

MORTALITY EXPERIENCE OF RESIDENTS IN THE NEIGHBORHOOD OF AN ASBESTOS FACTORY

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Conditions during 1949-54 in an amosite asbestos factory located in Paterson, New Jersey and the subsequent mortality experience of the workers were described earlier in this monograph. This paper reports on the mortality experience of men who lived in the vicinity of that factory. The study was undertaken for the following reasons.

During the years in which the factory was in operation, many of the workers were seen as private patients by one of us (I.J.S.) who had a special interest in tuberculosis and other lung diseases. Since their lung complaints seemed to be associated with their employment, he obtained information on their working environment. While no dust counts were made at that time, it was apparent by simple inspection that the men were heavily exposed to asbestos dust. Several attempts were made to relieve the situation by means of exhaust equipment. How effective this equipment was within the plant is open to question; the exhausts, however, removed the dust into the outside air. In addition, during hot weather, the windows were left open, allowing asbestos dust to blow around the neighborhood. To our knowledge, no dust count was made at that time. Therefore, we have no quantitative data on the degree to which the air in the neighborhood was actually contaminated. Many years later, we collected samples of settled dust from the attics of houses in the neighborhood. Samples collected from houses near the factory still contained appreciable numbers of amosite asbestos fibers; those collected from houses located at a greater distance from the factory contained fewer fibers.

From this sketchy information, it is safe to assume that people living in the neighborhood of the factory were exposed to asbestos dust, obviously an extremely light exposure as compared with the exposure of men working in the factory. We became concerned about this exposure at a much later date after the mortality experience of the factory workers became known. The question thus arises as to whether very light nonoccupational exposure to amosite asbestos dust produces adverse effects to a measurable degree (An extremely small effect would not be measurable by any means at hand. If there were absolutely zero effect, this fact could not be established.)

MATERIALS AND METHODS

The factory was located in a district known as Riverside, which was largely residential during the period when the factory was in operation. The prevailing winds

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were generally such as to blow dust from the factory in the direction of most of the dwellings. From a map of the city as it was in 1942-3, we ascertained the address of a Riverside dwelling located within one half mile of the factory. Hereafter, we will refer to the area as the "target" area or simply as Riverside (FIGURE 1).

For comparison, we selected another Paterson neighborhood known as Totowa, which is located several miles from Riverside. In the 1940s and 1950s, the two districts were very similar with respect to socioeconomic status, race, national origin of the inhabitants, and types of dwellings.

Fortunately, an excellent city directory of Paterson is published annually. It lists the name of all adults (age 18 or older) living at each address and states the occupation of the head of the household. Sex is not stated.

Our general plan was to trace, over a 35-year period or longer, residents of these two neighborhoods. We thought that tracing could be accomplished for males but probably not for females because of changes of name by marriage or divorce. Therefore, we confined our study to males.

City directories were available for each of the years 1942-54, the time-span during which the plant was in operation. A card was made for each apparently male resident of Riverside ("target area") and Totowa who was listed in at least two directories in 1942, 1943, and 1944 and also listed in at least one of the directories in 1945-54. In case of doubt as to sex, the person was tentatively included as a subject. Later, in tracing the subjects, some were found to be female. These subjects were then eliminated from further consideration. We also eliminated from the study any residents in either area who worked in the asbestos plant.

TRACING

Tracing of the subjects was started in 1968, those traced initially were retraced periodically thereafter. As a first step, we searched for each subject in the then most recent issues of the Paterson city directory. If found, we made contact with the subject (or a member of his family) by telephone, mail, or home visit and verified sex, date of birth, and determined whether the subject was still living. If the subject had died, a copy of the death certificate was obtained. This certificate yielded initial data on a considerable proportion of the subjects. We will call these subjects "easy" cases, the remainder are "difficult" cases.

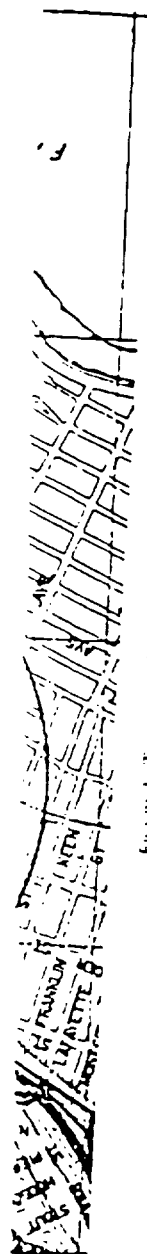
A list was made of the difficult cases, and, thanks to the New Jersey Department of Health, every name of this list was checked against the list of all deaths that occurred in New Jersey during the indicated interval of time. At the end of this process, there still remained many subjects whose status was unknown.

How were these subjects traced? Credit is due to our remarkable team of field workers. It would take many pages to describe all of the methods they used.

After completion of their initial tracing, the subjects were retraced periodically. This is a continuing process. The last tracing was completed in 1977. For analysis of the data, it is necessary to select a cutoff date through which time a very large proportion of the subjects were successfully traced. The cutoff date for this report is December 31, 1976.

TABLE 1 shows the results of tracing through that date. The original list contained 7653 names: 2447 residents of Riverside (target area) and 5206 residents of Totowa. By checking, we found that 16 of the men had worked in the amosite asbestos factory (Unarco), so they were excluded. Another 100 men were excluded for the following reasons: female instead of male, accidental duplication of names, and membership in insulation worker's union. To this day, we have never been able to trace 109 subjects

FIGURE 1. Target area, Paterson neighborhood study.



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TABLE 1
TRACING OF SUBJECTS IN THE PATERSON NEIGHBORHOOD STUDY

	Total	Riverside	Totowa
Total, original list of names	7653	2447	5206
Deleted from study			
Unarco workers	16	4	12
Females, duplicates, etc.	100	27	73
Never traced	109	41	68
Died before January 1, 1962, death certificate received	1723	537	1186
Reported dead before January 1, 1962, no death certificate	20	10	10
Net alive January 1, 1962	5685	1828	3857
Traced alive December 31, 1976	3046	1003	2043
Less traced alive, no date of birth	11	4	7
Net traced alive	3035	999	2036
Traced dead January 1962 to December 1976	2550	801	1749
Less traced dead, no death certificate	35	21	14
Net traced dead	2515	780	1735
Not traced	89	24	65
Total included in analysis	5550	1779	3771

(41 from Riverside and 68 from Totowa), so they must be excluded. After these exclusions, the net total was 7428 subjects.

Among employees of the asbestos plant, there was very little evidence of increased mortality until about 20 years after onset of exposure. Therefore, we decided to confine the present study to the period starting on January 1, 1962 (roughly 20 years after the opening of the factory).

TABLE 2
AGE DISTRIBUTION OF SUBJECTS INCLUDED IN ANALYSIS IN PATERSON NEIGHBORHOOD STUDY: AGE 35+ ON JANUARY 1, 1962, EXCLUDING THOSE NOT TRACED, UNARCO WORKERS, AND OTHERS

Year of Birth	Age in 1962	Total		Riverside		Totowa	
		Number	Percent	Number	Percent	Number	Percent
1922-1926	35-39	201	3.6	76	4.3	125	3.3
1917-1921	40-44	589	10.6	184	10.3	405	10.7
1912-1916	45-49	803	14.4	279	15.7	524	13.9
1907-1911	50-54	817	14.7	264	14.8	553	14.7
1902-1906	55-59	784	14.1	231	13.0	553	14.7
1897-1901	60-64	674	12.1	211	11.8	463	12.3
1892-1896	65-69	654	11.8	208	11.7	446	11.8
1887-1891	70-74	489	8.8	169	9.5	320	8.5
1882-1886	75-79	294	5.3	90	5.1	204	5.4
1877-1881	80-84	159	2.9	44	2.5	115	3.1
1872-1876	85-89	69	1.3	19	1.1	50	1.3
1871	90+	17	0.4	4	0.2	13	0.3
Total		5550	100.0	1779	100.0	3771	100.0
Mean age					58.0		58.5

NUMBER

Cause

All causes

Number

Percent

All cancer

Number

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Lung cancer

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TABLE 3
NUMBER OF DEATHS AND PERCENT DEAD OF SUBJECTS AT START OF PERIOD, RIVERSIDE
AND TOTOWA, PATERSON NEIGHBORHOOD STUDY

Cause of Death	1962-6		1967-71		1972-6		Total 1962-76	
	Riverside	Totowa	Riverside	Totowa	Riverside	Totowa	Riverside	Totowa
All causes								
Number	279	611	259	609	242	515	780	1735
Percent	15.7	16.2	17.3	19.3	19.5	20.2	43.8	46.0
All cancer								
Number	62	119	52	134	49	100	163	353
Percent	3.5	3.2	3.5	4.2	3.9	3.9	9.2	9.4
Lung cancer								
Number	16	28	13	44	12	26	41	98
Percent	0.9	0.7	0.9	1.4	1.0	1.0	2.3	2.6
Number of subjects at start of period	1779	3771	1500	3160	1241	2551	1779	3771

Of the 7428 subjects mentioned above, 1743 had died before January 1, 1962, and 5685 were alive as of that date. Of these 5685, 135 were excluded from analysis for the following reasons: 11 living but age unknown, 35 reported to have died but death certificate not obtained, and 89 lost to follow-up.

The analysis that follows is based on the final net total: 5550 men alive as of January 1, 1962, of whom 2515 were dead and 3035 were alive as of December 31, 1976.

FINDINGS

TABLE 2 shows the dates of birth and ages of the 5550 subjects as of January 1, 1962. The distributions are not identical for Riverside and Totowa, but they are very close indeed. This fact greatly simplified the presentation of findings.

TABLE 4
NUMBER AND PERCENT OF DEATHS FOR CANCER SITES, RIVERSIDE AND TOTOWA,
PATERSON NEIGHBORHOOD STUDY

	Riverside		Totowa	
	Number	Percent	Number	Percent
Lung	41	2.31	98	2.59
Colon-rectum	24	1.35	74	1.96
Prostate	17	0.96	37	0.98
Leukemia	11	0.62	15	0.39
Stomach	9	0.51	22	0.58
Pancreas	9	0.51	13	0.34
Kidney	5	0.28	7	0.19
Bladder	5	0.28	14	0.37
Lymphoma	5	0.28	9	0.24
Esophagus	4	0.22	12	0.32
Other specified	23	1.29	41	1.09
Unspecified	10	0.56	11	0.29

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Ordinarily, in comparing the mortality experience of two groups of subjects, it is necessary to take account of differences in age by some procedure, such as age standardization. We carried out the procedure and found that age-standardization had virtually no effect on the findings due to the closeness of the age distributions of the Riverside and Totowa subjects. For this reason, we will present the findings in terms of the actual number of deaths and the percentage of deaths of men alive at the start of the period for each of the two areas.

MORTALITY

Altogether, 780 (43.8%) of the Riverside subjects and 1735 (46.0%) of the Totowa subjects died during the 15-year period January 1, 1962 to December 31, 1976. During this period, cancer (all sites) accounted for the deaths of 163 (9.2%) of the Riverside subjects and for 353 (9.4%) of the deaths of the Totowa subjects; lung cancer accounted for 41 (2.3%) of deaths of Riverside and 98 (2.6%) deaths of Totowa subjects. Thus, with respect to total deaths, deaths from cancer (all sites combined), and lung cancer, mortality experience was slightly worse in Totowa than in Riverside. TABLE 3 shows the corresponding figures for each of three 5-year time periods. In all three periods, total mortality was slightly higher in Totowa than in Riverside. In the first period, cancer mortality (all sites) and lung cancer were higher in Riverside than in Totowa; in the second and third periods, the reverse occurred.

TABLE 4 shows mortality experience for the entire 15 years. Both lung cancer and colon-rectal cancer mortalities were a little worse in Totowa than in Riverside. The number of deaths from cancer of each of various other sites was so small that the differences in mortality (Riverside versus Totowa) are of no interest because of statistical instability. No deaths from peritoneal mesothelioma and just one death from pleural mesothelioma occurred during the 15-year period. This one death was that of a Riverside subject (an electrician) who died of pleural mesothelioma in 1966.

This is the only finding that gives even a hint that the slight asbestos exposure of Riverside subjects might have resulted in a fatality. What detracts from such a conclusion is the fact that the one mesothelioma occurred in the first of the three 5-year time periods rather than in the last of the three time periods. Based on evidence from studies of people with occupational exposure to asbestos dust, we would have expected that the mesothelioma death would have occurred in the last rather than the first 5-year time period, but this is only speculation.

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