a scale of 0 to 100, where "0" indicates an equally firm level of certainty of the lack of a cause-effect relationship, and "100" represents complete and irrefutable certainty of causation (see figure 11). This analysis constitutes an evaluation of the overall level of medical certainty for the likelihood a suspected agent (for example radon gas) is a cause of disease (lung cancer) in the general population. A Bayesian analysis might conclude, that in the mind of the evaluator, evidence indicates 20% certainty of a causal relationship buffeted by an 80% certainty of a non-causal relationship. That is to say one central feature of Bayesian analysis is that uncertainty in one conclusion is tantamount to certainty in the opposing conclusion, or the amount of certainty parceled out between two antithetical positions always equals 100%.[iii] All Bayesian assessments of causal relationships are valued somewhere between 0 and 100, since no scientific evidence can sustain intractable and incontrovertible conclusions. In fact, one condition for reaching complete and irrefutable certainty is that even if convincing evidence to the contrary became newly available, the level of certainty would remain unchanged in our assessment.[iv] This corollary highlights the second key feature of Bayes' theorem: the interpretation of new information depends on one's prior probability of causation.[v] At the boundary of 100% certainty, new information becomes less relevant and is incapable of modifying summary values in an important way. Since steadfast conclusions of this sort can rarely be made in good scientific conscience, reaching such conclusions is never required for drawing reasonable medical inferences, nor should courts expect such conclusions for reaching valid legal conclusions under a preponderance of the evidence standard.

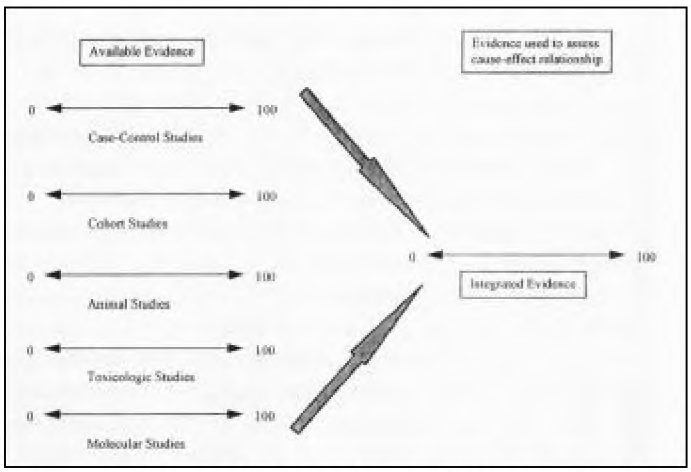


Figure 5: Bayesian integration of the available evidence. The accepted model for causation analysis

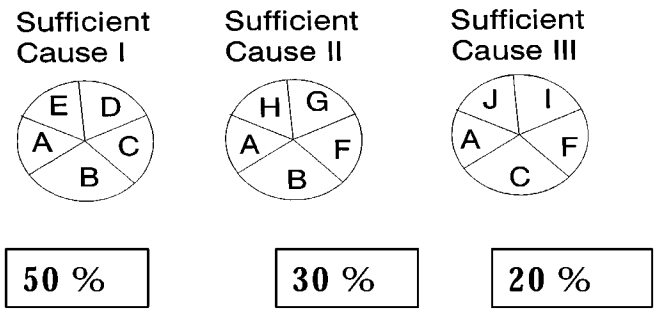
Suppose we wanted to perform a Bayesian analysis of the available scientific evidence relating the dietary intake of fiber to the reduction of colorectal cancer. We would first analyze each type of medical evidence. We would then order evidence in a manner that reflected the credibility we had for each type of evidence (Figure 5). We would weigh each class of evidence favoring or opposing the proposed association and place the body of evidence on a standard scale of causation from 0 to 100. This value reflects the support for the association internal to each type of medical evidence, without modification from other types of evidence. The second and globally integrative step in this assessment would follow from combining the priors of each type of medical evidence onto the integrated scale of causal certainty. The

summary does not classify scientific data according to particular study designs or models but gives the evaluator's overall impression of the likelihood of cause-effect relationship. The evaluator expresses her implicit subjectivity through the reasoning and assumptions behind the ordinal weight she gives to each type of evidence.[vi] Bayesian analysis forces a complete accounting of the epistemologic stance of the evaluator. Causal explanations offered by organizations or individuals should comport with the Bayesian framework of disclosing the subjectivism of their explanations.

The sum of all causes has no upper bound (is not 100 percent)

That a cause can be deemed with a high degree of certainty to be a specific cause of a disease does not imply that it is the sole or exclusive cause. Some legal defenses seize on the widely-circulated statistic that smoking is responsible for 80% of US lung cancers as ultimate proof that other known causes – radiation and asbestos – are only minor causes between which the remaining 20% of cancers must be split. The second assertion fails to deal with the fact that that a Bayesian analysis evaluates each cause independently, and a finding that one factor is a highly certain cause of disease has no bearing on the presence or importance of other factors.

Figure I: Current scientific thought regarding cause-effect relations.



A sample of information available in the literature includes:

1. Annual Report of the Chief Inspector of Factories and Workshops London, 1898.

2. Dangerous Trades, the Historical, Social, and Legal Aspects of Industrial Occupations as Affecting Health, by a Number of Experts, Edited by Dr. Thomas Oliver (1902).

3. Mortality from Respiratory Disease in Dusty Trades, Dept. of Labor, Bureau of Labor Statistics, Frederick L. Hoffman - June 1918

4. Fibrosis of the Lungs Due to the Inhalation of Asbestos Dust, British Medical Journal, Dr. W.E. Cooke - July 26, 1924

5. Pulmonary Asbestosis, Journal of the American Medical Assoc., Vol. 90, No. 2 (January 14, 1928).

6. Report on Effects of Asbestos Dust on the Lungs - Merewether And Price (1930).

7. The Occurrence of Pulmonary Fibrosis and other Pulmonary Affections in Asbestos Workers, The Journal of Industrial Hygiene, E.R.A. Merewether (1930).

8. Compensation Act Extended to Asbestosis - Foreign Letters; London, May 31, 1930.

9. Pulmonary Asbestosis, JAMA, Vol. 95, No. 19, p. 1431 - July/December 1930.

10. Asbestos, Occupation and Health Encyclopedia of Hygiene, Pathology and Social Welfare (1930).

11. Asbestos Bodies in Sputum and Lung, JAMA, Vol. 95: 659-661 - 1930 - Kenneth Lynch And W. Atmar Smith.

12. S. McDonald, Histology of Pulmonary Asbestosis, Brit. Med. J., 2: 1025 1927 –

13. JM Memo regarding excerpts from medical journals - 1930.

14. Bulletin of Hygiene - Gloyne and Woodhouse - Dec. 1928 (?)

15. Pulmonary Asbestosis, Radiology, Vol. 17, J.V. Sparks, 1931

16. Asbestosis - Report of Two Cases, Harold L. Stewart, Bucher and Coleman, Archives of Pathology, Vol. 12, 1931.

17. Industrial Commission of Wisconsin, Proceedings of Conference Concerning Effects of Dust Upon the Respiratory System, Nov. 1932.

18. Occupational Diseases Are Not Generally Understood, The National Underwriter, Dec. 15, 1932.

19. Journal of Industrial Hygiene, Drs. David L. Edsall and Edgar L. Collins, Editors (Jan. - Nov. 1933).

20. A Memorandum on Asbestosis, Tubercle, Vol. XV, E.R.A. Merewether, Nov. 1933.

21. Asbestos, The Industrial Bulletin, Vol. 13, No.4, April 1934.

22. **Pulmonary Asbestosis, A Review of One Hundred Cases**, The Lancet, W. Burton Wood and S. Roodhouse Gloyne, Dec. 22, 1934.

23. **Pulmonary Asbestosis III: Carcinoma of Lung in Asbestos-Silicosis**, American J. Cancer, Vol. 24:56-64; Kenneth Lynch and W. Atmar Smith, 1935.

24. Effects of the Inhalation of Asbestos Dust on the Lungs of Asbestos Workers, Public Health Reports, Vol. 50, Part 1, A.J. Lanza, 1935.

25. Asbestosis: Part II. and Part III., Bureau of Industrial Standards, Commonwealth of Pennsylvania, Dept. of Labor and Industry, Sept. 20, 1935.

26. A Study of Asbestosis in the Asbestos Textile Industry, U.S. Public Health Service, Dressen, Dallavalle, Edwards, Miller and Sayers, Bulletin No. 241 (1938).

27. Asbestosis, Occupation and Health Encyclopedia of Hygiene, Pathology and Social Welfare, Jan. 1938.

28. Great Britain passed Compensation for asbestosis in May 1931 Germany - Dec. 16, 1936 / March 11, 1937; United States North Carolina - March 26, 1935.

29. Occupational Cancer in Asbestos Workers, Abstract of the Literature of Industrial Hygiene, Vol. 20, Jan.-Dec. 1938.

30. Asbestosis, Baader, Deutsche Medizinische Wochenschrift, 65:407-8, 1939.

31. Statistics of Diseases and Injuries in the United States Navy, Annual Report of the Surgeon General, U.S. Navy, 1939.

32. Industrial Welfare and Medicine, Encyclopedia Britannica, Vol. 12, 1940.

33. Asbestosis, W. C. Hueper, Occupational Tumors and Allied Diseases, 1942.

34. Bronchogenic Carcinoma in Association with Pulmonary Asbestosis, H.B. Holleb and A. Angrist, American Journal of Pathology, Vol. XVIII, 1942.

35. 32. Bulletin of Hygiene, Bureau of Hygiene and Tropical Diseases, Vol. XVII, Dec. 1942 Kuhn, Illness among Dock Workers at Wihelmshaven (1930 to 1938) [German].

36. The Occupational Disease Hazard, Industrial Medicine, Volume 11, No. 4 Warren A. Cook, April 1942.

37. **Cancer in its Relation to Occupation and Environment**, Bulletin of American Society for the Control of Cancer, Vol. 25, No. 1, pp. 63-69, W. C. Hueper, Jan. 1943.

38. Minimum Requirements for Safety and Industrial Health in Contract Shipyards, Industrial Medicine, 12:249-263, 1943. Philip Drinker served as Health Consultant.

39. **Environmental Cancer**, JAMA Editorial, 126:836, Nov. 25, 1944

40. Dust as an Industrial Health Hazard, Heating and Ventilating, Vol. 41, No. 6, June F. W. Hutchinson, 1944.

41. Letter from British Chief Inspector of Factories to Thermal Insulation Contractors Assoc., concerning the hazards of asbestos to workers in the shipbuilding and ship repairing and urging precautions to be taken, August 1945 Demonstrative exhibits

42. A Health Survey of Pipe Covering Operations in Constructing Naval Vessels, Journal of Industrial Hygiene and Toxicology, Vol. 28, FLEISCHER and DRINKER, 1946.

43. Report of Preliminary Dust Investigation for Asbestos Textile Institute, W.C.L. Hemeon, Industrial Hygiene Foundation of America, Inc., June 1947.

44. **A further Study of the Incidence of Cancer in the Lung and Larynx,** The British Journal of Cancer, 1:260-298, E.L. and N.M. Kennaway, 1947.

45. **Discussion**, Diseases of the Chest, Vol. XIV, No. 1, Brahdy, L., Jan-Feb 1948.

46. **Cancer and the Environment,** Scientific American, Vol. 180, No. 1, Groff Conklin, January 1949.

47. **Asbestosis and Cancer of the Lung**, JAMA, Vol. 140:1219-20, Morris Fishbien, May-August 1949.

48. Annual Report of the Chief Inspector of Factories for the year 1949.

49. **Foundation Facts**, Industrial Hygiene Foundation, No. 8, August 1949.

50. Pulmonary Asbestosis: Anatomicopathologic Study of A Case, Industrial Hygiene and Occupational Medicine, Vol. 1:362-363, A. Franchini and G. Canepa, 1950.

51. Discussion by Vandiver Brown, Pneumoconiosis, Sixth Saranac Symposium, 1950.

52. **Environmental Cancer Hazards Caused by Industrial Air Pollution**, Archives of Industrial Hygiene and Occupational Medicine, Vol 2:325-328, W.H.C. Hueper (1950).

53. Abstracts from Current Literature, Archives of Industrial Hygiene and Occupational Medicine, Vol. 1:362-363, Chief Editor - Philip Drinker, 1950.

54. **Case Reports - Asbestosis Associated with Bronchogenic Carcinoma**, AMA Archives of Internal Medicine, Vol. 88:831-834, Roger Stoll, Richard Bass, Alfred A. Angrist, 1951.

55. 1942, Homburger, **Co-Incidence of Primary Carcinoma of Lungs and Pulmonary Asbestosis: Analysis of Literature and Report of 3 Cases**, Am. J. Path. 19:797-807 (1943)

56. 1943, Wedler, **Asbestose und Lungenkrebs**, abstracted in Bull. Hyg. 19:363 (1944).

57. 1947, Merewether, **Annual Report of the Chief Inspector of the Factories in England** for 1947.

58. 1948, Lynch and Cannon, **Asbestosis VI. Analysis of 40 Necropsied Cases**, Dis. Chest 14:874-880 (1948).

59. 1948, R. J. Cureton, Squamous cell carcinoma occurring in asbestosis of the lung, British J. Med.

60. 1949, Wyers, **Asbestosis**, Post-Grad. M. J., 25:631-638 (1949).

61. **Cancer**, Encyclopedia Britannica, Vol. 4, p. 731 (1952).

62. **Industrial Cancer of the Lungs**, Compensation Medicine, Vol. 4:11-18 May R. Mayers, 1952.

63. Asbestosis as Differentiated from Other Pneumoconiosis, AMA Archives of Industrial Health, O.A. Sander, 1953 (read in Symposium on Occupational Disease of the Lungs, sponsored by the Massachusetts Medical Society).

64. **Asbestosis and Bronchogenic Carcinoma, report of one autopsied case and review of the available literature**, American Journal of Medicine, Vol. XV:721-732, K.J. Isselbacher, H. Klaus, Harriet Hardy, Nov. 1953.

65. **Mortality from Lung Cancer in Asbestos Workers**, Brit. J. Indus. Med., Vol 12:81 - Richard Doll, 1955.

66. **The Dust Diseases in Great Britain**, AMAM Archives of Industrial Health, Vol. 12:83-99, A.I.G. McLaughlin, 1955.

67. **Lung Cancer in Asbestosis**, The Lancet, June 4, 1955.

68. **Editorials - Silicosis, Asbestosis, and Cancer of the Lung**, American Journal of Clinical Pathology, Vol. 25:1388-1390, W. C. Hueper, 1955.

69. **Industrial Aspects of Bronchogenic Neoplasms**, Diseases of the Chest, Vol. XXVIII:421-430, Lester Breslow, October 1955.

70. Chapter 40 - Occupational Pulmonary Disease, Disease of the Chest (textbook), pp. 666-68, H. Corwin Hinshaw and L. Henry Garland (1956).

71. Asbestosis with Pleural Calcification Among Insulation Workers, Danish Medical Bulletin, Vol. 3: 202-04, Frost, George, Moller, 1956.

72. Industrial Medicine, Abstracts of World Medicine, Vol. 21, Jan. to June 1957.

73. Bulletin of Hygiene, Occupational Hygiene and Tropical Diseases, Vol 32, No. 12 (December 1957).

74. **Industrial Hygiene**, The Encyclopedia Americana, Vol. XV, pp. 88-90 (1957).

75. Pneumoconiosis, Encyclopedia Britannica, Vol. 18, pp. 99-100, 1960.

76. Diffuse Pleural Mesothelioma and Asbestos Exposure in the North Western Cape Province, Brit. J. Industr. Med., Vol. 17:260, J.C. Wagner, Sleggs, Merchand, 1960.

77. **Asbestosis and Carcinoma of the Lung**, case report and review of literature, Archives of Environmental Health, Vol. 1, Anderson, Campagna, July - Dec. 1960.

78. The Pathology of Asbestosis with Reference to Lung Function, Thorax, Vol. 16:1181-1187, B.E. Heard, R. Williams, 1961.

79. 70. Pleural Asbestosis, American Practitioner, Vol. 13:573-578, H.B. Eisenstadt (Sept. 1962).

80. **Asbestosis and Carcinoma of the Lung**, Cancer, 6:1181-87, J.F. Cordova, H. Tesluk, K.P. Knudtson, Nov.-Dec. 1962.

81. Asbestos: Medical and Legal Aspects, Castleman, BL, 1996.

Sincerely yours,

David Egilman MD, MPH

---

[i] See e.g. the use of Bayesian analysis in medical decision-making and for probabilistic medical determinations of individual causation in "probability of causation" section, sub.

[ii] R.D. Etzioni and J.B. Kadane, Baysian statistical methods in public health and medicine. 16 Annu. Rev. Public Health. 26 (1995).

[iii] H.C. Sox, M.A. Blatt, M.C. Higgins, and K.I. Martin, Medical Decision Making. Butterworth-Heinemann: Boston, pp. 30-34, 1988.

[iv] See figure 4-8 in H.C. Sox, M.A. Blatt, M.C. Higgins, and K.I. Martin, Medical Decision Making. Butterworth-Heinemann: Boston, 1988, pp. 88.

[v] H.C. Sox, M.A. Blatt, M.C. Higgins, and K.I. Martin, Medical Decision Making. Butterworth-Heinemann: Boston, pp. 98, 1988.

[vi] W.H. DuMouchel and J.E. Harris, Bayes methods for combining results of cancer studies in human and other species. 78 J. Am. Med. Assoc. 293-306 (1983).