workers have been due to mesothelioma. The problem has assumed sufficient importance to have warranted the establishment of Mesothelioma Reference Panels in a number of countries, by the International Union Against Cancer, and the recent establishment of a Mesothelioma Registry in this country by the National Institute of Environmental Health Sciences of the U.S. Public Health Service.

These experiences highlight one portion of the current spectrum of asbestos disease. It is now recognized that *direct occupational exposure* to asbestos results in a hazard much more significant than formerly appreciated. In the last several years, however, additional problems have been recognized which add another dimension: the possibility that the utilization of asbestos is associated with a much wider risk, perhaps one of the community at large. This is less well defined, much less well documented, but because of its potential importance, of considerable concern.

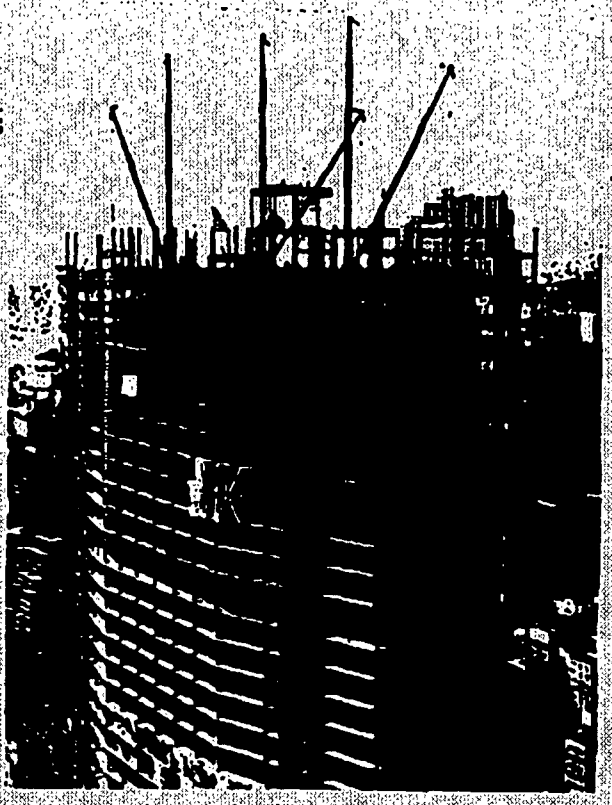
The recognition of this potentially wider spectrum of asbestos disease has been based upon three germinal observations. The first was the publication in 1960 by Wagner and his colleagues of 47 cases of mesothelioma in South Africa, all from the northwest Cape Province, an asbestos-rich area of the country. Analysis of the cases showed that few had worked directly with the mineral but that 45 of the 47 may have had contact with it, often indirect. They had lived in an area in which asbestos was mined, or had worked in an environment in which indirect, haphazard exposure was conceivable. In striking contrast, there were no cases of mesothelioma in the rest of South Africa reported in the same period, and none in 10,000 consecutive autopsies of individuals with silicosis. This report unequivocally raised the question of whether asbestos-associated mesothelioma was limited to direct occupational exposure, or whether much less intimate contact could produce the same result.

TABLE 2

Observed and Expected Number of Deaths among 370 Asbestos Workers from January 1, 1963 to April 30, 1967

Cause of Death	Observed Deaths	Expected Deaths*
Total, cancer (all sites)	49	8.6
Cancer of lung, pleura, bronchus, and trachea	27	2.3
Bronchogenic carcinoma	24	**
Pleural mesothelioma	3	***
Peritoneal mesothelioma	7	***
Cancer of stomach	3	0.6
Cancer of colon and rectum	5	1.2
Cancer of all other sites combined	7	4.5
Asbestosis	15	---
Heart and circulatory disease including stroke	22	28.5
All other causes of death	8	10.4
Total, all causes	94	47.5

*Based upon U.S. mortality data disregarding smoking habits.
**United States data not available, but figure should be only slightly less than 2.3.
***United States data not available, but these are rare causes of death in general population.



Insulation workers employed in the construction industry have had disastrous health experiences even though their work is often outdoors and involves only limited contact with asbestos. Up until the past several years, it was thought that lung cancer from asbestos was an industrial hazard limited to the heavily exposed individuals in asbestos factories.

In the same year, 1960, Kiviluoto raised an analogous question. Pleural calcification had been known to occur frequently in characteristic form among asbestos workers. In our experience, indeed, the majority of older asbestos workers may be expected to show these changes when X-rayed. It was, therefore, striking to find typical "asbestotic" pleural calcification in 499 of 6,812 individuals X-rayed in one county in Finland while the neighboring county had none in 7,101. Kiviluoto astutely noted that the first county contained an asbestos mine and while none of the individuals with pleural calcification had worked in this mine, they had lived nearby. His countrymen, Laamanen and his colleagues, later demonstrated the presence of asbestos fibers in the air in the vicinity of the mine and while this may not reflect the true explanation for Kiviluoto's findings, the question of environmental contamination was strongly suggested.

The third observation was equally sobering. It had long been known that asbestos fibers, when