

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	Percent of all deaths			
		Lung cancer	Mesothelioma		
			Pleural	Peritoneal	Total
<10	51	0	0	0	0
10-14	85	8.24	0	0	0
15-20	188	15.43	1.06	1.60	2.60
20-24	320	18.44	1.88	0.94	2.82
25-29	388	26.80	3.86	4.64	8.40
30-34	340	32.94	2.94	6.47	9.41
35-39	263	26.09	6.32	7.11	13.43
40-44	203	19.21	1.97	7.88	9.85
45+	442	15.61	2.94	6.56	9.50
Total	2270	21.37	2.90	4.80	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 —

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

TABLE 6

Percentage distribution of trades in private shipyards, June 1943

Trade	Percentage
Welders	15.3
Shiplifters	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

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-