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INDUSTRIAL ACCIDENTS AND HYGIENE SERIES

**CAUSES OF DEATH
BY OCCUPATION**

**OCCUPATIONAL MORTALITY EXPERIENCE
OF THE METROPOLITAN LIFE INSURANCE
COMPANY, INDUSTRIAL DEPARTMENT
1922-1924 : BY LOUIS I. DUBLIN, PH. D.
AND ROBERT J. VANE, JR.**



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CAUSES OF DEATH, BY OCCUPATION

INTRODUCTION

OUR first monograph entitled "Causes of Death, by Occupation," which was based on the occupational mortality experience of industrial policyholders insured with the Metropolitan Life Insurance Co., was published by the United States Department of Labor. This pamphlet, known as Bulletin No. 207 of the Bureau of Labor Statistics, analyzed the causes of death (among the 2,000,000 then insured) of 94,269 white males 15 years of age and older who died during the three years 1911 to 1913. The data contained in this bulletin have been favorably received, widely reprinted, and extensively used by agencies engaged in the practical improvement of industrial conditions. Highly gratifying has been the influence this publication has exerted in the settlement of labor difficulties and in the general improvement in industrial hygiene. It has been quoted in labor arbitrations in various industries, especially in the printing and publishing trades and in the clothing and textile industries; and it has been employed in the solution of problems of industrial relations in the railroad field.

Such favorable response has been coupled with an insistent demand for more recent statistics. Our mortality data are illustrative of the changing health of the wage earners of the Nation. Improvements in machinery, changes in industrial processes, new findings regarding the sanitation of factories, reductions in the hours of labor, increases in wages, and the extensive welfare activities characteristic of modern industry have profoundly influenced the health of workers. The betterment of living conditions and improved standards of living have made their impress very definitely upon the longevity and vitality of wage earners and have been immediately reflected in lower death rates. To-day workers 20 years of age may expect to live, on the average, five years longer than similar workers could in 1912. It is for these reasons that we have thought it desirable to bring our report up to date; for only by the widespread dissemination of such facts can we arrive at a sound means of bettering working conditions and raising still further the level of industry.

Tuberculosis has always been the predominating scourge of the American workman; but since 1912 tuberculosis of the respiratory system alone has declined over 50 per cent. Other causes of death

have decreased in varying amounts. Only a few conditions, like cancer, have shown a rising death rate. Consequently, it now seems desirable to extend our previous analysis of occupational mortality. The present bulletin is based upon a far larger experience than the earlier one. It now covers 3,250,000 white male policyholders insured in the industrial department of the Metropolitan Life Insurance Co. Of this exposure, 112,364 died during the years 1922, 1923, and 1924. Our aim is to provide reliable, recent, and useful information regarding a typical cross section of the wage-earning population. Industrial physicians, health officers, and private practitioners will be in a position to discover from what diseases these workers died and at what ages. Labor arbitrators and others interested in the improvement of working conditions will learn about some of the less satisfactory aspects of the present industrial situation and, having this knowledge, will be in a far better position to find a solution for their problems.

The method of analysis has been in general the same as that used in the previous study. As we do not know the number of insured persons in each occupation, we have been compelled to use the method of proportionate mortality; that is, to find out for each occupation the part that any cause of death has played in the total mortality, taking into account the factor of age. There can no longer be any doubt as to the utility of this method in working out practical problems of industrial hygiene. Certain safeguards, to be sure, have to be thrown around our discussion, since we lack accurate knowledge of the occupational status of living policyholders; but we are especially fortunate in having at our disposal the actual death rates for the group as a whole and in the light of this information, differences in the proportionate mortality take on added significance. Fortunately, we now have, also, the data of the Registrar General of England and Wales on the effects of occupation on mortality; these figures cover recent years and supplement the historic material of that office. These British statistics give death rates for each occupation and so have been useful in checking the conclusions derived from the study of our data.

The causes of death have been classified as heretofore according to the standard method used by the Census Bureau of the United States Department of Commerce, while the occupations have been classified according to an abridged and modified list of titles based on the Classified Index to Occupations of the Bureau of the Census. Comparability with our previous study and with data of the Census Bureau has been maintained. It will, therefore, be possible to consider the newer material in the light of the old and to compare it with publications of similar insurance experience such as those issued by Dr. Frederick L. Hoffman from time to time and also with those of the Census Bureau.

The authors desire to acknowledge their indebtedness to Dr. Wade Wright for many helpful criticisms, to Dr. Paul W. Cohen and to Miss Bessie Bunzel, who from the very beginning have assisted in the compilation of this material.

CHAPTER 1

The Group as a Whole

THE group of industrial policyholders of the Metropolitan covered by this study consists mainly of people in the United States and Canada who earn their livelihood in manufacturing plants, mines, transportation industries, and mechanical pursuits. They constitute a fairly homogeneous social and economic group which may be described as the urban wage-earning population. The actual occupations of living policyholders were not available; but the occupational classification of the 105,467 occupied white males who died in the three years covered by this study is known. While no substitute for the former, it, nevertheless, is representative of the general occupational make-up of the group. The following table shows their distribution in 1911-1913 and 1922-1924:

TABLE 1.—Occupations of white male decedents, aged 15 years and over, 1911-1913 and 1922-1924

Occupation	Number of deaths, 1922-1924	Per cent of total	
		1911-1913	1922-1924
Laborers (undefined).....	1 10, 026	11.4	9.5
Clerks, bookkeepers, and office assistants.....	5, 140	4.4	4.9
Teamsters, drivers, and chauffeurs.....	5, 001	6.9	4.7
Machinists.....	4, 835	3.3	4.6
Farmers and farm laborers.....	4, 681	4.1	4.4
Policemen, watchmen, and guards.....	1 3, 832	2.6	3.6
Carpenters.....	1 3, 582	4.2	3.4
Textile (except cordage, hemp, dyeing and finishing) mill workers.....	3, 512	2.5	3.3
Store clerks and salesmen.....	3, 302	2.5	3.1
Merchants and storekeepers.....	3, 133	2.4	3.0
Painters, paper hangers, and varnishers.....	2, 740	2.9	2.6
Railway track and yard workers.....	2, 617	2.0	2.5
Janitors and building employees.....	1 2, 583	1.9	2.4
Children, students, and scholars.....	2, 378	1.5	2.3
Coal miners (underground).....	1, 960	1.7	1.9
Professional service.....	1, 784	1.3	1.7
Iron and steel mill workers.....	1, 587	.8	1.5
Stationary engineers and firemen.....	1, 555	1.5	1.5
Agents, canvassers, and traveling salesmen.....	1 1, 524	1.3	1.4
Shoemakers and shoe-factory workers.....	1, 500	1.5	1.4
Masons, bricklayers, and plasterers.....	1 1, 423	1.9	1.4
Plumbers, gas fitters, and steam fitters.....	1, 263	1.2	1.2
Iron-foundry workers.....	1, 234	1.7	1.2
Waiters and hotel servants.....	1 1, 113	.8	1.1
Tailors and garment-factory workers.....	1 1, 046	1.2	1.0
Compositors, printers, and pressmen.....	937	1.1	.9
Hucksters and peddlers.....	932	.9	.9
Blacksmiths.....	876	1.4	.8
Street-railway workers.....	860	.9	.8
Electricians.....	855	.6	.8
Cabinet and furniture makers.....	1 846	.8	.8
Railway engineers and trainmen.....	769	1.0	.7
Barbers and hairdressers.....	768	.6	.7

(See footnote 1 at end of table, p. 4.)

TABLE 1.—Occupations of white male decedents, ages 15 years and over, 1911-1913 and 1922-1924—Continued

Occupation	Number of deaths, 1922-1924	Per cent of total	
		1911-1913	1922-1924
Sailors and marine workers.....	692	0.8	0.7
Street and sewer cleaners.....	617	.6	.6
Longshoremen and stevedores.....	594	.7	.6
Bakers.....	591	.7	.6
Cigar makers and tobacco workers.....	508	.7	.5
Tinners (shop) and tinware workers.....	467	.7	.4
Saloon keepers and bartenders.....	457	2.3	.4
Hostlers and stablemen.....	363	.9	.3
Leather-goods workers.....	278	.7	.3
Coopers.....	233	.6	.2
All other occupations.....	20,463	16.5	19.4
All occupations (excluding "retired").....	105,467	100.0	100.0

¹ For purposes of comparison, the classification of occupations used in the 1911-1913 study has been retained in this table. The number of deaths given in the table for this occupation is not the same, therefore, as that appearing in other sections of this report because of changes in classification procedure since the earlier study was published.

It appears at once that the occupational make-up of the group ^a has remained fairly constant since the earlier study of 1911-1913 (*I*). In both periods the greatest number of deaths occurred in the group entitled "Laborers." The first 10 occupations in the list in 1922-1924 were responsible for 44.5 per cent of the deaths; in 1911-1913 they accounted for 44.3 per cent of the total. Only one entry, "Painters, paper hangers, and varnishers," disappeared from its position among the 10 leading occupations, being replaced by "Merchants and storekeepers," the eleventh in the earlier list. A few noteworthy differences, due to major national readjustments in industry, are recorded during the decade. The number of deaths among saloon keepers and bartenders has decreased 79 per cent; among hostlers and stablemen, 56 per cent; and among blacksmiths, 31 per cent. Similarly, the progressive expansion of the metal industries has caused an increase of 53 per cent in the number of deaths among machinists and of 108 per cent among iron and steel mill workers. In some occupations at least a part of the proportional differences shown in the above table results from a change in mortality; but, unfortunately, because of the method used in this study, we can not determine with assurance which industries have been thus affected. We may say that in spite of the changes in the proportionate representation of individual occupations, the general complexion of the group as a whole has not been altered essentially in the last 10 years, and the comparability of the two groups remains essentially undisturbed.

Although these industrial policyholders are typical of the wage-earning population of the country, they include in their number fewer agricultural workers, professional people, executives, and small, independent business men than does the entire working population. Differences in the occupational composition of the two classes can not be measured with absolute accuracy, as we do not know the occupations of living policyholders. However, unpublished data in the files of the United States Bureau of the Census showed the

^a For sources of data as indicated by italic figures in parentheses in the text of this bulletin see corresponding numbers in list of references, page 129. [Ed.]

occupations of gainfully employed white males of the United States registration States who died in 1920. Their distribution by broad industrial classes may be compared with a similar distribution of our deceased policyholders. More than 25 per cent of the occupied males of the registration States were engaged at the time of their death in agriculture, forestry, or animal husbandry, whereas only a little over 5 per cent of our male policyholders were so employed. This is because the operations of the company are largely concentrated in American cities and towns. There were more gainfully employed males in professional occupations and semiprofessional pursuits in the general population than in the Metropolitan group, the percentages being 3.9 and 1.7, respectively.

Other main industrial classes were better represented among the insured males, with the exception of the extraction of minerals, where the percentages were about the same, 2.7 and 2.5, respectively, for males in the registration States and for insured males. Over one-half (51.7 per cent) were classified under the heading "Manufacturing and mechanical industries," whereas 42 per cent of the males in the registration States were thus designated. Transportation pursuits (including steam and street railway workers, sailors, longshoremen, teamsters, etc.) accounted for 13.1 per cent of the insured males and 6.7 per cent of the other group. Public-service occupations, including watchmen and guards, policemen, city firemen, and soldiers, contained 5.1 per cent of the policyholders, as compared with 2.5 per cent of the males in the registration States. The percentages of deaths among insured males and among males of the registration States, in the remaining industry groups, were, respectively: Trade, 9 and 8.5; domestic and personal service, 6 and 4.2; and clerical, 5.6 and 4.1 per cent.

In this section we shall consider the mortality experience of this group of insured lives as a whole; that is, without regard to particular occupations. Fortunately, there are available complete records, both of the number of living policyholders and of the number of deaths, classified according to age, sex, cause of death, and other items, which should give a very instructive picture. This is certainly one of the most extensive series of figures existing in the entire field of industrial hygiene, covering, as it does, an exposure of three and a quarter million workmen during a period of three years.

The following table presents the death rates by age periods for the Metropolitan industrial policyholders, as compared with the rates at the same ages for men in the general population of the United States registration States. Both sets of figures are for the year 1923.

TABLE 2.—*Death rates of white males, ages 15 and over, all causes, 1923: Metropolitan industrial department and United States registration States compared*

Population group	Death rate per 100,000 for ages (years)—						
	15 and over	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over
1. United States registration States.....	1,384.5	363.8	457.7	717.4	1,207.4	2,527.8	8,304.6
2. Metropolitan insured males.....	1,183.5	347.2	556.1	946.6	1,725.4	3,385.3	7,574.7
Per cent, Group 2 of Group 1.....	85.5	95.4	121.5	131.9	142.9	133.9	91.2

Curiously enough the mortality rate of the insured group, at all ages combined, is lower than that of males in the registration States, the figures being 11.8 and 13.8 per thousand, respectively. This condition is due to lower mortality in the first age group, 15 to 24 years, and in the last, 65 years and over. At age 25, however, the mortality rate of the insured is already higher and it remains so up to age 64, increasing progressively from age 25 to 54 years. In the age period 45 to 54 years, the death rate for the insured exceeds that for the general population group by 43 per cent. In the succeeding age period (55 to 64 years) the rate is 34 per cent higher. These rates reflect primarily the results of industrial exposure. In the beginning, the group of policyholders is in its best physical condition and suffers from a lower mortality rate than does the general population. At age 25, the situation changes; and thereafter, largely, we believe, as a result of industrial hazards of one kind or another, the mortality rate is heavier than that of the general male population. The rates for the last age period, when the insured again make a more favorable showing, are not reliable because most of our industrial policies terminate at age 74. It, therefore, follows that the average age of policyholders in the class 65 years of age and over is lower than that of the corresponding population group; and consequently, other things being equal, one would expect their mortality rate to be lower.

The effects of industry are also clearly revealed in the differential death rates for males and females of the same economic class. Comparing the death rates as given in the following table for male policyholders and for their wives and sisters as represented by our female industrial policyholders, we find some striking differences. After age 10, the mortality rates for males are consistently higher than for females, with the single exception of the age period 15 to 24 years. Since the industrialization of women is then at its height, the question of the relative susceptibility of men and women to the exactions of industry upon their health is definitely raised. After this age, the large majority of these women become housewives and we notice a much lower rate of mortality for them in each succeeding age period than for men. This, we think, is largely traceable to the absence of industrial hazard in the lives of most women.

TABLE 3.—*Death rates of males and of females, ages 10 years and over, all causes, 1923: Metropolitan Life Insurance Co., industrial department*

Sex	Death rate per 100,000 for ages (years)—						
	10 to 14	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over
White males.....	198.6	347.2	556.1	946.6	1,725.4	3,385.3	7,574.7
White females.....	162.4	353.3	491.9	677.9	1,188.0	2,576.1	6,726.7
Per cent, male of female.....	122.3	98.3	113.1	139.6	145.2	131.4	112.6

Even more marked differences suggestive of the effects of industrial exposures are found when the mortality of industrial males

is compared with that of persons who are for the most part engaged in nonhazardous pursuits. We may take for this comparison, white male policyholders insured in the ordinary department of the Metropolitan Life Insurance Co., who are composed mainly of the clerical, professional, and commercial classes. Agricultural workers and the better-paid mechanics are also represented in fairly large numbers. Age for age considered, the mortality rates for the industrial group run from one and one-half times to more than two times the rates for policyholders in the ordinary department. This is shown in the following table:

TABLE 4.—*Death rates for all causes, 1923: Regular ordinary department (total males) compared with industrial department (white males)*

Insurance class	Death rate per 100,000 for ages (years)—						
	20 and over	20 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over
Industrial department, males....	1,404.1	400.6	556.1	946.6	1,725.4	3,385.3	7,574.7
Ordinary department, males....	550.0	255.2	268.4	422.0	790.1	1,868.0	5,604.1
Per cent, industrial of ordinary..	255.3	157.0	207.2	224.3	218.4	181.2	135.2

In terms of life expectation, the severer status of the industrial worker is equally impressive. The industrial worker at age 20, when he begins his career, has an expectation of life of 42 years; or in other words he may expect to reach age 62. The 20-year-old worker engaged in nonhazardous occupations, however, may expect to attain age 69, or seven years additional. Industrial workers are at a disadvantage in each succeeding period; at age 30 the difference is 6.6 years; at age 50, 4.2 years; and at age 70, 1.3 years, always in favor of the nonindustrial groups. These facts are shown in Table 5.

TABLE 5.—*Expectation of life of white male policyholders insured in the Metropolitan Life Insurance Co., ordinary and industrial departments, 1923*

Age	Expectation of life in years		Per cent difference	Age	Expectation of life in years		Per cent difference
	Industrial department	Ordinary department			Industrial department	Ordinary department	
20.....	42.10	49.31	17.1	50.....	18.79	22.96	22.2
25.....	37.89	44.82	18.3	55.....	15.60	18.99	21.7
30.....	33.72	40.31	19.5	60.....	12.73	15.32	20.3
35.....	29.71	35.82	20.6	65.....	10.15	12.02	18.4
40.....	25.88	31.42	21.4	70.....	7.96	9.23	16.0
45.....	22.23	27.15	22.1				

The above comparisons between the death rates of various groups—males insured in the industrial department of the Metropolitan Life Insurance Co., males of the registration States, males insured in the ordinary branch of the Metropolitan, and females of the wage-earning class reveal the influence of industrial environment on mortality

rates and life expectation. The difference in the mortality rates for these groups gives a rough measure of the tax which industrial work exacts and reflects the hazards to which workers are exposed. Other items obviously account for a part of the disparity in these figures. Heredity and innate differences play some part in the end result. But probably the most important factors are the conditions incidental to industrial employment, including deleterious dusts, excessive fatigue, bad posture, crowded workrooms, dampness, extreme changes of temperature, and sometimes specific occupational poisoning, to which industrial workers are so frequently exposed. We shall see later the great susceptibility of workers in a given occupation to specific causes of death which are related to each of these industrial hazards.

Up to this point we have considered only the total mortality of the group without regard to specific causes of death. In Table 6 we present the more detailed findings for the principal causes among white male industrial policyholders 15 years of age and over and the percentage of increase or decrease in 1923 as against 1912, the mid-years of our two studies.

The causes of death showing the highest death rates in 1923 were other diseases of the heart with 188.7 per 100,000, tuberculosis of the respiratory system (149.7), and influenza, pneumonia (124).

In 1912, tuberculosis of the lungs with a rate of 319.9 was the leading cause of death. Organic diseases of the heart with a rate of 203.9 was second and nephritis (acute and chronic) with a rate of 178.1 per 100,000 was third. At ages 15 to 24, in 1923 accidental or undefined violence was the leading cause of death, with a rate of 89, and tuberculosis of the respiratory system was second with 80.2. In the next age period tuberculosis took the lead with a rate of 162.5, accidental violence being next with a rate of 95.9. "Influenza, pneumonia" became prominent in this age period and was the third highest cause, with a rate of 61.2. In the age period 35 to 44 years the order was still the same—tuberculosis and accidental violence showing the highest rates, amounting to 196.1 and 118.3, respectively. After age 44 years, diseases of the heart became the chief cause of death with death rates of 253.3 in the age group 45 to 54, and of 681.3 in the 55 to 64 year group. In the first of these periods, tuberculosis was second in numerical importance with a rate of 218.5; but in the latter, it was superseded by cancer, which showed a rate of 436.2, and by nephritis and cerebral hemorrhage, both of which had a rate of 363.

Almost every cause of death has shown a highly gratifying downward trend of mortality. Tuberculosis of the respiratory system, one of the most important causes, has fortunately shown a very great improvement, the death rate decreasing from 319.9 per 100,000 in 1912 to 149.7 in 1923, a fall of 53.2 per cent in the earlier rate. Workers 25 to 34 years of age and 35 to 44 years were the most favorably affected, the decrease amounting to 60.2 and 62.6 per cent respectively. Nephritis has shown a significant but smaller decrease of 38.0 per cent, the rates declining from 178.1 for all ages in 1912 to 110.5 in 1923. The mortality rate from this disease showed the

greatest decline in the age period 35 to 44, where it went down 55.7 per cent. Mortality from pneumonia also showed the substantial reduction of 26.2 per cent, the rate in 1923 being only 92.5. The younger workers enjoyed the greatest decline, the reduction amounting to 42.4 and 35.2 per cent, respectively, in the age periods 25 to 34 and 35 to 44. The fatal accident rate was reduced from 140.6 in 1912 to 121.2 in 1923, a decline of 13.8 per cent. Diseases of the heart¹ showed little change for all ages. The death rate declined 7.5 per cent or from 203.9 per 100,000 to 188.7. In the age period 35 to 44, however, the reduction amounted to 33.5 per cent.

Some of the lesser causes of death display a most marked diminution, notably typhoid fever, cirrhosis of the liver, and suicide, with decreases of 72.2, 65.4, and 42.2 per cent, respectively. The effects of better industrial hygiene are clearly seen in the 50 per cent decline in the death rate from chronic lead poisoning, a disease almost exclusively occupational in origin.

Several exceptions to the general downward trend of mortality are found. Thus cancer has increased in frequency from 77.6 per 100,000 in 1912 to 94.9 in 1923, a rise of 22.3 per cent in the death rate. In the important age periods 45 to 54 and 55 to 64 the rates increased 15.5 per cent and 30.6 per cent, respectively.

Influenza went up 157 per cent and automobile accidents almost 500 per cent at all ages, between the years 1912 and 1923. Diabetes and homicide registered increases but of a lesser amount, being, respectively, only 13 and 18 per cent for all ages. Cancer, influenza, and automobile accidents increased at every age period; diabetes at every period after age 45; and homicide at every period except the 45 to 54 and 55 to 64 year groups.

The greatest differences in the total mortality rates for various social groups, it will be recalled, were found when the mortality of males insured in the industrial department of the Metropolitan Life Insurance Co. was compared with that of males insured in the ordinary department of the same company. This condition is shown with particular clearness in relation to the principal causes of death in these two classes. White males 15 years of age and over insured in the industrial department suffered from higher death rates for every cause of death than did males insured in the ordinary department. The death rates for tuberculosis, age period for age period, are from two and one-half to nearly four times as high among the industrial workers as among the professional, mercantile, and agricultural group. Pneumonia is more than twice as prevalent among industrial as among nonindustrial workers. In like manner, the degenerative diseases such as cerebral hemorrhage, nephritis, and organic diseases of the heart show death rates that are two, and in some cases more than three, times as high as in the nonindustrial group. The increased accident hazard is important, the death rate of wage earners being more than twice that of non-industrial workers.

¹ Changes in classification procedure have materially affected the comparability of the figures for heart disease. (See discussion on p. 114.)

TABLE 6.—Number of deaths and death rates, 1923, and per cent decline in white males, aged 15 and over, by age periods,

Line No.	Cause of death	1920 international list numbers	Age period (years)				
			15 and over			15 to 24	
			Number of deaths 1923	Death rate per 100,000, 1923	Per cent decline in death rate, ¹ 1912-1923	Death rate per 100,000, 1923	Per cent decline in death rate, ¹ 1912-1923
1	All causes.....		38,427	1,183.5	27.0	347.2	26.0
2	Typhoid fever.....	1	202	6.2	72.2	9.7	60.1
3	Influenza, pneumonia.....	11, 100-101	4,025	124.0	9.9	32.6	16.4
4	Influenza.....	11	1,020	31.4	157.4	11.3	222.9
5	Pneumonia (all forms).....	100, 101	3,005	92.5	26.2	21.3	13.4
6	Pneumonia (lobar and undefined).....	101	2,256	69.5	34.1	17.0	26.7
7	Other diseases of the respiratory system.....	97-99, 102-107	592	18.2	36.4	3.7	35.1
8	Tuberculosis of the respiratory system.....	31	4,862	149.7	53.2	80.2	49.4
9	Syphilis, tabes dorsalis, and general paralysis of insane.....	38, 72, 76	854	26.3	4	1.6	15.8
10	Cancer (all forms).....	43-49	3,082	94.9	22.3	3.4	36.0
11	Rheumatism (acute and chronic).....	51, 52	132	4.1	50.0	3.9	15.2
12	Diabetes.....	57	578	17.8	12.7	4.1	6.8
13	Alcoholism.....	66	327	10.1	35.7	.4	55.6
14	Cirrhosis of the liver.....	122	405	12.5	65.4	.4	55.6
15	Chronic poisoning by mineral and organic substances.....	67-68	41	1.3	35.0	.3	-----
16	Chronic lead poisoning.....	67(a)	26	.8	50.0	.1	-----
17	Other chronic poisonings.....	67(b), 68	15	.5	-----	.3	200.0
18	Cerebral hemorrhage, apoplexy, paralysis.....	74, 75	2,862	88.1	19.5	1.4	26.3
19	Other diseases of the heart.....	90	6,127	188.7	7.5	26.0	7.1
20	Diseases of the arteries.....	91	650	20.0	40.8	.1	-----
21	Arteriosclerosis.....	91(b)	543	16.7	(?)	-----	(?)
22	Nephritis (acute and chronic).....	128, 129	3,588	110.5	38.0	8.2	47.1
23	Suicides (all forms).....	165-174	647	19.9	42.2	5.0	60.0
24	Accidental or undefined violence.....	175-196, 201-203	3,936	121.2	13.8	89.0	.2
25	Other acute poisonings (gas excepted).....	177	61	1.9	24.0	.8	60.0
26	Conflagration.....	178	36	1.1	8.3	.4	20.0
27	Accidental burns (conflagration excepted).....	179	105	3.2	18.5	1.7	13.3
28	Accidental mechanical suffocation.....	180	15	.5	(?)	.3	(?)
29	Accidental absorption of irrespirable or poisonous gases.....	181	213	6.6	(?)	1.7	(?)
30	Accidental drowning.....	182	466	14.4	28.0	19.4	13.4
31	Accidental traumatism by fall.....	185	518	16.0	38.2	4.9	35.5
32	Accidental traumatism in mines and quarries.....	186	136	4.2	4.5	3.0	23.1
33	Accidental traumatism by machines.....	187	181	5.6	16.7	5.6	27.3
34	Railroad accidents.....	188(a)	458	14.1	48.5	11.2	47.7
35	Street-car accidents.....	188(b)	130	4.0	50.6	1.7	52.8
36	Automobile accidents.....	188(c)	845	26.0	465.2	17.6	423.3
37	Other accidental electric shocks.....	196	85	2.6	7.1	3.2	3.2
38	Homicides (all forms).....	167-199	314	9.7	18.3	7.0	34.6
	Exposure.....						
				3,246,984		1,150,758	

¹ Bold-face figures denote increase.

death rates, 1912 to 1923, from specified causes of death, in all occupations, Metropolitan Life Insurance Co, industrial department

Age period (years)										Line No.
25 to 34		35 to 44		45 to 54		55 to 64		65 and over		
Death rate per 100,000, 1923	Per cent decline in death rate, ¹ 1912-1923	Death rate per 100,000, 1923	Per cent decline in death rate, ¹ 1912-1923	Death rate per 100,000, 1923	Per cent decline in death rate, ¹ 1912-1923	Death rate per 100,000, 1923	Per cent decline in death rate, ¹ 1912-1923	Death rate per 100,000, 1923	Per cent decline in death rate, ¹ 1912-1923	
556.1	43.1	946.6	41.2	1,725.4	26.3	3,385.3	16.4	7,574.7	13.4	1
5.0	81.3	3.9	80.7	4.0	78.7	4.9	70.5	1.7	79.8	2
61.2	25.7	117.6	17.9	191.3	12.7	352.2	4.1	696.8	3.5	3
15.9	341.7	29.3	306.9	43.0	144.3	82.5	116.0	180.9	101.0	4
45.3	42.4	88.2	35.2	148.4	26.4	269.8	18.0	515.9	18.4	5
37.7	46.9	71.2	42.9	120.9	29.4	189.9	30.8	327.4	26.8	6
5.0	54.1	12.1	28.4	31.5	12.5	56.7	26.5	139.9	45.5	7
162.5	60.2	196.1	62.6	218.5	49.6	200.0	38.0	183.4	22.4	8
14.5	1.4	47.0	1.7	58.4	3.3	61.6	5.1	58.6	19.9	9
9.7	47.0	42.4	5.8	166.6	15.5	436.2	30.6	755.4	29.3	10
2.0	25.9	3.7	45.6	4.5	71.5	7.8	49.4	10.9	71.6	11
6.6	14.3	8.3	5.7	26.0	2.8	72.4	60.9	115.6	10.8	12
5.1	61.4	20.0	41.0	24.0	23.1	22.8	5.0	14.2	50.7	13
1.8	86.4	8.6	78.9	23.2	72.6	56.3	51.7	79.6	51.9	14
1.2	71.4	1.5	58.3	3.5	18.6	2.2	60.0	-----	100.0	15
.4	20.0	1.3	50.0	2.5	35.9	1.9	55.8	-----	100.0	16
.8	300.0	.2	80.0	1.0	150.0	.4	66.7	-----	100.0	17
4.8	55.1	22.4	38.6	100.9	19.0	363.0	15.0	1,097.1	9.4	18
39.6	26.4	86.6	33.5	253.3	3.3	681.3	1.7	1,854.1	3.7	19
1.0	37.5	6.8	9.3	16.5	14.5	55.6	46.9	1,325.8	35.8	20
.4	(?)	1.8	(?)	9.0	(?)	48.1	(?)	305.7	(?)	21
25.0	50.8	67.5	55.7	175.1	38.2	363.0	39.4	1,056.0	18.7	22
14.3	45.6	26.2	45.3	35.5	44.4	45.9	38.0	60.3	10.3	23
95.9	18.0	118.3	21.2	148.1	24.6	213.1	6.3	310.7	15.9	24
1.3	43.5	3.3	-----	3.5	31.4	3.7	32.7	-----	100.0	25
1.7	750.0	.9	60.9	1.2	7.7	1.1	38.9	4.2	41.7	26
2.1	16.7	2.8	7.7	5.5	1.8	6.0	62.2	13.4	59.5	27
.1	(?)	.6	(?)	1.0	(?)	1.1	(?)	-----	(?)	28
2.9	(?)	7.7	(?)	12.2	(?)	19.8	(?)	23.4	(?)	29
13.4	26.4	11.0	39.6	10.5	46.7	11.2	35.3	7.5	65.3	30
8.6	50.0	12.8	53.1	27.2	39.4	45.5	17.1	79.6	34.3	31
3.7	14.0	6.4	52.4	5.5	1.8	4.5	27.4	3.3	31.2	32
4.7	86.0	5.0	35.9	5.5	41.0	7.8	2.5	8.4	16.7	33
13.9	53.2	13.6	44.3	15.5	51.1	20.1	49.9	27.6	37.8	34
2.6	55.9	4.8	29.4	5.0	70.1	9.7	34.5	15.9	42.4	35
22.5	603.1	27.3	396.4	28.0	495.7	46.6	441.9	70.3	432.6	36
3.5	2.8	2.0	48.7	1.5	11.8	1.5	150.0	-----	-----	37
14.3	14.4	12.7	39.6	9.0	15.9	5.6	30.0	4.2	16.7	38
763,197	-----	545,239	-----	400,368	-----	268,011	-----	119,411	-----	-----

¹ Figures for 1912 and 1923 are not comparable.

Notwithstanding the relatively unfavorable mortality of workers, it is highly gratifying that their death rate has rapidly declined and their life expectation has considerably increased during recent decades. Between 1912 and 1923 the death rate has declined from 1,621.7 per 100,000 to 1,183.5 per 100,000. Not only has there been a total decline of 27 per cent during the period, but a substantial decline in the death rate has characterized every age group. On account of this reduced mortality, almost 14,000 fewer deaths have occurred among the three and a quarter million policyholders in the single year of 1923 than would have taken place had the mortality rates of 1912 prevailed. This lessened mortality amounts in terms of life expectation to an average increase of five years for each industrial worker at age 20; and there has been some increase in longevity at every age period. The greatest reduction in mortality has taken place in the important working ages 25 to 34 years and 35 to 44 years, when the rates declined 43.1 and 41.2 per cent, respectively. Less progress is recorded after age 55, the decline amounting to only 16.4 per cent in the age period 55 to 64 years.

While it is true that the death rate has declined among all classes, our group of workers has exhibited a greater improvement, age for age, than has the general population. Table 7 shows the percentage of decline in mortality of white males insured in our industrial department as compared with insured white females and with white males of the general population (United States registration States of 1910).

TABLE 7.—Per cent of decline in death rates among white males and white females insured in industrial department of Metropolitan Life Insurance Co. and among white males of the registration States of 1910

Age period	Metropolitan Life Insurance Co., 1912 to 1923		Registration States, 1911 to 1923, white males
	White males	White females	
15 years and over.....	27.0	21.1	3.5
15 to 24.....	26.0	21.1	19.3
25 to 34.....	43.1	27.5	29.0
35 to 44.....	41.2	28.2	23.2
45 to 54.....	26.3	17.5	15.7
55 to 64.....	16.4	13.7	6.1
65 years and over.....	13.4	12.1	13.6

¹ Increase.

Age for age considered, the decline in the death rates for our insured group has been from 7 to 18 per cent greater than the decline for males of the registration States and from 1 to 16 per cent greater than for females of the industrial population. The greatest gain for all classes has been at the ages 25 to 34 and 35 to 44 years; and at these ages also, the rate of decline for industrial males exceeds by the greatest margin the decline in the rate of the other classes. It would be very instructive if we could make similar comparisons between the trend in the death rates for individual causes of death for males of the registration States and for males insured in our

industrial department. Unfortunately, the data necessary to make these comparisons are not available. However, we can say that our figures, although incomplete, indicate that the decline in mortality among industrial males has been more rapid for all of the more important causes of death. This fact has been conclusively shown for tuberculosis in a recent study entitled "Special Aspects of the Declining Tuberculosis Death Rate in the United States" (2). It was pointed out in that paper that the maximum decline in the death rate from tuberculosis among industrial males between the years 1911 and 1925 occurred at the ages between 20 and 45 years and that at these ages the rate of decline was about 20 per cent greater among industrial males than among males in the general population.

What factors have brought about this vast improvement in the health and longevity of industrial workers? Surely among the many causes must be included the wide expansion of workmen's compensation, preventive industrial medicine, the safety movement, the reduction in the hours of labor, elimination of the sweatshop, better plant sanitation, the wider education of the workers regarding the dangers inherent in certain occupations, and the more intelligent care now taken to safeguard the health of workers. But even more important has been the improved standard of living which the increased prosperity of the American wage earner has provided. The outlook for the future is bright indeed. There is every reason to believe that the continuation and expansion of health activities in industry, noticeable everywhere, will result in further reductions in mortality. The trend in the death rates according to our recent figures is still downward. It is not unreasonable to expect, therefore, that in the not far distant future the mortality rates of industrial workers will more nearly approach, if they do not quite equal, those of the more favored classes of the population.

CHAPTER 2

Mortality According to Occupation

WE HAVE shown in the preceding chapter that, as a class, industrial workers have a higher mortality rate from the principal causes of death than do other occupied groups. In this section of our report we shall analyze the mortality of the more important occupations among industrial policyholders, to determine which are contributing unduly to the unfavorable showing. It would be well if, in addition to the distribution of the occupations of the deceased, there were available the occupational distribution of living policyholders. We should then be able to present death rates for each of the occupations in question. Such rates, especially if prepared for the various age periods of life, would undoubtedly be a very accurate measure of the hazard to life in the various occupations. Unfortunately, information with reference to the occupations of living policyholders is not available because the constant shifting in the type of work engaged in makes it impractical to keep such detailed records.

Proportionate mortality.—We may nevertheless measure approximately the hazards involved in certain occupations by presenting the proportionate mortality from certain causes of death in each occupation. This method has the virtue of showing at once what causes mortality in each age period. With proper precautions, occupations can be compared among themselves and valuable facts obtained for the practical purposes of industrial hygiene. Our first step was to obtain the general proportionate distribution of the principal causes of death among the group as a whole as is shown in Table 8. The number of deaths in 10-year age periods, from each cause, and the percentage distribution of the causes within each age period are presented.

Similar tables will be presented for each occupation studied and the proportionate representation of any one cause of death in a certain occupation will be compared with the corresponding figure for all occupations. The ratio of these percentages may be conveniently called the *relative index of mortality*. For example, referring to Table 13 we find that among cigar makers and tobacco workers, aged 15 to 24 years, 41.4 per cent of the deaths are due to tuberculosis of the respiratory system. For all occupied males of the same ages, the corresponding proportion of deaths is 23.5 per cent. (Table 8.) The relative index for tuberculosis among cigar makers and tobacco workers for the 15 to 24 year period is, therefore, 176.2. Thus it is obvious that tuberculosis of the respiratory system is a relatively much more important cause of death among young cigar makers and tobacco workers than it is among workers as a whole.

CAUSES OF DEATH, BY OCCUPATION

TABLE 8.—Number and per cent of deaths from specified causes in all occupa
Metropolitan Life Insurance

Line No.	Cause of death	1920 international list numbers	Ages, 15 years and over		Age period (years)	
					15 to 24	
			Number of deaths	Per cent of total	Number of deaths	Per cent of total
1	Typhoid fever.....	1	597	0.6	313	2.6
2	Influenza, pneumonia.....	11, 100, 101	10, 221	9.7	1, 053	8.8
3	Influenza.....	11	2, 083	2.0	286	2.4
4	Pneumonia (all forms).....	100, 101	8, 138	7.7	767	6.4
5	Other diseases of the respiratory system.....	97-99, 102-107	1, 614	1.5	134	1.1
6	Tuberculosis of the respiratory system.....	31	14, 172	13.4	2, 798	23.5
7	Syphilis, tabes dorsalis, and general paralysis of insane.....	38, 72, 76	2, 375	2.3	51	.4
8	Cancer (all forms).....	43-49	8, 632	8.2	128	1.1
9	Rheumatism (acute and chronic).....	51, 52	370	.4	119	1.0
10	Diabetes.....	57	1, 529	1.4	146	1.2
11	Alcoholism.....	66	854	.8	14	1
12	Cirrhosis of the liver.....	122	1, 128	1.1	17	1
13	Chronic occupational poisonings ¹	67, 68	80	.1	4	
14	Chronic lead poisoning ¹	67(a)	70	.1	3	
15	Other occupational and chronic poisonings ¹	67(b), 68	10		1	
16	Cerebral hemorrhage, apoplexy, paralysis.....	74, 75	7, 616	7.2	58	.5
17	Other diseases of the heart.....	90	16, 217	15.4	903	7.6
18	Arteriosclerosis.....	91(b)	1, 389	1.3		
19	Nephritis (acute and chronic).....	128, 129	9, 414	8.9	317	2.7
20	Suicides (all forms).....	165-174	1, 894	1.8	193	1.6
21	Accidental or undefined violence.....	{ 175-189, 192-196, 201-203	{ 10, 916	{ 10.4	{ 2, 953	{ 24.8
22	Occupational accidents ¹	{ 175-189, 192-196, 201-203	{ 3, 592	{ 3.4	{ 819	{ 6.9
23	Septicemia (secondary cause).....		76	.1	12	1
24	Other acute accidental poisonings (gas excepted).....	177	162	.2	20	.2
25	Conflagration.....	178	144	.1	24	.2
26	Accidental burns (conflagration excepted).....	179	280	.3	61	.5
27	Accidental absorption of irrespirable, irritating, or poisonous gases.....	181	609	.6	57	.5
28	Accidental drowning.....	182	1, 380	1.3	713	6.0
29	Accidental traumatism by fall.....	185	1, 380	1.3	170	1.4
30	Accidental traumatism in mines and quarries.....	186	389	.4	102	.9
31	Accidental traumatism by machines.....	187	482	.5	155	1.3
32	Railroad accidents.....	188(a)	1, 155	1.1	301	2.5
33	Street-car accidents.....	188(b)	388	.4	65	.5
34	Automobile accidents.....	188(c)	2, 292	2.2	599	5.0
35	Other accidental electric shocks.....	196	271	.3	100	.8
36	Homicides (all forms).....	197-199	865	.8	213	1.8
37	Occupational homicides ¹		42		4	
38	All other causes.....		15, 584	14.8	2, 513	21.1
39	Total.....		105, 467	100.0	11, 927	100.0
40	All occupational causes ¹		3, 955	3.7	839	7.0
41	Occupational accidents ¹		3, 592	3.4	819	6.9
42	Occupational homicides ¹		42		4	
43	Occupational diseases ¹		321	.3	16	.1
44	Nonoccupational causes.....		101, 512	96.3	11, 088	93.0

¹ Deaths from causes directly incidental to occupation.

MORTALITY ACCORDING TO OCCUPATION

tions (excluding "retired"), by age periods, white males, 1922 to 1924, Co., Industrial department

Age period (years)										Average age at death (years)	Line No.
25 to 34		35 to 44		45 to 54		55 to 64		65 and over			
Number of deaths	Per cent of total	Number of deaths	Per cent of total	Number of deaths	Per cent of total	Number of deaths	Per cent of total	Number of deaths	Per cent of total		
118	1.0	77	0.5	52	0.3	30	0.1	7	28.9	1	
1,210	10.0	1,752	11.6	1,971	10.0	2,424	9.7	1,811	8.4	2	
276	2.3	358	2.4	340	1.7	441	1.8	382	1.8	3	
934	7.7	1,394	9.3	1,631	8.3	1,953	7.9	1,429	6.6	4	
123	1.0	215	1.4	331	1.7	412	1.6	399	1.8	5	
3,572	29.4	3,129	20.8	2,558	13.0	1,546	6.2	569	2.6	6	
292	2.4	712	4.7	683	3.5	447	1.8	190	.9	7	
239	2.0	647	4.3	1,894	9.6	3,302	13.2	2,422	11.2	8	
48	.4	48	.3	58	.3	55	.2	42	.2	9	
141	1.2	139	.9	274	1.4	493	2.0	336	1.6	10	
121	1.0	279	1.9	259	1.3	144	.6	37	.2	11	
47	.4	128	.9	305	1.6	386	1.5	245	1.1	12	
8	.1	18	.1	23	.1	17	.1	10	.5	13	
6	-----	18	.1	19	.1	15	.1	9	.4	14	
2	-----	4	-----	2	-----	2	-----	1	.1	15	
134	1.1	405	2.7	1,169	5.9	2,729	10.9	3,121	14.4	16	
854	7.0	1,386	9.2	2,982	15.2	4,941	19.7	5,151	23.8	17	
8	.1	28	.2	120	.6	366	1.5	867	4.0	18	
539	4.4	1,003	6.7	1,908	9.7	2,762	11.0	2,885	13.3	19	
336	2.8	439	2.9	404	2.1	357	1.4	165	.8	20	
2,014	16.6	1,840	12.2	1,696	8.6	1,541	6.2	872	4.0	21	
774	6.4	744	4.9	583	3.0	467	1.9	205	.9	22	
12	.1	12	.1	10	.1	23	.1	7	-----	23	
38	.3	39	.3	38	.2	25	.1	2	-----	24	
35	.3	35	.2	24	.1	16	.1	10	-----	25	
49	.4	42	.3	55	.3	48	.2	25	.1	26	
72	.6	109	.7	149	.8	145	.6	77	.4	27	
249	2.0	174	1.2	134	.7	81	.3	29	.1	28	
189	1.6	241	1.6	269	1.4	301	1.2	210	1.0	29	
77	.6	92	.6	70	.4	38	.2	10	-----	30	
81	.7	80	.5	75	.4	66	.3	25	.1	31	
259	2.1	211	1.4	166	.8	145	.6	73	.3	32	
68	.6	62	.4	60	.3	85	.3	48	.2	33	
458	3.8	364	2.4	334	1.7	325	1.3	212	1.0	34	
87	.7	47	.3	26	.1	10	-----	1	-----	35	
291	2.4	185	1.2	111	.6	51	.2	14	.1	36	
11	.1	8	.1	9	.0	7	-----	3	-----	37	
2,058	16.9	2,611	17.4	2,858	14.5	3,051	12.2	2,493	11.5	38	
12,153	100.0	15,041	100.0	19,656	100.0	25,054	100.0	21,636	100.0	39	
810	6.7	799	5.3	690	3.5	568	2.3	249	1.2	40	
774	6.4	744	4.9	583	3.0	467	1.9	205	.9	41	
11	.1	8	.1	9	.0	7	-----	3	-----	42	
25	.2	47	.3	98	.5	94	.4	41	.2	43	
11,343	93.3	14,242	94.7	18,966	96.5	24,486	97.7	21,387	98.8	44	

Standardized relative index.—The relative indexes for all ages combined do not reflect the actual mortality picture in any given occupation, because age distribution varies so greatly from occupation to occupation, and differences in age distribution unduly weight and distort the result. It is quite apparent that except in unusual instances, occupations having a preponderance of persons in the older age divisions will show (for all ages combined) a low percentage of deaths from tuberculosis and other diseases to which men succumb more frequently at the younger ages; and, conversely, a higher percentage of deaths from heart disease and other diseases characteristic of later life. We have, therefore, not calculated the usual relative indexes for all ages 15 years and over. Nevertheless, for convenience of discussion, it would be very desirable to provide a single figure which would show whether the occupation is characterized by relatively low or high percentages of deaths from any particular cause. To meet this need, standardized percentages for principal causes of death and for each occupation during the main working period of life (ages 15 to 64 years)¹ have been worked out. The ratios between the standardized percentage for a given cause in a selected occupation and the corresponding percentage for all occupied males will be referred to as the *standardized relative index*.

The standardized relative index for the principal causes of death will be found in the table for each occupation. It is a helpful device for picking out the relatively most important causes of death. Its use eliminates, to a large extent, the factor of age distribution in the several occupations; it does not, however, eliminate the factor of differential occupational death rates. Since this is so, these indexes do not afford an accurate measure of the relative frequency of deaths from a specific cause among men actively engaged in different occupations and must not be confused with the more accurate indexes based upon actual death rates. It is entirely possible, for example, that an index above 100 may be shown by the proportionate mortality method for a given cause and occupation even when the actual death rate is below average. This will occur when both the total death rate for the occupation and the death rate from the given cause in that occupation are lower than average, the first being proportionately lower than the second. On the other hand, proportionate mortality indexes below 100 will be found when the death rate for a cause of death is above the average but not as much above average as the total death rate. Variations in the total death rate, it will be seen from these illustrations, should be taken into account in using these indexes as a basis to form an opinion as to whether an occupation is characterized by a high or low death rate for a specific disease. We have, therefore, brought together and discussed in a paragraph at the beginning of each occupational section important facts brought out in this study as well as data available from other sources

¹ The total number of deaths for each occupation was assumed to be the same as for all occupied males, and to be similarly distributed by 10-year age periods—ages 15 to 64 years. The proportionate distribution of the deaths among the several causes of death actually found for a given occupation was then applied to the assumed number of deaths in each age period, 15 to 64 years. The sum of the deaths thus calculated for a selected cause of death, divided by the total number of deaths from all causes among all occupied males, ages 15 to 64 years, gives the standardized percentage, or the proportion of deaths which would have been due to that cause of death if the total number of deaths from all causes at each age division, had been the same for that occupation as for all occupied males.

which would indicate whether an occupation is characterized by a high or low total death rate.

Tebb and Greenwood (3) found, it is interesting to observe, that in spite of many exceptions of the type indicated in the foregoing paragraph, the correlation at ages 35 to 45 between the proportionate mortality from phthisis and the death rate from phthisis in the Registrar General's occupational groups (mortality experience of 1900-1902) was as much as 0.754 ± 0.04 . This is a better result than we should expect to find for causes less affected by occupational stress; but it certainly indicates that high or low proportionate mortality indexes generally point to high or low death rates.

Entirely apart, however, from the question of whether or not these indexes measure the relative frequency of death from specific diseases among men actively engaged in different occupations, the point must be again emphasized that they always show which causes of death are most dependent upon working conditions. Even if the death rate is low for every cause of death among men engaged in an occupation the fact that some causes of death are relatively not so favorable as others may be significant of untoward conditions and is a fact of importance to the industrial physician charged with the care of the health of these men.

Average age at death.—The average age at death has been determined for each of the occupations, and is to be found in a footnote to each occupational section. It must not be assumed, however, that these average ages are in any sense measures of the mortality of persons in the various occupations. They are dependent in large measure upon the age distribution of the living workers in each of the occupations. It is obvious that the average age at death will be low in such occupations as clerks, bookkeepers, and office assistants, where the largest number of persons exposed are in the earlier age periods. On the other hand, a high average age at death will be found in those occupations in which a considerable proportion of the workers are in the advanced age periods, as for example, among laborers. Yet the mortality rate of laborers is clearly much higher per thousand exposed than the mortality rate found among clerks, bookkeepers, and office assistants. The determining factor is, then, the distribution of the ages of the living in each occupation. Data covering this point are not available in our experience, but, in spite of these limitations, it is nevertheless of interest to note the average ages of the deceased.

Our original tabulations analyzed 72 individual occupations. The number of deaths for many of these occupations was too small to yield reliable results except in the case of the few most important causes of death. We shall, therefore, consider in detail only 33 occupations. Significant facts for the remaining occupations will be discussed when we summarize our findings for each cause of death. In our previous study we considered only 19 occupations; but we have extended this number because other data are so scanty and many requests for information on occupations not investigated have reached us. We have, consequently, included this time some occupations such as carpenters, merchants, and storekeepers which have, apparently, no special health hazards. It is instructive to find that some of

these occupations show unusually low percentages for certain diseases.

Bakers²

PREVIOUS analyses of the mortality of bakers have shown a somewhat lower death rate than among all occupied males. The medico-actuarial investigation of 1913 (4), which analyzed the occupational mortality of persons insured under ordinary plans of life insurance (1885-1908), reported a ratio of 98 per cent of actual to expected deaths among journeymen bakers. In the experience of England and Wales, 1921-1923 (5), bakers and pastry cooks had a death rate 14 per cent below that of all occupied and retired males. These figures seem to contradict the general opinion that bakers suffer from a high death rate because they are obliged to work in a confined atmosphere laden with dust and are exposed to heat and sudden variations in temperature. Undoubtedly the hazards of the occupation have been exaggerated; but it is very probable, at the same time, that bakers experience a very high morbidity rate from respiratory diseases of a nonfatal type. A study of the health of food handlers (6) made in New York City some years ago, disclosed that bakers suffered inordinately from chronic bronchitis and emphysema. Pharyngitis was also a frequent impairment, probably as a result of the dusty atmosphere in bakeries. The outstanding features of the present investigation are the high indexes for syphilis, cancer, tuberculosis, and diabetes.

TABLE 9.—Number and per cent of deaths from specified causes among white male bakers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index *
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths	591		47	69	78	118	170	109	
Typhoid fever	4	0.7	4.3	1.4		0.8			
Influenza, pneumonia	51	8.6	6.4	14.5	11.5	8.5	7.6	5.5	
Influenza	6	1.0		4.3	1.3		1.2		60
Pneumonia (all forms)	45	7.6	6.4	10.1	10.3	8.5	6.5	5.5	102
Other diseases of the respiratory system	8	1.4		1.4	1.3	.8	2.4	.9	93
Tuberculosis of the respiratory system	88	14.9	31.9	27.5	28.2	12.7	7.6	3.7	116
Syphilis, tabes dorsalis, and general paralysis of insane	23	3.9		2.9	10.3	4.2	4.1	.9	172
Cancer (all forms)	66	11.2	2.1	2.9	2.6	13.6	16.5	15.6	126
Rheumatism (acute and chronic)	3	.5				1.7	.6		
Diabetes	10	1.7		1.4	1.3	1.7	2.9	.9	120
Alcoholism	5	.8		1.4	2.6	.8		.9	
Cirrhosis of the liver	6	1.0			2.6	.8	1.8		
Cerebral hemorrhage, apoplexy, paralysis	33	5.6			1.3	3.4	5.9	16.5	52
Other diseases of the heart	97	16.4	6.4	10.1	7.7	18.6	18.8	24.8	104
Arteriosclerosis	8	1.4					1.2	5.5	
Nephritis (acute and chronic)	57	9.6	2.1	1.4	5.1	12.7	9.4	18.3	93
Suicide (all forms)	12	2.0		5.8	3.8	1.7	1.2	.9	
Accidental or undefined violence	33	5.6	21.3	7.2	5.1	4.2	4.7	.9	62
Occupational accidents	2	.3	2.1				.6		
Homicide (all forms)	5	.8	4.3	1.4	1.3		.6		
All other causes	82	13.9	21.3	20.3	15.4	13.6	14.7	4.6	
Total	591	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths	2	.3	2.1				.6		
Nonoccupational deaths	589	99.7	97.9	100.0	100.0	100.0	99.4	100.0	

* See page 18 for explanation of standardized relative index.

² Includes foremen and workmen in bakeries where breads, cakes, pies, biscuits, and crackers are made. (Bakers' store clerks are not included.) The average age at death is 50.2 years. (See p. 19.)

Respiratory diseases.—Pneumonia is slightly higher than average, the standardized relative index being 102. The relative indexes are somewhat above 100 in every age period up to age 54. The highest relative index (131) appears at the ages 25 to 34. In the period 55 to 64, the relative index falls to 82. There are too few deaths attributed to influenza and other respiratory diseases for the figures to be conclusive.

Tuberculosis of the respiratory system.—Tuberculosis is apparently more prevalent among bakers than among all occupied males. The standardized relative index is 116. The ratios are higher than the average in the age periods 15 to 24, 35 to 44, and 55 to 64, the relative indexes being, respectively, 136, 136, and 123. The medico-actuarial investigation reported a death rate from tuberculosis among journeymen bakers 15 per cent above the standard; but this finding is not borne out by the English occupational statistics, which record only an average death rate from tuberculosis among bakers and pastry cooks. The proportionate mortality for all ages 15 years and over was lower in 1922-1924 than in 1911-1913, the percentages being 14.9 and 18.8 for the two periods, respectively. Tuberculosis has apparently not gone down as rapidly among bakers as among all occupied males. The cellar bakery is not yet a thing of the past; and night work and its concomitant irregular habits of living will probably remain for a long time an inherent characteristic of the occupation. Preventive measures could well be directed toward remedying these conditions.

Syphilis, tabes dorsalis, general paralysis of the insane.—Although few deaths are recorded, the ratios are so consistently high that the figures are not without significance. The standardized relative index is 172. In an occupation where we should expect to find a low ratio because of the strict supervision carried on by public health departments, this is a surprising condition. The prevalence of transmissible diseases among food handlers should be a matter of great concern to a community. Only stringent periodic physical examinations can adequately protect the public from such a hazard.

Cancer (all forms).—The standardized relative index for cancer is 126. The high relative indexes point to a high death rate from this cause. In the age periods 45 to 54 and 55 to 64, where cancer becomes a leading cause of death, the relative indexes are 142 and 125, respectively. The present state of our knowledge concerning this disease does not, however, warrant the conclusion that occupation is a causative factor in these high ratios.

Suicide (all forms).—Although the ratios for this cause have been greatly reduced since 1911-1913 and the number of deaths in the present study is not large, the indications are that the rate is still somewhat higher than that for all occupied males. Especially high relative indexes are recorded at the ages 25 to 44. English statistics for 1921-1923 also show a higher death rate from suicide among bakers and pastry cooks than among all occupied and retired males. There is perhaps some relationship between the high ratio for this cause and the high incidence of syphilis.

Other causes.—The other important causes of death with the exception of accidental violence and diabetes do not exhibit significant differences. Accidents, however, are especially low throughout, the

standardized relative index being only 62. There were 10 deaths from diabetes, giving a standardized relative index of 120.

Blacksmiths ³

THE CLASSIFICATION "Blacksmiths" includes not only blacksmiths doing horseshoeing but also the industrial blacksmiths or forgemen. The composition of the group has changed considerably since our earlier study and all comparisons of mortality with that study must take this change into consideration. As a result of the gradual disappearance of the horse as a draft animal, there were far fewer of the first type of blacksmith and, conversely, far more industrial blacksmiths in the present investigation than in our previous study. In the occupational mortality investigation of England and Wales 1921-1923 (5), smiths and skilled forge workers had a mortality rate 5 per cent lower than average, the rates for cancer, diabetes, and the respiratory diseases being somewhat higher than average. In the present study cerebral hemorrhage, pneumonia, syphilis, and cancer show notably higher than average percentages.

TABLE 10.—Number and per cent of deaths from specified causes among white male blacksmiths, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	876		23	44	83	178	254	294	
Typhoid fever.....	1	0.1	4.3						
Influenza, pneumonia.....	90	10.3	13.0	11.4	14.5	13.5	8.3	8.5	
Influenza.....	15	1.7	4.3	2.3	2.4	2.2	.8	1.7	105
Pneumonia (all forms).....	75	8.6	8.7	9.1	12.0	11.2	7.5	6.8	120
Other diseases of the respiratory system.....	5	.6				1.1	.8	.3	34
Tuberculosis of the respiratory system.....	67	7.6	8.7	20.5	19.3	11.2	6.7	1.0	76
Syphilis, tabes dorsalis, and general paralysis of insane.....	23	2.6		2.3	8.4	5.6	1.2	.7	135
Cancer (all forms).....	103	11.8	8.7	2.3	6.0	12.9	12.6	13.6	127
Rheumatism (acute and chronic).....	3	.3			1.2			.7	
Diabetes.....	16	1.8				1.1	2.8	2.4	77
Alcoholism.....	4	.5			1.2	1.1	.4		
Cirrhosis of the liver.....	8	.9			1.2	1.1	4.6	.3	
Cerebral hemorrhage, apoplexy, paralysis.....	108	12.3		2.3	4.8	5.6	15.7	18.0	134
Other diseases of the heart.....	150	17.1	4.3	4.5	7.2	10.7	19.3	24.8	82
Arteriosclerosis.....	17	1.9					1.2	4.8	
Nephritis (acute and chronic).....	81	9.2		9.1	9.6	8.4	8.3	11.2	96
Suicide (all forms).....	10	1.1		4.5		2.2	1.6		
Accidental or undefined violence.....	60	6.8	26.1	18.2	6.0	9.6	5.9	3.1	96
Occupational accidents.....	15	1.7	8.7	2.3	1.2	2.8	2.0	.3	
Traumatism by machines.....	4	.5			1.2	1.1	.4		
Burns (conflagration excepted).....	3	.3	4.3		1.2			.3	
Homicide (all forms).....	5	.6		2.3	1.2	1.1		.3	
All other causes.....	125	14.3	34.8	22.7	19.3	14.6	13.8	10.2	
Total.....	876	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths.....	15	1.7	8.7	2.3	1.2	2.8	2.0	.3	
Nonoccupational deaths.....	861	98.3	91.3	97.7	98.8	97.2	98.0	99.7	

^a See page 18 for explanation of standardized relative index.

³ Includes blacksmiths, horseshoers, and hand-forge workers in the various industries (excludes drop-forge workers). The average age at death is 56.9 years. (See note, p. 19.)

Respiratory diseases.—Blacksmiths, like workers in other occupations in the metal industry exposed to heat and sudden variations of temperature, have very high ratios for pneumonia. The standardized relative index is 120. Up to age 54, the relative indexes are well above the average. Excluding the age period 15 to 24, where there are only two deaths, the highest relative index, 135, is in the age period 45 to 54 years. The ratios for other respiratory diseases can not be interpreted because of the paucity of data.

Tuberculosis of the respiratory system.—On the whole, deaths from tuberculosis are less frequent in this occupation than among all occupied males, the standardized relative index being 76. The relative indexes are very low, increasing more or less gradually from 37 in the age period 15 to 24 years, to 108 in the age period 55 to 64. The actual death rate is therefore undoubtedly low. The fine physique of men engaged in this sort of work explains the low mortality from tuberculosis. The proportion of deaths for all ages 15 years and over declined from 14 per cent to 7.6 per cent since 1911–1913.

Cancer (all forms).—The ratios for cancer are consistently high and recall the greater frequency reported in 1911–1913; the standardized relative index is 127. Up to age 54 the relative indexes are much in excess of the average. In the age period 55 to 64 the ratio is about normal, the relative index being 96. In England and Wales the cancer death rate is about 12 per cent higher than that of all occupied and retired males. Occupation may be a causative influence as these workers are exposed to radiant heat and continual burns by hot metal. An analysis based on a much larger number of cancer deaths classified according to the organ or part of the body affected could perhaps throw further light and substantiate this assumption.

Cerebral hemorrhage, apoplexy, paralysis.—The proportionate mortality from this cause is inordinately high. The standardized relative index is 134. Only in the age period 45 to 54 is the relative index less than 100. The relative index of 144 based on 40 deaths in the age period 55 to 64 is the most significant figure. Excessive physical labor is perhaps a contributory cause of these high ratios.

Other diseases of the heart.—The low ratios for heart diseases are a reflection of the robust health of those choosing this occupation. The standardized relative index is 82. The relative indexes are all low, ranging from 57 in the age period 15 to 24 to 98 in the age period 55 to 64. The relative indexes increase gradually with age.

Nephritis (acute and chronic).—The death rate for nephritis is probably lower than the average. The standardized relative index is 96. In the age periods when nephritis is an important cause of death, the relative indexes are low, being 87 in the years 45 to 54, and 76 at 55 to 64 years. The small number of deaths at the younger ages makes the ratios at those periods unreliable.

Accidental or undefined violence.—It would appear from the proportionate mortality accident ratios that the actual death rate does not deviate much from the average. The standardized relative index is 96. From 15 to 34 and 45 to 54 the relative indexes are somewhat more than 100. Machinery accidents and burns were few in number and exhibit average percentages. Occupational accidents account for 25 per cent of all accidental deaths.

Carpenters ⁴

CARPENTERS suffer from accident hazards of the building trades. Their industrial environment, on the other hand, does not seem to be productive of excessive death rates for any of the important diseases. In England and Wales (5) the death rate of carpenters is 16 per cent less than that of all occupied and retired males and the chief causes of death all share in the favorable death rate. The report comments that carpenters and agricultural laborers are the only occupational groups wherein the mortality rate for each of the important causes of death is lower than the general average. In the present investigation syphilis, accidents, and cancer show notably higher than average percentages, but in view of the probable low total death rate the indexes do not suggest excessive mortality from these causes.

TABLE 11.—Number and per cent of deaths from specified causes among white male carpenters, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	3,499	-----	127	188	382	587	1,004	1,211	-----
Typhoid fever.....	14	0.4	2.4	1.1	0.5	1.0	0.1	-----	-----
Influenza, pneumonia.....	295	8.4	5.5	11.7	11.5	8.2	8.4	7.4	-----
Influenza.....	62	1.8	2.4	3.2	3.1	2.0	1.4	1.2	111
Pneumonia (all forms).....	233	6.7	3.1	8.5	8.4	6.1	7.0	6.2	84
Other diseases of the respiratory system.....	52	1.5	1.6	1.6	.8	1.9	2.0	1.1	114
Tuberculosis of the respiratory system.....	325	9.3	15.7	25.0	21.2	11.8	7.0	3.1	90
Syphilis, tabes dorsalis, and general paralysis of insane.....	90	2.6	.8	4.3	6.5	4.1	2.0	1.0	133
Cancer (all forms).....	412	11.8	3.9	1.6	3.1	12.3	17.9	11.6	129
Rheumatism (acute and chronic).....	11	.3	.8	.5	.3	.5	.1	.3	-----
Diabetes.....	33	.9	.8	.5	.8	.5	1.3	1.0	59
Alcoholism.....	24	.7	-----	1.6	1.3	1.5	.7	-----	-----
Cirrhosis of the liver.....	49	1.4	-----	-----	.8	1.9	1.5	1.7	-----
Chronic occupational poisonings.....	2	.1	-----	-----	-----	.2	.1	-----	-----
Lead poisoning.....	2	.1	-----	-----	-----	.2	.1	-----	-----
Cerebral hemorrhage, apoplexy, paralysis.....	330	9.4	.8	1.1	2.6	4.9	10.1	15.4	92
Other diseases of the heart.....	601	17.2	2.4	4.8	10.2	15.8	16.9	23.7	88
Arteriosclerosis.....	74	2.1	-----	-----	.3	.3	1.4	4.7	-----
Nephritis (acute and chronic).....	344	9.8	1.6	4.8	4.2	9.0	9.5	14.0	85
Suicide (all forms).....	43	1.2	1.6	1.6	2.1	1.7	1.4	.5	-----
Accidental or undefined violence.....	322	9.2	38.6	21.8	15.4	8.3	6.9	4.5	129
Occupational accidents.....	96	2.7	11.8	6.9	4.7	2.6	1.7	1.5	-----
Traumatism by fall.....	78	2.2	7.9	5.9	3.7	2.0	1.5	1.3	-----
Homicide (all forms).....	16	.5	2.4	3.2	.5	.2	.2	.2	-----
All other causes.....	462	13.2	21.3	14.9	17.8	15.8	12.6	9.8	-----
Total.....	3,499	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths.....	103	2.9	11.8	6.9	4.7	3.1	2.0	1.6	-----
Nonoccupational deaths.....	3,396	97.1	88.2	93.1	95.3	96.9	98.0	98.4	-----

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—Influenza and other diseases of the respiratory system are somewhat higher than the average, the standardized relative indexes being 111 and 114, respectively. Pneumonia, however, is less frequent than among all occupied males. The stand-

⁴ Includes foremen and workmen in the construction and maintenance of wooden buildings, factories, and ships; Carpenters, joiners, stair builders, house framers, and house and roof shinglers. The average age at death is 56.6 years. (See note, p. 19.)

ardized relative index is 84. The ratios are low except in the age period 25 to 34. It should be noted that in the ages 25 to 34 all types of respiratory diseases are frequent.

Tuberculosis of the respiratory system.—Tuberculosis is productive of relatively few deaths. The standardized relative index is 90. The percentages are about average or below average up to age period 55 to 64, where the index is 113. The relative index is lowest for the age period 15 to 24, where it is 67.

Syphilis, tabes dorsalis, general paralysis of the insane.—The ratios from this cause are high at every age period. The standardized relative index is 133.

Cancer (all forms).—Carpenters have the highest relative incidence of cancer among the 33 larger occupations for which standardized relative indexes were calculated. The standardized relative index is 129. Deaths from cancer are excessive after age 44 and in the first age period. In England and Wales the death rate for cancer (all forms) is only slightly below the average, but higher than average rates are recorded for cancer of the oesophagus.

Accidental or undefined violence.—The accident hazard is greater among carpenters than among all occupied males. The standardized relative index is 129. A very high relative index, 156, is found in the first period. Higher than average percentages are found in each age period except 45 to 54, where the relative index is 97. Falls accounted for almost 25 per cent of all accidental deaths.

Chauffeurs ⁵

EARLIER studies of occupational mortality do not show the death rate of chauffeurs. Recently, however, Arthur Hunter (7) of the New York Life Insurance Co. reported on the mortality of public taxicab and auto truck operating chauffeurs insured under ordinary plans in his company for the years 1916 to 1926. The actual number of deaths among chauffeurs was found to be 145 per cent of the number which might have been expected according to the death rates on standard lives. In the English mortality study (5), however, drivers of motor vehicles and steam wagons had death rates 14 per cent below the average. All the principal causes except syphilis showed average, or below average, death rates. Especially interesting is the fact that the death rate from accidents was 14 per cent below the average, whereas our study of American chauffeurs shows a standardized relative index for accidents of 146. There are more deaths from accidents in our study than from any other cause, except tuberculosis. Notably higher proportions of death are recorded in our study also for syphilis, cancer, and homicide. The extremely high percentages of deaths for homicides are an outstanding feature of the mortality of this group and should be of great significance to the public authorities, as they indicate that despite our system of licensing and checking up on chauffeurs, many undesirables have used this occupation as a cloak to cover their illegal activities.

⁵ Includes truck, taxi, and private automobile chauffeurs. The average age at death is 32.9 years. (See note, p. 19.)

TABLE 12.—Number and per cent of deaths from specified causes among white male chauffeurs, by age periods, 1922 to 1924

Cause of death	Age 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	1,400	.....	372	523	294	135	55	21	.....
Typhoid fever.....	10	0.7	1.9	0.2	0.3	0.7	.....	.....	.....
Influenza, pneumonia.....	116	8.3	6.5	9.0	9.5	8.1	9.1	4.8	.....
Influenza.....	24	1.7	1.9	1.5	2.4	1.5	.....	.....	63
Pneumonia (all forms).....	92	6.6	4.6	7.5	7.1	6.6	9.1	4.8	91
Other diseases of the respiratory system.....	18	1.3	1.1	1.0	2.4	1.5	.....	.....	75
Tuberculosis of the respiratory system.....	331	23.6	25.3	29.2	22.1	11.9	3.6	4.8	97
Syphilis, tabes dorsalis, and general paralysis of insane.....	35	2.5	.5	2.5	4.4	3.0	5.5	.....	137
Cancer (all forms).....	57	4.1	.8	2.7	4.8	11.1	14.5	14.3	112
Rheumatism (acute and chronic).....	5	.4	.3	.4	.....	.7	1.8	.....	.....
Diabetes.....	12	.9	.3	1.0	.7	1.5	3.6	.....	122
Alcoholism.....	15	1.1	.3	1.3	2.0	.7	.....	.....	.....
Cirrhosis of the liver.....	5	.4	.....	.6	.....	1.5	.....	.....	.....
Cerebral hemorrhage, apoplexy, paralysis.....	23	1.6	.3	.8	1.4	3.7	12.7	9.5	95
Other diseases of the heart.....	133	9.5	7.3	7.3	10.5	17.0	18.2	19.0	102
Arteriosclerosis.....	5	.4	.....	.....	.7	.7	1.8	4.8	.....
Nephritis (acute and chronic).....	65	4.6	2.7	3.4	7.1	5.9	7.3	19.0	73
Suicide (all forms).....	28	2.0	2.2	1.9	1.7	3.7	.....	.....	.....
Accidental or undefined violence.....	304	21.7	32.3	19.9	19.0	11.9	12.7	4.8	146
Occupational accidents.....	148	10.6	16.1	8.4	10.2	5.9	10.9	.....	.....
Occupational automobile accidents.....	94	6.7	9.9	5.9	5.8	3.0	9.1	.....	.....
Automobile accidents.....	135	9.6	14.8	8.2	8.5	4.4	9.1	4.8	.....
Homicide (all forms).....	47	3.4	4.6	4.8	.7	1.5	1.8	.....	.....
All other causes.....	191	13.6	14.0	14.1	12.6	14.8	7.3	19.0	.....
Total.....	1,400	100.0	100.0	100.0	100.0	100.0	100.0	100.0	.....
Occupational deaths.....	148	10.6	16.1	8.4	10.2	5.9	10.9	.....	.....
Nonoccupational deaths.....	1,252	89.4	83.9	91.6	89.8	94.1	89.1	100.0	.....

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—This occupation shows low ratios for the respiratory diseases. The standardized relative indexes for influenza, pneumonia, and other diseases of the respiratory system are 63, 91, and 75, respectively. The occupation teamsters and drivers, which is exposed to very similar conditions, exhibits much higher ratios. Chauffeurs are perhaps of a higher economic level and may also be a better selected group physically. They are also, on the whole, better protected from the elements.

Tuberculosis of the respiratory system.—The proportionate mortality for tuberculosis does not differ much from the average in the several age periods. The standardized relative index is 97. Excluding the indefinite period 65 and over, where there was one death, the highest relative index is 108 in the age period 15 to 24. The actual death rate from this cause is probably not far from the average.

Cancer (all forms).—The standardized relative index for cancer is 112. Cancer ratios are high after age 24. Occupational influences which predispose to cancerous growths are not evident. In England and Wales chauffeurs had an average death rate from cancer.

Alcoholism.—Though the actual number of deaths from alcoholism is small, there appears to be a greater incidence among chauffeurs than among all occupied males, a condition which was found also among teamsters and drivers.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 95. The number of deaths is small, and the ratios are therefore subject to large chance variations.

Other diseases of the heart.—The standardized relative index is 102. Heart disease exhibits high ratios in the age periods between 25 and 54. The highest relative index is 114, in the age period 35 to 44. The differences from the average are not large, but the indications are for a slightly higher incidence of heart impairment among these men.

Nephritis (acute and chronic).—Low ratios for nephritis are the rule. The standardized relative index is 73.

Accidental or undefined violence.—Accidents caused more deaths than any other cause except tuberculosis. The standardized relative index is 146. The proportionate mortality is high in every age period. The highest relative index appears in the age period 55 to 64, where it is 205. About one-half the accidental deaths were of occupational origin. The highest relative index for occupational accidents, 574, appeared in the age period 55 to 64 years, but is based on a small number of deaths. The highest indexes for teamsters, however, were also found at the older ages. The older man is probably not as capable as the younger of coping with the exigencies of these occupations. There were 135 automobile casualties, of which 94 or 69.6 per cent were of occupational origin.

Homicide (all forms).—There were 47 deaths from this cause, of which 42 occurred in the first two age periods. The relative indexes were 256 and 200 in the age periods 15 to 24 and 25 to 34, respectively. None of the deaths was of occupational origin, and a review of the original records indicates that in a majority of the cases the deceased chauffeur was to some extent culpable.

Cigar Makers and Tobacco Workers⁶

THE COMPOSITION of this group of workers has changed somewhat since our earlier study (1). The number of deaths has decreased from 693 to 508. Since this decrease has been mostly at the younger ages, the effect has been to raise the average age at death more than six years. The decrease in deaths is due to an actual reduction in the number of men employed in this industry as a result of greater machine production, a decreased demand for cigars, and a replacement of male by female workers, especially at the younger ages. The total death rate of tobacco workers is probably not above that of all occupied males insured in our industrial department. Cigar makers in the medico-actuarial investigation of 1913 (4) showed a ratio of actual to expected deaths of 108 per cent; and in England and Wales (5) tobacco factory operatives had a death rate about 15 per cent higher than the average. All of the older studies of occupational mortality record very high rates for tuberculosis. High ratios are also found for this cause in the present study.

⁶ Includes foremen and workmen: Branders, bunch makers, cappers and nip wrappers, casers, classifiers, cutters, dippers, driers and dry-house men, hangers and shakers-out, lump makers, pressers, prizer hands, rollers, samplers, shapers, sizers, snuff makers, sorters, steam wrappers, steam-box hands, stemmers, strippers, tiers, weighers, and wrappers. The average age at death is 55.9 years. (See note, p. 19.)

TABLE 13.—Number and per cent of deaths from specified causes among white male cigar makers and tobacco workers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	508		29	18	50	88	162	161	
Typhoid fever.....	3	0.6	3.4		2.0		0.6		
Influenza, pneumonia.....	44	8.7		5.6	22.0	9.1	6.2	8.7	
Influenza.....	12	2.4		5.6	4.0	3.4	.6	3.1	124
Pneumonia (all forms).....	32	6.3			18.0	5.7	5.6	5.6	78
Other diseases of the respiratory system.....	8	1.6				1.1	1.2	3.1	43
Tuberculosis of the respiratory system.....	53	10.4	41.4	55.6	16.0	17.0	3.7	1.2	135
Syphilis, tabes dorsalis, and general paralysis of insane.....	15	3.0			4.0	6.8	1.2	3.1	103
Cancer (all forms).....	63	12.4		5.6	4.0	8.0	17.9	14.9	118
Rheumatism (acute and chronic).....	1	.2					.6		
Diabetes.....	9	1.8			4.0	1.1	1.2	2.5	94
Alcoholism.....	7	1.4			4.0	2.3	1.9		
Cirrhosis of the liver.....	7	1.4			2.0	1.1	1.9	1.2	
Cerebral hemorrhage, apoplexy, paralysis.....	53	10.4			4.0	10.2	13.6	12.4	134
Other diseases of the heart.....	76	15.0	6.9		8.0	13.6	16.7	19.3	80
Arteriosclerosis.....	7	1.4			2.0		.6	3.1	
Nephritis (acute and chronic).....	52	10.2	6.9		8.0	8.0	11.1	13.0	98
Suicide (all forms).....	15	3.0	3.4	11.1	4.0	2.3	3.1	1.9	
Accidental or undefined violence.....	36	7.1	13.8	11.1	10.0	5.7	6.8	5.6	73
Occupational accidents.....	2	.4	3.4				.6		
Homicide (all forms).....	1	.2	3.4						
All other causes.....	58	11.4	20.7	11.1	6.0	13.6	11.7	9.9	
Total.....	508	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths.....	2	.4	3.4				.6		
Nonoccupational deaths.....	506	99.6	96.6	100.0	100.0	100.0	99.4	100.0	

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—The standardized relative indexes for pneumonia and for other diseases of the respiratory system are low, being 78 and 43, respectively. The standardized relative index for influenza, on the other hand, is high, being 124. The number of deaths, however, from influenza and other diseases of the respiratory system are too few to give reliable results.

Tuberculosis of the respiratory system.—The standardized relative index for tuberculosis is 135. The proportionate mortality ratios are very high up to age 34 and also in the age period 45 to 54. The highest relative index (189) is in the age period 25 to 34 years. In England and Wales in 1921–1923, the death rate was twice that of all occupied and retired males. Other investigations, including the medico-actuarial investigation and our earlier study, confirm these findings. There has evidently been an improvement in the tuberculosis rate since 1911–1913, but most of it has taken effect at the older ages. In the age period 15 to 24 years the proportion of deaths from tuberculosis to all deaths was 48.5 per cent in 1911–1913 and 41.4 per cent in the period 1922–1924. In the next period the proportions were 44.9 per cent and 55.6 per cent, respectively. The number of deaths at these ages is small, however. Causes for the high incidence of tuberculosis in this industry are controversial. The most recent investigators tend to minimize the direct occupational influence of tobacco dust. Dr. H. R. M. Landis (8) reports that in his examination of cigar workers, none of them, even after many years of exposure, showed lung changes different in any way from those found in city dwellers. The tendency for men of poor phy-

sique to enter this occupation may account in part for their high rates from this disease.

Cancer (all forms).—The standardized relative index for cancer is 118. At the age period 55 to 64, when the number of deaths is large, the index is 136. In England and Wales the death rate was 24 per cent above the average.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 134. The relative index in every age period where deaths have been recorded, except for the indefinite period 65 and over, is much above normal. The highest relative index is 173, in the age period 45 to 54 years. In England and Wales, in striking contrast to our figures, the death rate from this cause among tobacco workers is only a little more than half that of all occupied and retired males.

Other diseases of the heart.—Heart disease is a less frequent cause of death than among all occupied males. The standardized relative index is 80. In every age period the proportionate mortality ratio is much less than the normal. In England and Wales again the picture is different; tobacco factory operatives experienced a mortality rate from valvular diseases of the heart 48 per cent higher, while other heart diseases were 4 per cent higher than the average for all occupied and retired males.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 98. In the age periods 55 to 64 and 65 and over, where a large number of deaths is recorded, the relative indexes are 101 and 98, respectively. The relative indexes in other age periods are inconclusive because of the small number of deaths on which the ratios are based.

Suicide (all forms).—Very high suicide ratios are shown at every age. The highest relative index (396) appears in the age period 25 to 34. That this condition is not casual is corroborated by the similarly high proportionate mortality ratios from this cause in 1911-1913. English tobacco workers, however, show a lower than average death rate from suicide.

Accidental or undefined violence.—There is virtually no industrial accident hazard among tobacco workers. The standardized relative index for all types of accidents is 73. The ratios are very low up to age 54, after which they are above the average.

Clerks, Bookkeepers, and Office Assistants ⁷

CLERKS ARE on the whole a selected class. Their occupation is sedentary and exposes them to no apparent serious health or accident hazard. The only recent American study giving death rates for a group of clerical workers is the intercompany group insurance mortality experience for the years 1922 to 1926 (9), where clerical workers show a ratio of actual to expected deaths of 76.1 per cent, while that for all industries is 90.2 per cent. In England and Wales (5) the death rate of clerks is about the same as the average for all occupied and retired males. The death rate of clerks insured in our

⁷ Includes bookkeepers, clerks, stenographers, typewriters, office boys, proof readers, copy holders, post-office clerks, shipping clerks, and stock clerks. The average age at death is 40 years. (See note, p. 19.)

industrial department is very probably less than the average for white male industrial policyholders.

In the present study clerks have greater than average percentages of deaths from tuberculosis, diabetes, cerebral hemorrhage, and heart disease. The fatal accident rate, on the other hand, is very low, the standardized relative index being only 50. These findings are in agreement with those of our analysis of mortality by occupation in 1911 to 1913 (1). In England and Wales clerks showed higher than average death rates from tuberculosis, syphilis, diabetes, diseases of the digestive system, cirrhosis of the liver, and suicide.

TABLE 14.—Number and per cent of deaths from specified causes among white male clerks, bookkeepers, and office assistants, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	5,140	-----	1,313	990	749	841	766	481	-----
Typhoid fever.....	54	1.1	2.6	1.6	0.5	-----	-----	-----	-----
Influenza, pneumonia.....	503	9.8	10.4	9.5	12.0	9.6	8.2	7.9	-----
Influenza.....	104	2.0	2.1	2.3	2.8	1.7	1.6	1.2	99
Pneumonia (all forms).....	399	7.8	8.3	7.2	9.2	8.0	6.7	6.7	97
Other diseases of the respiratory system.....	61	1.2	1.3	1.3	.8	1.2	1.7	.4	90
Tuberculosis of the respiratory system.....	1,165	22.7	31.8	38.4	24.6	15.1	6.3	1.7	123
Syphilis, tabes dorsalis, and general paralysis of insane.....	110	2.1	.2	2.1	4.7	4.2	.9	1.9	93
Cancer (all forms).....	319	6.2	.9	2.2	5.2	8.9	13.6	13.9	102
Rheumatism (acute and chronic).....	32	.6	1.3	.6	.4	.4	.1	.4	-----
Diabetes.....	77	1.5	1.7	1.5	.8	1.3	2.7	.4	121
Alcoholism.....	23	.4	-----	7	.9	.8	.1	.2	-----
Cirrhosis of the liver.....	46	.9	.4	.5	.4	2.3	1.2	1.0	-----
Cerebral hemorrhage, apoplexy, paralysis.....	231	4.5	.4	1.0	2.8	5.4	12.7	11.0	108
Other diseases of the heart.....	749	14.6	10.1	9.4	11.7	18.1	20.4	26.6	116
Arteriosclerosis.....	27	.5	-----	-----	.1	.6	1.4	2.0	-----
Nephritis (acute and chronic).....	391	7.6	3.1	5.6	6.9	10.0	10.4	16.4	102
Suicide (all forms).....	91	1.8	1.6	1.5	3.1	1.8	1.0	1.9	-----
Accidental or undefined violence.....	369	7.2	14.0	7.6	4.1	5.0	3.3	2.5	50
Occupational accidents.....	36	.7	1.4	.5	.3	.5	.5	.4	-----
Homicide (all forms).....	38	.7	1.0	1.1	1.5	.4	-----	-----	-----
All other causes.....	854	16.6	19.2	15.4	19.4	15.1	15.9	11.6	-----
Total.....	5,140	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths.....	38	.7	1.4	.5	.4	.5	.7	.4	-----
Nonoccupational deaths.....	5,102	99.3	98.6	99.5	99.6	99.5	99.3	99.6	-----

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—Respiratory diseases are on the whole less frequent causes of death than among all occupied males. The standardized relative indexes for influenza, pneumonia, and other diseases of the respiratory system are 99, 97, and 90, respectively. English clerks have lower than average death rates for respiratory diseases; however, the death rate for influenza is average.

Tuberculosis of the respiratory systems.—The standardized relative index for tuberculosis is 123. The relative indexes decrease progressively from 135 in the age period 15 to 24 years to 102 in the age period 55 to 64 years. The high indexes are confirmed by our earlier study, where the relative indexes ran from 137 in the period 15 to 24 to 102 in the period 55 to 64, and by the experience of England and Wales where the death rate from tuberculosis among clerks is 24 per cent above the average. The sedentary nature of this occupa-

tion, poor posture, and faulty ventilation are possibly important causative factors of high rates for tuberculosis. Also contributory is the fact that men of weak constitution are attracted to this occupation. The percentage of deaths for all ages 15 years and over has declined from 35 per cent in 1911-1913 to 22.7 per cent in 1922-1924. Clerks have therefore shared proportionately in the general decline of the death rate from tuberculosis.

Cancer (all forms).—The standardized relative index for cancer is 102. The percentage of deaths for all ages 15 years and over has increased from 3.1 per cent in 1911-1913 to 6.2 per cent in 1922-1924. The death rate has therefore very probably shown a considerable increase since the previous study. However, the increase is due in part at least to an increase of three and a half years in the average age of the group at death.

Rheumatism (acute and chronic).—The ratios for rheumatism are high up to age 54 years. Although the number of deaths is small, the uniformly high ratios point to a high incidence of this disease among clerks. Men afflicted with rheumatism necessarily have to choose sedentary employment, since they are unable to do work requiring physical exertion. The high ratios may be due to this element of selection.

Diabetes.—The standardized relative index for diabetes is 121. High ratios for diabetes are noted also among most of the sedentary occupations, notably among merchants and storekeepers and tailors and other clothing workers. In England and Wales, the death rate from diabetes among clerks is 18 per cent above the average.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 108. Only in the age period 55 to 64, where the relative index is 117, is the ratio much above the average. In England and Wales clerks have an average death rate from this cause.

Other diseases of the heart.—The standardized relative index is 116. The relative indexes decrease progressively from 133 in the age period 15 to 24 to 104 in the age period 55 to 64. High relative indexes were found in our earlier study for the ages 15 to 44 years. There seems to be no direct occupational influence affecting this cause of death, although selection of work because of impairment is again suggested. The high ratios from rheumatism in this occupation coupled with the high ratios for heart disease suggest a greater incidence of rheumatic heart disease especially at the younger ages. In England and Wales, however, the death rates from valvular and other diseases of the heart are about average.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 102. Up to age 34, however, the ratios are considerably above the average. The death rate from chronic nephritis among English clerks is 6 per cent higher than among all occupied and retired males.

Accidental or undefined violence.—The most favorable aspect of the mortality of clerks is the extremely low accident rate. The standardized relative index is 50. This is one of the lowest ratios recorded in our analysis. The relative indexes are similarly low in every age period. Occupational accidents account for 10 per cent of all accidental deaths. The percentage of deaths for all ages 15 years and over has remained, since 1911-1913, at a figure of 7.2.

Coal Miners (Underground)^s

THE DEATH rate among coal miners in the United States is undoubtedly very high. In the medico-actuarial investigation of 1913 (4) the ratio of actual to expected deaths among working anthracite coal miners was 191 per cent and among bituminous miners 132 per cent. In the intercompany group mortality investigation 1922-1926 (9), the ratio was 146.2 per cent for underground bituminous mining and 122.9 per cent for anthracite mining. Coal mine accidents alone, judging from the comprehensive reports of the United States Bureau of Mines (10), are responsible for about 5 deaths annually per 1,000 underground workers who work 300 days a year. Such a fatal accident rate is clearly indicative of a very high total death rate. In the experience of the Metropolitan Life Insurance Co., 22 per cent of all deaths among coal miners is due to accidental violence. The outstanding features of the mortality of coal miners as revealed in this study are the very high ratios for respiratory diseases and accidents, the low ratios for tuberculosis, and the large proportion of deaths clearly occupational in origin. More than one-fifth (21.5 per cent) of the deaths are assigned specifically to occupational causes. Occupational accidents account for 15.8 per cent of all deaths, while occupational diseases are responsible for an additional 5.7 per cent.

TABLE 15.—Number and per cent of deaths from specified causes among white male coal miners (underground), by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ^a
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	1,960		191	193	299	435	503	339	
Typhoid fever.....	17	0.9	2.6	1.6	1.3	0.7	0.4		
Influenza, pneumonia.....	317	16.2	13.1	9.3	19.1	17.5	17.1	16.2	
Influenza.....	76	3.9	3.7	3.1	4.3	3.2	4.4	4.1	188
Pneumonia (all forms).....	241	12.3	9.4	6.2	14.7	14.3	12.7	12.1	150
Other diseases of the respiratory system.....	83	4.2		1.0	2.3	5.7	5.2	6.8	238
Tuberculosis of the respiratory system.....	139	7.1	4.7	13.5	10.4	6.4	5.8	4.7	48
Syphilis, tabes dorsalis, and general paralysis of insane.....	26	1.3			3.3	2.1	1.0	.6	53
Cancer (all forms).....	107	5.5	.5	.5	2.7	5.7	9.7	6.8	66
Rheumatism (acute and chronic).....	5	.3		.5	.7	.2		.3	
Diabetes.....	12	.6		.5	1.3	.5	1.0		51
Alcoholism.....	6	.3			.7	.7	.2		
Cirrhosis of the liver.....	20	1.0		.5	.7	1.1	1.0	2.1	
Chronic occupational poisonings.....	1	.1					.2		
Cerebral hemorrhage, apoplexy, paralysis.....	100	5.1		1.0	2.3	3.9	6.8	11.8	65
Other diseases of the heart.....	268	13.7	2.6	7.3	7.7	18.9	16.5	18.0	92
Arteriosclerosis.....	21	1.1			.3		1.4	3.8	
Nephritis (acute and chronic).....	132	6.7	.5	3.1	4.7	5.1	9.1	12.9	68
Suicide (all forms).....	26	1.3	3.1	2.1	2.0	1.4	.8		
Accidental or undefined violence.....	432	22.0	54.5	45.6	31.4	17.2	11.1	4.4	228
Occupational accidents.....	310	15.8	40.8	32.6	22.7	13.8	6.6	2.4	
Traumatism in mines.....	306	15.6	40.3	32.6	22.1	13.6	6.6	2.4	
Homicide (all forms).....	14	.7	.5	3.6	1.3	.2	.2		
All other causes.....	234	11.9	17.8	9.8	7.7	12.6	12.5	11.8	
Total.....	1,960	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths.....	421	21.5	41.9	34.2	26.4	22.1	14.7	7.7	
Nonoccupational deaths.....	1,539	78.5	58.1	65.8	73.6	77.9	85.3	92.3	

^a See page 18 for explanation of standardized relative index.

^s Includes foremen and workmen in coal mines: Line drivers, pit miners (in coal mines only), cagers, crib men, drillers, laborers in coal mines, trimmers, shaft tenders, and timbermen in coal mines. The average age at death is 49.1 years. (See note, p. 19.)

Typhoid fever.—The number of deaths from typhoid fever is small. Nevertheless, the high ratios indicate that the death rate from typhoid fever among coal miners is considerably higher than that among all occupied males. The relative indexes are high in every age period after age 24. Sanitation in coal mines and in coal mining communities is often deficient and could be greatly improved.

Respiratory diseases.—Very high ratios are found for all the respiratory diseases among coal miners and point definitely to the health hazards of this occupation. Earlier studies by Frederick L. Hoffman (11) and our own data for the years 1911 to 1913, as well as the recent report of the Registrar General of England and Wales, confirm these findings. In the present study, the respiratory diseases account for 20.4 per cent of all the deaths among coal miners.

The standardized relative index for influenza is 188. A high relative index is found in every age period, the highest being 244 at the ages 55 to 64 years. The proportionate mortality for influenza alone has increased from 1.5 per cent for all ages 15 years and over in 1911–1913 to 3.9 per cent in 1922–1924. These figures undoubtedly represent an increase in the actual death rate from this cause. It is worthy of mention here that in a study of influenza-pneumonia mortality during the epidemic in the last quarter of 1918, the death rate from this cause among bituminous coal miners insured under our group policies was found to be more than twice that of all insured white male industrial policyholders ages 15 years and older.

Pneumonia is the third highest cause of death among coal miners, being exceeded only by accidents and heart disease. The standardized relative index is 150. Other diseases of the respiratory system also show high ratios, the standardized relative index being 238. This very high index is due to the large number of deaths from miners' asthma, which disease was given either as the primary cause or as a contributory cause of death in virtually all of the 111 deaths from occupational diseases occurring among these miners.

Taking into consideration the very high total death rate in this occupation, it is quite evident from the ratios given above that the death rates for respiratory diseases among coal miners are excessive.

Tuberculosis of the respiratory system.—That coal miners have a very low death rate from tuberculosis has been confirmed by almost every mortality investigation. In this study, coal miners had relatively fewer deaths from tuberculosis than any of the 72 occupations analyzed. The standardized relative index is 48. The ratios are low in every age period up to age 64. While the heavy mortality from accidents makes the proportion of deaths from other causes low, it should not be inferred that this is the whole explanation for the low ratio for tuberculosis. If we relate the deaths from tuberculosis to deaths from all causes, excluding accidents for both all occupied males and coal miners, the ratios remain lower for miners in every age period. The precise factors causing the remarkably low incidence of tuberculosis among coal miners are still obscure. Collis (12) notes that coal mining does not bring workers together as closely as do manufacturing industries and suggests that this condition may be a contributory influence to the low mortality from tuberculosis in the industry.

Coal miners have not shared proportionately in the general decline of the tuberculosis death rate. In fact, the percentage of deaths has actually increased from 5.8 per cent for ages 15 years and over in 1911-1913 to 7.1 per cent in 1922-1924. We may therefore assume that there has been no appreciable decline in the tuberculosis mortality rate. It must be kept in mind, however, that coal miners have had in the past very low death rates from tuberculosis and it is not to be expected that this rate would decline as fast as in the case of all occupied males, where there was considerably more room for improvement.

Cancer (all forms).—The standardized relative index for cancer is 66. The ratios are similarly very low at every age. Because of the very high death rate from all causes combined, these low ratios for cancer can not be interpreted as representing lower than average death rates. In England and Wales, the death rate from cancer among coal miners is 13 per cent less than that of all occupied and retired males.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 65; and the ratios are low in every age period. The actual death rate, however, is probably not very different from that of all occupied males because of the high total death rate. In England and Wales the death rate from cerebral hemorrhage among coal miners is 9 per cent greater than the average. The proportionate mortality has decreased from 6 per cent for all ages in 1911-1913 to 5.1 per cent in 1922-1924.

Other diseases of the heart.—The standardized relative index for other diseases of the heart is 92. This index probably represents a death rate which is considerably higher than the average. The greater incidence is possibly a result of strenuous labor. It may also be associated with the high frequency of miners' asthma as well as the acute respiratory diseases. There has been a large increase in the proportionate mortality from this cause. The proportion rose from 9.6 per cent in 1911-1913 to 13.7 per cent in 1922-1924.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 68. The ratios are low in every period, but on the whole are not low enough to suggest a low death rate from this cause. In England and Wales the death rate from chronic nephritis among coal miners is 24 per cent less than among all occupied and retired males.

Accidental or undefined violence.—Accidental violence accounts for more deaths among coal miners than any other cause. Twenty-two per cent of all deaths are due to accidents. The standardized relative index is 228. The ratios are much higher than the average in every age period. The highest relative index is 275 in the age period 25 to 34 years. Out of a total of 432 fatal accidents, 306 are due to coal mine accidents. Coal mine accidents alone accounted for 15.6 per cent of the deaths from all causes. The total number of occupational accidents is 310. The proportionate mortality from all accidental causes shows a slight increase over that in 1911-1913, the percentage rising from 20.4 per cent to 22 per cent.

Other causes.—The standardized relative indexes for syphilis and diabetes are 53 and 51, respectively, suggesting a low death rate for these diseases. The ratios for suicide, homicide, and cirrhosis of the liver, although for the most part below average, are

suggestive of high death rates. The number of deaths in each case is quite small.

Compositors, Printers, and Pressmen⁹

A NUMBER of studies has shown that the death rate for the printing trades as a whole differs but little from the average. A high rate for tuberculosis, however, is found in all mortality studies of this occupation. In England and Wales (5) hand compositors had an average death rate and machine compositors a death rate 13 per cent below that for all occupied and retired males. The death rates from tuberculosis in these occupations were, respectively, 29 and 32 per cent above the average. Printing machine minders and assistants had an average death rate with a mortality from tuberculosis 25 per cent greater than among all occupied and retired males. The medico-actuarial investigation (4) reported in 1913 that the ratio of actual to expected deaths among journeymen compositors was 102 per cent and that among journeymen pressmen the ratio was 117 per cent. In both classes, deaths from tuberculosis were about 50 per cent above the normal, the excess being greater at the younger ages of entry than at the older ages. The standardized relative index for tuberculosis in the present study was 131. Nephritis also showed a high standardized relative index (116). On the other hand, the standardized relative index for accidents (67) was one of the lowest recorded.

TABLE 16.—Number and per cent of deaths from specified causes among white male compositors, printers, and pressmen, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ^a
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	937	-----	141	166	144	203	178	105	-----
Typhoid fever.....	3	0.3	0.7	1.2	-----	-----	-----	-----	-----
Influenza, pneumonia.....	85	9.1	5.0	9.0	16.0	7.4	7.9	10.5	-----
Influenza.....	15	1.6	1.4	.6	4.2	1.5	.6	1.9	77
Pneumonia (all forms).....	70	7.5	3.5	8.4	11.8	5.9	7.3	8.6	92
Other diseases of the respiratory system.....	12	1.3	3.5	1.2	.7	1.5	-----	1.0	79
Tuberculosis of the respiratory system.....	201	21.5	34.0	39.8	21.5	17.2	9.0	4.8	131
Syphilis, tabes dorsalis, and general paralysis of insane.....	28	3.0	-----	2.4	3.5	6.9	2.8	-----	132
Cancer (all forms).....	67	7.2	7	2.4	3.5	10.8	12.9	11.4	101
Rheumatism (acute and chronic).....	4	.4	7	.6	1.4	-----	-----	-----	-----
Diabetes.....	12	1.3	-----	1.2	1.4	1.0	2.8	1.0	105
Alcoholism.....	6	.6	-----	.6	1.4	1.0	.6	-----	-----
Cirrhosis of the liver.....	8	.9	-----	-----	-----	1.5	2.2	1.0	-----
Chronic occupational poisonings.....	1	.1	-----	-----	-----	.5	-----	-----	-----
Lead poisoning.....	54	5.8	.7	2.4	2.8	5.4	10.1	15.2	98
Cerebral hemorrhage, apoplexy, paralysis.....	122	13.0	9.9	8.4	7.6	12.8	22.5	16.2	104
Other diseases of the heart.....	11	1.2	-----	.6	.7	1.0	1.7	3.8	-----
Arteriosclerosis.....	87	9.3	4.3	4.2	4.9	13.8	12.4	16.2	116
Nephritis (acute and chronic).....	24	2.6	1.4	1.8	2.1	3.4	2.2	4.8	-----
Suicide (all forms).....	79	8.4	22.0	6.6	9.7	3.4	4.5	7.6	67
Accidental or undefined violence.....	5	.5	2.1	-----	-----	.5	-----	1.0	-----
Occupational accidents.....	6	.6	3.5	-----	-----	.5	-----	-----	-----
Traumatism by machines.....	1	.1	.7	-----	-----	-----	-----	-----	-----
Homicide (all forms).....	1	.1	.7	-----	-----	-----	-----	-----	-----
All other causes.....	132	14.1	16.3	17.5	22.9	12.3	8.4	6.7	-----
Total.....	937	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths.....	6	.6	2.1	-----	-----	1.0	-----	1.0	-----
Nonoccupational deaths.....	931	99.4	97.9	100.0	100.0	99.0	100.0	99.0	-----

^a See page 18 for explanation of standardized relative index.

⁹ Includes foremen and workmen: Hand compositors and typesetters, type printers, typographers, plate printers, job printers, pressmen, press feeders, linotype and monotype operators. The average age at death is 44.2 years. (See note, p. 19.)

Respiratory diseases.—The standardized relative indexes for influenza, pneumonia, and other diseases of the respiratory system are uniformly low, being, respectively, 77, 92, and 79. Low relative indexes were found for pneumonia at every age in our earlier study. In the English investigation, printers show average or lower than average death rates for the respiratory diseases.

Tuberculosis of the respiratory system.—The uniformly high ratios for tuberculosis are in marked contrast to the low ratios for non-tuberculous respiratory diseases. The standardized relative index is 131, the relative indexes in the several age periods varying between 103 in the age period 35 to 44 and 145 in the age period 55 to 64. An even higher index (185) is recorded in the indefinite period 65 and over. Similarly in our earlier study high indexes were found in every age period up to 64 years. In fact, a high mortality from tuberculosis among printers has been found in virtually every occupational mortality investigation, American and foreign. The causes of this unfavorable situation are not definitely known. Several observers have associated the prevalence of tuberculosis among printers with lead poisoning and lead absorption. It is difficult, however, to reconcile the theory that lead absorption predisposes to the contraction of tuberculosis with the fact that painters, among whom lead poisoning is undoubtedly a far greater hazard than among printers, have a much lower percentage of deaths from tuberculosis. In fact, the tuberculosis mortality for painters, as recorded in our analysis as well as in the report of the Registrar General of England and Wales, does not differ appreciably from the average. Chronic lead poisoning may, like any other chronic debilitating disease, weaken resistance to infection; but the evidence presented does not show this consistently among workers exposed to lead.

More recent investigators, among them S. Kjaer (13) seem to ascribe greater importance to the general insanitary conditions of some printing plants in which workers are exposed to dust, carbon monoxide, and poor ventilation. Disregard of personal cleanliness and irregular habits among the workmen are also considered contributory factors. Much improvement has taken place in the mortality from tuberculosis among printers since our earlier study. The percentage of deaths at all ages 15 years and over has declined from 34.1 in 1911-1913 to 21.5 in 1922-1924. Correspondingly lower percentages are recorded at every age period up to 65 and over.

Cancer (all forms).—The standardized relative index for cancer is 101. No extraordinary features regarding cancer incidence are found among printers.

Lead poisoning.—Fatal lead poisoning is apparently of rare occurrence among printers, compositors and pressmen. Only one death is recorded from this disease out of a total of 937 deaths in the present investigation, while in the earlier study 4 such deaths were recorded out of a total of 1,056. Undoubtedly this does not represent the true situation, as some cases of lead poisoning were probably not recognized by the attending physicians and were recorded in this analysis under some other title. Nevertheless, the actual number of deaths is probably small. It should not be inferred from these figures, however, that lead poisoning is an unimportant hazard in the printing trades and that it has little influence on the mortality

of men engaged in them. There is much trustworthy evidence that many of these men have absorbed lead to a harmful degree. Dr. Louis I. Harris (13), for example, reports that out of a total of 900 members of the New York Typographical Union No. 6, who were examined, about one-fifth were in some degree affected by lead poisoning. The indirect effects of lead absorption are reflected in the high indexes for nephritis and arteriosclerosis found in the present study.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 98. The proportionate mortality is high at the young ages when this cause of death is relatively unimportant. At the old ages, however, the percentages are below the average.

Other diseases of the heart.—The standardized relative index is 104. Heart disease causes more than the average proportion of deaths, except in the ages 35 to 54 years, when the relative indexes are low. The highest relative index is 130, in the age period 15 to 24 years; a high index (120) is also found in the period 25 to 34. In our earlier study, printers showed high relative indexes at every age period.

Arteriosclerosis.—Although the number of deaths from this cause is very small, the relative indexes are very high in every age period except the first, where no deaths are recorded. Here again the insidious action of lead is suggested as a contributory factor.

Nephritis (acute and chronic).—The standardized relative index is high (116) and suggests the influence of the lead hazard. The relative indexes are high after age 45, when the bulk of the deaths from this disease occurs.

Accidental or undefined violence.—The ratios from accidental causes are very low at every age period up to 64, the standardized relative index being 67. The occupational factor is practically negligible, although the number of machinery accidents in the age period 15 to 24 is high.

Electricians¹⁰

THE TITLE "electrician" includes all types of electrical workers except electrical linemen. The outstanding occupational hazard of electricians, accidental electric shock, is responsible for 7 per cent of all deaths. Accidents of all kinds cause 20 per cent of the total number of deaths. There are more deaths from accidents than from any other cause. No death rates are available for American electricians, but the high percentage of deaths from accidents indicates that the total death rate is above the average. In England and Wales (5), electrical engineers, fitters, and wiremen, have an average total death rate.

The number of accidental deaths is so large among American electricians that other causes of death become relatively less important than if accidents had occurred with only average frequency. Nevertheless, syphilis, diabetes, and cancer maintain higher than average ratios. English electrical engineers, etc., have higher than average death rates from tuberculosis, syphilis, diseases of the digestive system, suicide, and accidents.

¹⁰ Includes electricians: Power house, chandelier, wiring, cold-storage warehouse, elevator, subway and surface car, and building; dynamo and motor tenders. The average age at death is 37.4 years. (See note, p. 19.)

TABLE 17.—Number and per cent of deaths from specified causes among white male electricians, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	855		169	236	198	146	72	34	
Typhoid fever.....	6	0.7	3.6						
Influenza, pneumonia.....	78	9.1	8.3	9.7	11.1	8.2	9.7		
Influenza.....	22	2.6	4.7	2.1	4.0	.7			91
Pneumonia (all forms).....	56	6.5	3.6	7.6	7.1	7.5	9.7		94
Other diseases of the respiratory system.....	9	1.1	1.2	.8	1.0	.7	1.4	2.9	72
Tuberculosis of the respiratory system.....	153	17.9	18.9	26.7	20.2	8.9	5.6	2.9	86
Syphilis, tabes dorsalis, and general paralysis of insane.....	35	4.1	1.2	1.7	7.1	7.5	4.2	2.9	181
Cancer (all forms).....	45	5.3	1.2	2.1	5.6	8.9	16.7	5.9	116
Rheumatism (acute and chronic).....	1	.1		.4					
Diabetes.....	17	2.0	1.8	2.1	1.5	1.4	2.8	5.9	140
Alcoholism.....	5	.6			2.0				
Cirrhosis of the liver.....	4	.5		.4	.5	.7	1.4		
Cerebral hemorrhage, apoplexy, paralysis.....	26	3.0			1.0	6.8	8.3	23.5	79
Other diseases of the heart.....	82	9.6	5.3	5.5	11.6	13.7	16.7	14.7	90
Arteriosclerosis.....	4	.5				.7	1.4	5.9	
Nephritis (acute and chronic).....	51	6.0	1.2	7.6	4.0	8.9	6.9	14.7	79
Suicide (all forms).....	23	2.7	1.2	4.7	3.5	1.4	1.4		
Accidental or undefined violence.....	176	20.6	28.5	22.0	15.7	13.7	8.3	5.9	143
Occupational accidents.....	90	10.5	20.1	11.4	8.1	7.5	1.4	2.9	
Traumatism by fall.....	19	2.2	2.4	.8	3.0	2.7	1.4	5.9	
Traumatism by machines.....	5	.6	1.2		1.0				
Electric shock.....	60	7.0	14.2	8.9	4.0	4.1	1.4		
Homicide (all forms).....	9	1.1	6	2.5	.5				
All other causes.....	131	15.3	17.2	13.1	14.6	17.8	15.3	14.7	
Total.....	855	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths.....	91	10.6	20.1	11.4	8.1	8.2	1.4	2.9	
Nonoccupational deaths.....	764	89.4	79.9	88.6	91.9	91.8	98.6	97.1	

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—The standardized relative indexes for influenza, pneumonia, and other diseases of the respiratory system are 91, 94, and 72, respectively. In view of the probably high total death rate, the ratio for pneumonia indicates an average and possibly an above-average death rate for this disease. A similar group of workers in England and Wales shows average or less than average death rates for the respiratory diseases.

Tuberculosis of the respiratory system.—The standardized relative index for tuberculosis is 86. The ratios are low in every age period up to 64. The death rate from tuberculosis, however, is probably not so low as the ratios suggest, as the total death rate in this occupation is somewhat high. English electricians have a death rate from tuberculosis 10 per cent above the average.

Syphilis, tabes dorsalis, and general paralysis of insane.—Electricians have the highest relative index for syphilis found in any of the 33 occupations analyzed in detail. The standardized relative index is 181. The death rate from syphilis among English electrical engineers, fitters, and wiremen is 57 per cent higher than among all occupied and retired males.

Cancer (all forms).—The standardized relative index is 116. In England, the cancer death rate among these men is about average.

Diabetes.—Although the number of deaths from diabetes is small, the ratios are uniformly higher than those among all occupied males.

The standardized relative index is 140. Occupation is no apparent factor in these high ratios.

Cerebral hemorrhage, apoplexy, paralysis.—Too few deaths are recorded for this cause to give conclusive figures. The standardized relative index is 79. The death rate from cerebral hemorrhage is probably not much less than average. In England and Wales the death rate from these causes is about average.

Other diseases of the heart.—The standardized relative index for other diseases of the heart is 90. The death rate from heart disease among English electrical engineers, fitters, and wiremen is about average.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 79. English electricians have a death rate from chronic nephritis 22 per cent less than that of all occupied and retired males.

Accidental or undefined violence.—Accidents cause a large number of deaths among electricians, being responsible for more than one-fifth of all the deaths. The standardized relative index is 143. Occupational accidents were the cause of a little more than one-half the accidental deaths. Electric shock caused 7 per cent of the deaths from all causes and more than one-third of the deaths from accidents.

Farmers and Farm Laborers¹¹

AGRICULTURAL workers are noted for their long life. Life tables for 1910, published by the United States Census Bureau (14), for example, show that white males 20 years of age living in cities might have expected on the average 40.5 additional years of life; while white males of the same age in the rural areas could have expected a remaining life span of 45.9 years. In England and Wales (5) farmers and their relatives had a mortality rate 33 per cent lower than that of all occupied and retired males. The rates for four other agricultural groups were similarly 29 to 47 per cent below the average. These figures indicate the generally healthful conditions of life prevailing among farmers and farm laborers. We may assume therefore that the death rate for our group of farmers and farm laborers is well below the average for male industrial policy-holders. The present investigation reveals, nevertheless, somewhat higher than average percentages of deaths for tuberculosis, cancer, cerebral hemorrhage, apoplexy and paralysis, accidents, suicide, influenza, and typhoid fever. Only influenza and typhoid fever, however, show indexes large enough to suggest death rates actually higher than average. The standardized relative index for influenza is 121, high ratios being recorded for every age period except 15 to 24. Typhoid fever shows extremely high indexes at every age, varying between 180 in the period 25 to 44 and 333 in the period 45 to 54. Both causes in our earlier study also showed very high ratios.

¹¹ Includes farmers and planters, florists and flower growers (not including store-keepers), fruit growers, gardeners, nurserymen, turpentine farmers, orchardists, farm laborers, dairy farmers, and truck farmers. The average age at death is 56.3 years. (See note, page 19.)

TABLE 18.—Number and per cent of deaths from specified causes among white male farmers and farm laborers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	4,681		370	273	335	601	1,305	1,797	
Typhoid fever.....	47	1.0	7.6	1.8	0.9	1.0	0.3	0.1	
Influenza, pneumonia.....	442	9.4	9.2	7.0	11.0	8.7	10.3	9.2	
Influenza.....	112	2.4	1.6	3.3	3.6	2.0	2.1	2.5	121
Pneumonia (all forms).....	330	7.0	7.6	3.7	7.5	6.7	8.2	6.7	87
Other diseases of the respiratory system.....	56	1.2	.5	1.1	1.5	.7	1.1	1.6	69
Tuberculosis of the respiratory system.....	468	10.0	24.1	34.8	21.5	14.3	5.7	2.8	107
Syphilis, tabes dorsalis, and general paralysis of insane.....	57	1.2	.3	.7	4.8	3.0	1.1	.3	78
Cancer (all forms).....	437	9.3	.5	2.6	5.1	10.1	12.6	10.3	101
Rheumatism (acute and chronic).....	12	.3	1.1		.3	.2	.2	.2	
Diabetes.....	51	1.1	.5	1.1	1.2	1.0	1.4	1.0	77
Alcoholism.....	31	.7	.3	.7	1.5	2.0	.5	.2	
Cirrhosis of the liver.....	55	1.2	.3			1.5	1.5	1.4	
Chronic occupational poisonings.....	1							.1	
Lead poisoning.....	1							.1	
Cerebral hemorrhage, apoplexy, paralysis.....	495	10.6	.3	.7	1.5	5.7	12.6	16.1	103
Other diseases of the heart.....	823	17.6	5.9	8.8	3.9	13.3	20.2	23.4	91
Arteriosclerosis.....	88	1.9				.3	1.4	3.8	
Nephritis (acute and chronic).....	405	8.7	1.4	2.6	5.1	8.0	8.8	11.9	77
Suicide (all forms).....	65	1.4	1.9	3.7	2.7	2.7	1.1	.4	
Accidental or undefined violence.....	376	8.0	23.5	15.0	15.5	9.5	5.6	3.7	102
Occupational accidents.....	97	2.1	6.2	2.6	5.4	2.5	1.4	.9	
Traumatism by machines.....	13	.3	1.1	1.1	.3	.5		.1	
Injuries by animals (not poisoning).....	9	.2	1.1			.3	.1	.1	
Homicide (all forms).....	19	.4	1.6	.7	1.5	.3	.2	.1	
All other causes.....	753	16.1	21.1	18.7	22.1	17.8	15.3	13.5	
Total.....	4,681	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths.....	106	2.3	6.5	2.6	6.0	2.7	1.5	1.1	
Nonoccupational deaths.....	4,575	97.7	93.5	97.4	94.0	97.3	98.5	98.9	

¹See page 18 for explanation of standardized relative index.

Typhoid fever.—The relative indexes for typhoid fever are high at all ages and in some age periods the percentages reach three times the average. Undoubtedly this situation develops from the faulty sanitation still found in farming regions. One encouraging finding, however, is that farmers show a much lower proportionate mortality at each age period in the years 1922–1924 than in 1911–1913. For all ages (15 years and over) the proportions were 1.4 per cent in the earlier, as compared with 1 per cent in the later period.

Respiratory diseases.—The standardized relative index for influenza is 121. It is interesting to note that whereas influenza exhibits high relative indexes at every age period except 15 to 24, pneumonia and other respiratory diseases are comparatively low, the standardized relative indexes being 87 and 69, respectively. In the earlier study farmers also showed high relative indexes for influenza at the same ages.

Tuberculosis of the respiratory system.—Previous studies of farmers' mortality have shown especially low death rates from tuberculosis. In England and Wales in 1921–1923 the death rate from all causes among farmers and their relatives was 33 per cent less than that found among all occupied and retired males, whereas the rate for respiratory tuberculosis was 59 per cent below the average. Similarly, in our earlier study, lower than average percentages were

found at every age period, the relative indexes seldom being higher than 75. It is indeed surprising therefore to note that in the present study the standardized relative index for tuberculosis among farmers is 107 and that higher than average percentages are recorded in each period except 55 to 64, when the index is 92. At the other ages the indexes vary from 103 to 118. While this is a reversal of previous conditions, it must not be inferred hastily from these higher indexes that the death rate from this cause is now higher among farmers than among our industrial males. If the very low total death rate for farmers be taken into account, a standardized relative index of 107 certainly does not indicate a higher than average death rate but rather suggests a rate somewhat below average. The relatively greater importance of tuberculosis among farmers in the period 1922-1924 than in the period 1911-1913 in all probability results from the fact that the tuberculosis death rate has not declined nearly so rapidly among farmers as it has among all occupied males. The proportion of deaths from tuberculosis for all ages 15 years and over was 34.6 per cent lower among all occupied males in 1922-1924 than in 1911-1913, whereas the proportion of deaths from tuberculosis among farmers was 3.1 per cent higher.

The findings of Allen K. Krause (15) regarding the trend of death rates from tuberculosis in urban and rural areas of New York State (exclusive of New York City) between 1913 and 1925 tend to confirm the results of our study. In summing up his conclusions Krause says: "This trend, it is plain, is a mounting ratio of rural to urban tuberculosis, which has been going on for at least 13 years, to reach a point at present which puts rural well ahead of urban mortality. During the last five years the trend has been greatly accentuated, as it expresses, no doubt, a static or slightly rising rural rate set against an accelerated urban decline." Apparently the antituberculosis campaign, including as it has an intensive study of the effects of industrial environment on the incidence of tuberculosis, has brought about a marked improvement in the mortality of urban wage earners, which bids fair in time to reduce urban mortality below that of farmers, who have heretofore enjoyed a more favorable position as regards tuberculosis.

Cancer (all forms).—The standardized relative index for cancer is 101. Because of the high average age of farmers their cancer mortality is of special interest. Almost 80 per cent of the deaths from all causes in this group occurred after age 44 when cancer begins to assume its leading position. In the ages after 44 the percentages of death do not differ much from the average. Higher than average percentages are recorded at ages 25 to 34 and 35 to 44, the relative indexes being 130 and 119, respectively. In England and Wales agricultural pursuits exhibit low death rates for cancer.

The percentage of deaths from cancer at all ages 15 years and over increased from 7.6 in the period 1911-1913 to 9.3 in the period 1922-1924, indicating an increased mortality from this cause in keeping with the general increase in cancer between the two periods.

Cerebral hemorrhage, apoplexy, paralysis.—These diseases are significant only at the older ages. The relative indexes up to age 44 are extremely low. In the age period 45 to 54 the percentage of

deaths is about average, but after 54 the relative indexes are somewhat high. The standardized relative index is 103.

Other diseases of the heart.—Except for the age period 25 to 34, where the relative index is 126, this cause of death exhibits relative indexes which are about average or lower than the average. The standardized relative index is 91. The ratios when compared with those of 1911–1913 seem to show that farmers have shared in the general decline of the death rate from heart disease.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 77. The relative indexes are low at every age. Excluding ages 65 and over, the highest index (83) is in the age period 45 to 54. The figures indicate a low death rate from this disease. The proportionate mortality for this disease was also low in 1911–1913.

Suicide (all forms).—The relative indexes for suicide are high in the age periods 15 to 24 (119), 25 to 34 (132), and 45 to 54 (129). The ratios were even higher for most ages in 1911–1913. The English figures for 1921 to 1923 showed a death rate for farmers 24 per cent above the average.

Accidental or undefined violence.—The standardized relative index is 102. Low ratios prevail, except between the ages of 35 and 54. In the age period 35 to 44 the relative index is highest, 127. The proportionate mortality for all ages 15 years and over was 8.1 per cent in 1911–1913 and 8 in 1922–1924, which indicates no marked change in the death rate from this cause.

Other causes.—Average or lower than average percentages indicative of a favorable mortality are found at the several age periods, with rare exceptions, for syphilis, rheumatism, diabetes, alcoholism, arteriosclerosis, and homicide.

Fishermen, Oystermen, Sailors, and Marine Workers¹²

THE ONLY reliable death rates for American workers in water transportation and fishing pursuits are given for a few selected occupations in the medico-actuarial investigation of 1913 (4). In that report, the ratio of actual to expected deaths for officers in coastwise trade (not traveling to the Tropics) was 138 per cent; for officers on ocean steamers, 156 per cent; on the Great Lakes, 118 per cent; on rivers, lakes, sounds, and harbors (excluding the Great Lakes), 107 per cent; for inshore fishermen, 73 per cent. Deep-sea fishermen were insured in small numbers and their mortality was about twice the normal.

In England, in the past, the Registrar General (5) as well as the Board of Trade have compiled statistics on the mortality of merchant seamen based on the census data and official registration of deaths. This method, however, has been proved faulty because of the lack of correspondence in the two sets of data. In the mortality investigation of 1921–1923 the Registrar General, therefore, omitted the customary figures for merchant seamen from the statistical

¹² Includes clam, crab, lobster, seal, shell, whale, shrimp, oyster, and "other" fishermen; canal, river, and small lake boat captain, deckhand, fireman, stoker, engineer, pilot, ferryman, small boatman, bargeman, purser, mate, steward, porter, waiter, and cook; deep-sea: stoker, fireman, engineer, and navigating officer. The average age at death is 47.9 years. (See note, p. 19.)

tables and appended to the report an estimate of the death rate of merchant seamen in which the errors of the earlier figures were virtually eliminated. It was finally estimated that the death rate for English seamen between the ages 20 and 65 years, was 77 per cent greater than that for all occupied and retired males. It seems clear, therefore, from the data cited that seamen have a very high death rate. The death rate for our fishermen, oystermen, sailors, and marine workers while undoubtedly higher than that for all occupied males is probably not so high as that of British merchant seamen, since the insured group includes a large number of men in less hazardous occupations in inland water transportation.

The mortality data for specific diseases are difficult to interpret because of the frequently inaccurate certification of causes of death. It is not uncommon for the causes of death of men dying at sea to be certified by nonmedical men. For this reason the Registrar General of England and Wales has deemed it advisable to estimate death rates only for tuberculosis, cancer, and accidents, the three causes for which he believes registration of deaths is most accurate and complete. It is safe to assume that the errors of certification are not so great in our insured group because of the large number of men in inland waterways and in coastwise transportation included in it. A more detailed analysis is therefore given of the insurance data than the Registrar General has deemed justifiable.

TABLE 19.—Number and per cent of deaths from specified causes among white male fishermen, oystermen, sailors, and marine workers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	882	-----	111	119	124	169	182	177	-----
Typhoid fever.....	10	1.1	5.4	1.7	0.8	-----	0.5	-----	-----
Influenza, pneumonia.....	70	7.9	7.2	5.0	12.1	10.7	6.0	6.8	-----
Influenza.....	11	1.2	.9	-----	1.6	2.4	1.1	1.1	64
Pneumonia (all forms).....	59	6.7	6.3	5.0	10.5	8.3	4.9	5.6	86
Other diseases of the respiratory system.....	8	.9	-----	-----	3.2	.6	1.6	-----	82
Tuberculosis of the respiratory system.....	105	11.9	18.0	28.6	16.9	10.1	6.0	1.1	86
Syphilis, tabes dorsalis, and general paralysis of insane.....	21	2.4	.9	2.5	3.2	5.9	.5	1.1	100
Cancer (all forms).....	59	6.7	.9	1.7	3.2	10.7	10.4	8.5	89
Rheumatism (acute and chronic).....	3	.3	-----	-----	-----	-----	.5	1.1	-----
Diabetes.....	16	1.8	-----	1.7	.8	1.8	3.3	2.3	126
Alcoholism.....	4	.5	-----	.8	.8	-----	-----	.6	-----
Cirrhosis of the liver.....	6	.7	-----	-----	-----	-----	.5	2.8	-----
Cerebral hemorrhage, apoplexy, paralysis.....	53	6.0	-----	-----	.8	3.0	12.1	14.1	83
Other diseases of the heart.....	119	13.5	1.8	7.6	4.8	14.8	18.1	24.9	84
Arteriosclerosis.....	6	.7	-----	-----	-----	.6	1.6	1.1	-----
Nephritis (acute and chronic).....	84	9.5	1.8	2.5	6.5	8.9	17.0	14.1	115
Suicide (all forms).....	15	1.7	.9	4.2	2.4	1.8	.5	1.1	-----
Accidental or undefined violence.....	174	19.7	46.8	30.3	25.8	19.5	6.6	5.1	186
Occupational accidents.....	124	14.1	36.0	19.3	22.6	12.4	3.8	2.8	-----
Drowning.....	107	12.1	35.1	13.4	16.9	14.2	2.7	1.1	-----
Traumatism by fall.....	17	1.9	4.5	5.9	8.8	1.2	.5	.6	-----
Traumatism by machines.....	9	1.0	2.7	1.7	2.4	-----	.5	-----	-----
Homicide (all forms).....	7	.8	1.8	2.5	.8	.6	-----	-----	-----
All other causes.....	122	13.8	14.4	10.9	17.7	10.7	14.3	15.3	-----
Total.....	882	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths.....	125	14.2	36.0	19.3	22.6	13.0	3.8	2.8	-----
Nonoccupational deaths.....	757	85.8	64.0	80.7	77.4	87.0	96.2	97.2	-----

¹ See page 18 for explanation of standardized relative index.

The outstanding cause of death and characteristic hazard of workers at sea is accidental violence. In our study the standardized relative index is 186. Up to age 54 the ratios average about twice the normal. The highest relative index (227) is found in the age period 45 to 54 years. Almost one-fifth of all the deaths at all ages are due to accident. Drowning alone accounts for 12.1 per cent of the deaths from all causes. In the medico-actuarial investigation the following data were given for deaths from accidental violence. Among deep-sea fishermen, 45 per cent of the deaths were from accident; the death rate from accident among those whose duties keep them on rivers, lakes, sounds, and harbors was three times the normal; among those on the Great Lakes, four times; among those engaged in the coastwise trade and on ocean steamers, five times the normal. In the estimate of the Registrar General of England and Wales one-fourth of all the deaths among merchant seamen were due to accident.

Typhoid fever shows the greatest excess over the average proportion of deaths from disease. To be sure, the actual number of deaths is small; but the exceedingly high ratios in the significant ages leave no doubt that the death rate for this cause is much greater than that for all occupied males. The relative index for all ages 15 years and over is 183. The conditions imposed by water-transportation pursuits are in large measure responsible for the inordinate incidence of typhoid fever among these workers. Sanitation on smaller vessels, especially freight and fishing boats, is far from adequate. Furthermore, some of the ships travel to foreign ports where the disease is endemic.

Diabetes has a standardized relative index of 126, indicating a high death rate from this cause.

Nephritis is the only other disease showing higher than average ratios. The standardized relative index is 115. The death rate from this cause is probably considerably above the average. In view of the very high total death rate in this occupation, however, all of the other numerically important diseases apparently have death rates which are above average. Syphilis appears to be substantially more frequent than among all occupied males. The standardized relative index is 100. The standardized relative indexes for the other causes range around 85 per cent, being 89 for cancer, 86 for pneumonia, 86 for tuberculosis, 84 for other diseases of the heart, and 83 for cerebral hemorrhage. In England and Wales in 1921-1923 the death rate from respiratory tuberculosis among merchant seamen was 36 per cent above the average and that from cancer 15 per cent above the average.

Furniture and Other Wood Workers ¹³

THE GROUP of furniture and other woodworkers consists essentially of wage earners in factories producing wooden products, who, on the whole, are not apparently exposed to any especially severe hazards. Saw-mill workers have not been included in this group, because of the more hazardous nature of their work. The

¹³ Includes foremen and workmen engaged in the manufacture of wooden products: wagon and carriage builders, cabinet and furniture makers, coopers, pattern makers, and miscellaneous woodworkers. The average age at death is 53.8 years. (See note, p. 19.)

death rate for men in these selected woodworking industries in all probability is less than that for industrial policyholders as a group. The intercompany group insurance mortality experience for the years 1922-1926 (9) shows a ratio of actual to expected deaths of 79.3 per cent for furniture and woodworking factories, while that for all industries combined is 90.2 per cent. In England and Wales (5) the death rates for several groups of similar occupations are average or below average. In our industrial mortality experience notably higher than average percentages are recorded for cancer, influenza, and tuberculosis, while other diseases of the heart, nephritis, and accidents are low.

TABLE 20.—Number and per cent of deaths from specified causes among white male furniture and other wood workers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—					Standardized relative index ¹	
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64		65 and over
Number of deaths.....	1,806	-----	127	154	198	301	488	538	-----
Typhoid fever.....	9	0.5	4.7	1.3	0.5	-----	-----	-----	-----
Influenza, pneumonia.....	173	9.6	9.4	10.4	15.7	11.0	9.6	6.3	-----
Influenza.....	39	2.2	3.1	3.2	2.5	2.0	2.3	1.5	124
Pneumonia (all forms).....	134	7.4	6.3	7.1	13.1	9.0	7.4	4.8	107
Other diseases of the respiratory system.....	18	1.0	.8	.6	-----	2.0	.8	1.1	63
Tuberculosis of the respiratory system.....	232	12.8	32.3	32.5	25.8	13.6	6.8	3.0	118
Syphilis, tabes dorsalis, and general paralysis of insane.....	38	2.1	1.6	3.2	5.1	4.0	1.0	.7	109
Cancer (all forms).....	206	11.4	-----	1.9	8.1	11.6	15.4	14.3	122
Rheumatism (acute and chronic).....	4	.2	-----	1.3	-----	-----	.4	-----	-----
Diabetes.....	19	1.1	1.6	1.3	.5	1.0	1.4	.7	81
Alcoholism.....	12	.7	-----	.6	2.5	1.7	.2	-----	-----
Cirrhosis of the liver.....	19	1.1	-----	-----	.5	1.0	1.6	1.3	-----
Chronic occupational poisonings.....	1	.1	.8	-----	-----	-----	-----	-----	-----
Cerebral hemorrhage, apoplexy, paralysis.....	167	9.2	-----	1.9	1.5	8.6	10.9	15.2	109
Other diseases of the heart.....	292	16.2	5.5	6.5	7.1	13.0	18.4	24.5	88
Arteriosclerosis.....	24	1.3	-----	-----	-----	1.0	1.6	2.4	-----
Nephritis (acute and chronic).....	173	9.6	1.6	3.9	4.0	8.3	12.1	13.6	91
Suicide (all forms).....	41	2.3	3.1	2.6	4.5	1.7	2.7	1.1	-----
Accidental or undefined violence.....	130	7.2	12.6	15.6	9.6	7.3	5.7	3.9	77
Occupational accidents.....	21	1.2	3.9	2.6	1.0	1.7	.6	.4	-----
Traumatism by machines.....	7	.4	.8	.6	.5	1.0	-----	.2	-----
Homicide (all forms).....	6	.3	-----	1.3	.5	1.0	-----	-----	-----
All other causes.....	242	13.4	26.0	14.9	14.1	13.3	11.3	11.7	-----
Total.....	1,806	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths.....	23	1.3	5.5	2.6	1.0	1.7	.6	.4	-----
Nonoccupational deaths.....	1,783	98.7	94.5	97.4	99.0	98.3	99.4	99.6	-----

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—Influenza is prevalent in this occupational group, the standardized relative index being 124. The relative indexes are high in every age period up to 64. Pneumonia, with a standardized relative index of 107, is relatively slightly more important than among all occupied males. Other diseases of the respiratory system cause few deaths. The standardized relative index is 63.

Tuberculosis of the respiratory system.—The ratios for tuberculosis are higher than among all occupied males in every age period. The standardized relative index is 118, pointing to a high actual

death rate from this cause. The dust generated in some of the woodworking processes is perhaps a factor in the high incidence of tuberculosis. In England and Wales, sawyers, wood turners, and machinists had an average death rate from tuberculosis; while the rate for cabinetmakers was 21 per cent above the average.

Cancer (all forms).—The standardized relative index for cancer is 122. The relative indexes are higher than average in every age period in which cancer is a frequent cause of death. No occupational factors contribute, apparently, to these high ratios. It is interesting to note, however, that in England and Wales, sawyers, wood turners, and machinists had a death rate from cancer 10 per cent higher than that of all occupied and retired males, and cabinetmakers had one 22 per cent higher.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index for these causes is 109.

Other diseases of the heart.—Deaths from heart disease are below average in every age period up to 64 and give a standardized relative index of 88.

Nephritis (acute and chronic).—The ratios for nephritis are low. The standardized relative index is 91.

Suicide (all forms).—The number of deaths from suicide is inexplicably large. In two age periods, 15 to 24 and 55 to 64, the relative indexes are over 190. It is very high also in the period 35 to 44 (155).

Accidental or undefined violence.—These woodworking processes are not hazardous to life from the point of view of accidents. The standardized relative index is 77, low relative indexes being found in every age period. Relatively few fatal occupational accidents occur in this group.

Iron and Steel Mill Workers¹⁴

OUR TABULATIONS provide for two divisions of the iron and steel industry—iron and steel mill workers and iron foundry workers. The hazards in both branches are very similar, though differing in severity. Although the occupational groupings of other mortality investigations for which death rates are available are not exactly comparable with our own, the rates for the several branches of the industry are nevertheless instructive. They indicate a high total mortality for these men. The mortality rate of rolling-mill workers in the medico-actuarial investigation of 1913 (4) was about 17 per cent above the standard; that of forgemen and foundrymen was 18 per cent above. The death rate from accidents was about one and one-half times the standard in these classes, and pneumonia was also high among them. In England and Wales (5) persons engaged in smelting, rolling, and converting iron and steel had an average total mortality, although the rates for respiratory diseases, cancer, and accidents were higher than the average. The death rate of iron foundry, furnace men and laborers was 12 per cent above the

¹⁴ Includes annealers, bloomers, furnace blowers, breakers, bushelers, casters, catchers, chargers, cupola tenders, hammermen, heaters, lademen, puddlers, rammermen, rollers, roughers, smeltermen, spanners, in iron and steel mills which manufacture sheet iron, steel beams, structural iron, iron pipe, rails, wire, and rods. The average age at death is 49.2 years. (See note, p. 19.)

average; while that of metal molders was 14 per cent above the average. In both classes respiratory diseases were high. The respiratory diseases stand out in our study also. The standardized relative index for pneumonia among iron and steel mill workers is 142, while among the iron foundry workers it is 220, a higher index than is found for any other occupation. Among both classes the ratios for influenza and for other diseases of the respiratory system are well above the average. Exposure to extremes of temperature, dusts, and gases, and the fatiguing character of the work are all highly conducive to the contraction of respiratory affections. The complete agreement of all investigations on these points leaves little doubt that the conditions surrounding these occupations are the chief causative factors of the high rates.

TABLE 21.—Number and per cent of deaths from specified causes among white male iron and steel mill workers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—					Standardized relative index ¹	
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64		65 and over
Number of deaths.....	1,587	-----	142	174	267	327	397	280	-----
Typhoid fever.....	13	0.8	4.2	0.6	1.1	0.6	0.3	-----	-----
Influenza, pneumonia.....	204	12.9	10.6	14.9	15.4	14.4	13.6	7.5	-----
Influenza.....	37	2.3	2.1	3.4	3.0	2.4	2.0	1.4	123
Pneumonia (all forms).....	167	10.5	8.5	11.5	12.4	11.9	11.6	6.1	142
Other diseases of the respiratory system.....	33	2.0	.7	1.1	1.5	3.4	1.5	3.2	122
Tuberculosis of the respiratory system.....	190	12.0	18.3	18.4	20.2	13.5	6.5	2.9	86
Syphilis, tabes dorsalis, and general paralysis of insane.....	48	3.0	.7	5.7	5.2	4.3	1.5	1.1	127
Cancer (all forms).....	137	8.6	-----	3.4	3.7	11.0	13.9	10.7	107
Rheumatism (acute and chronic).....	4	.3	.7	-----	.7	-----	-----	.4	-----
Diabetes.....	26	1.6	1.4	1.1	1.5	1.5	1.8	2.1	107
Alcoholism.....	11	.7	-----	-----	3.0	.6	-----	-----	-----
Cirrhosis of the liver.....	20	1.3	-----	.6	1.1	2.1	-----	2.5	2.9
Cerebral hemorrhage, apoplexy, paralysis.....	106	6.7	.7	1.1	.7	5.8	11.1	13.6	94
Other diseases of the heart.....	207	13.0	7.7	6.9	8.2	10.1	17.9	20.7	86
Arteriosclerosis.....	19	1.2	-----	-----	-----	3	2.0	3.6	-----
Nephritis (acute and chronic).....	132	8.3	3.5	4.6	4.9	6.7	12.1	12.9	93
Suicide (all forms).....	29	1.8	2.1	2.9	3.0	2.4	.8	-----	-----
Accidental or undefined violence.....	186	11.7	33.8	21.3	15.7	9.2	4.8	3.6	119
Occupational accidents.....	68	4.3	11.3	8.6	7.1	3.1	1.0	1.4	-----
Burns (conflagration excepted).....	9	.6	1.4	.6	.7	.6	.3	.4	-----
Absorption of irrespirable, irritating, or poisonous gases.....	7	.4	1.4	.6	-----	.6	.3	.4	-----
Traumatism by fall.....	23	1.4	2.1	1.7	2.2	1.8	.8	.7	-----
Traumatism by machines.....	29	1.8	7.7	5.2	1.9	3	.5	.4	-----
Homicide (all forms).....	17	1.1	3.5	2.3	2.2	.3	.3	-----	-----
All other causes.....	196	12.4	12.0	14.9	11.6	13.8	9.6	13.9	-----
Total.....	1,587	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths.....	72	4.5	11.3	8.6	7.5	3.4	1.5	1.4	-----
Nonoccupational deaths.....	1,515	95.5	88.7	91.4	92.5	96.6	98.5	98.6	-----

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—All the respiratory diseases, but especially pneumonia, are much more frequent causes of death among iron and steel mill workers than among all occupied males. The standardized relative index for influenza is 123. The proportionate mortality ratios for pneumonia are very high throughout all ages up to 64. The standardized relative index is 142. The relative indexes vary from 133 to 149. The highest relative index (149) appears in the age period 25 to 34. Other diseases of the respiratory system are also higher than among all occupied males, the standardized relative index

being 122. These high ratios are characteristic of industries where hot metal is worked.

Tuberculosis of the respiratory system.—The standardized relative index for tuberculosis is 86. The ratios are low up to age 44, but increase at the older ages. The figures at the later ages are nearly average and indicate a higher than average tuberculosis rate in view of the high total death rate. The robust health of men entering this industry is undoubtedly responsible for the lower rates at the young ages, the cumulative effects of the hazards to which they are exposed being revealed by the higher relative indexes at the older ages. Dust is probably a factor in some of the occupations in the industry and is responsible for some of the mortality.

Cancer (all forms).—The standardized relative index for cancer is 107. The relative indexes are somewhat above normal at the ages 45 to 64. In England and Wales the cancer death rate among steel workers is 16 per cent above the average.

Diabetes.—The standardized relative index is high (107). English iron and steel workers had a death rate only 67 per cent of the average.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 94. In the significant ages 45 to 64 the ratios are average.

Other diseases of the heart.—The ratios for this cause are somewhat below the average in most age periods, the standardized relative index being 86. The death rate from heart disease is probably not very different from that found among all occupied males. In England and Wales persons engaged in smelting, rolling, and converting of iron and steel show death rates for heart diseases well below the average.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 93. The death rate is probably about average.

Suicide (all forms).—The proportionate mortality ratios for suicide are higher than among all occupied males up to age 54. The highest relative index (131) is found in the age period 15 to 24. The high suicide ratios are coincident with high ratios for syphilis. These two causes of death are apparently often correlated.

Accidental or undefined violence.—Accidents are relatively more frequent among iron and steel mill workers than among all occupied males. The standardized relative index is 119. The highest relative index is 136 in the age period 15 to 24. The relative indexes decrease at the older ages. Accidental traumatism by machines accounted for 1.8 per cent of all deaths as compared with 0.5 per cent among all occupied males. Although there are only nine deaths from burns, excluding those due to conflagration, the relative index is high. Occupational accidents accounted for more than one-third of all accidental deaths.

Iron Foundry Workers¹⁵

THE HAZARDS of iron foundry workers resemble those of iron and steel mill workers. Fatal accidents, however, are not so frequent, but

¹⁵ Includes foremen and workmen in iron foundries: Molders, core makers, bushelers, chippers, cupola tenders, pourers, scratchers, stove and range assemblers, and repairers. The average age at death is 50.1 years. (See note, p. 19.)

respiratory diseases are apparently much more common. Iron foundry workers in the present investigation show the highest proportion of deaths from pneumonia of all occupations in the study. There are actually more deaths from this cause than from any other cause, a condition found in no other occupation. In England and Wales (5) the death rate among iron foundry, furnace men and laborers was 12 per cent higher than among all occupied and retired males, while among metal molders the death rate was 14 per cent higher. The death rates from respiratory diseases were high among both classes.

TABLE 22.—Number and per cent of deaths from specified causes among white male iron foundry workers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths	1,234		82	126	197	285	339	205	
Typhoid fever	6	0.5	3.7	0.5	0.4	0.3			
Influenza	236	19.1	18.3	29.4	21.8	19.6	19.8	8.8	
Influenza	40	3.2	2.4	5.6	4.6	3.2	3.2	1.0	182
Pneumonia (all forms)	196	15.9	15.9	23.8	17.3	16.5	16.5	7.8	220
Other diseases of the respiratory system	27	2.2	1.2	.8	2.0	1.4	2.4	4.4	117
Tuberculosis of the respiratory system	180	14.6	28.0	23.8	16.8	15.4	9.7	8.3	105
Syphilis, tabes dorsalis, and general paralysis of insane	28	2.3			5.6	2.8	1.8	1.5	84
Cancer (all forms)	102	8.3			4.1	7.7	14.5	11.2	93
Rheumatism (acute and chronic)	3	.2	1.2			.7			
Diabetes	5	.4		.8		.4	.6	.5	27
Alcoholism	7	.6		1.6	1.0	.7	.3		
Cirrhosis of the liver	10	.8			.5	1.4	.9	1.0	
Cerebral hemorrhage, apoplexy, paralysis	83	6.7		1.6	3.6	6.7	8.6	12.7	94
Other diseases of the heart	178	14.4	3.7	4.8	8.6	13.7	16.2	28.3	82
Arteriosclerosis	12	1.0			.5	.4	1.5	2.4	
Nephritis (acute and chronic)	102	8.3	1.2	3.2	5.1	10.2	9.7	12.2	88
Suicide (all forms)	21	1.7			2.4	1.5	2.5	1.8	1.0
Accidental or undefined violence	99	8.0	23.2	15.9	11.2	6.7	4.4	2.0	88
Occupational accidents	27	2.2	6.1	4.0	3.0	1.8	1.5	.5	
Burns (conflagration excepted)	3	.2	1.2			.7			
Traumatism by machines	12	1.0	2.4	1.6	1.0	1.1	.9		
Homicide (all forms)	11	.9	7.3	.8	2.0				
All other causes	124	10.0	12.2	15.1	15.2	9.5	7.7	5.9	
Total	1,234	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths	29	2.4	6.1	4.0	3.6	2.1	1.5	.5	
Nonoccupational deaths	1,205	97.6	93.9	96.0	96.4	97.9	98.5	99.5	

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—More than one-fifth (21.3 per cent) of the deaths of iron foundry workers are due to respiratory diseases. The standardized relative index for influenza is 182. The highest relative index (244) occurs in the age period 25 to 34 years. Pneumonia is relatively more than twice as frequent as among all occupied males, the standardized relative index being 220. In this occupational group only is pneumonia the highest cause of death. The highest relative index is 309 in the age period 25 to 34 years. The ratios are very high at every age period. The standardized relative index for other diseases of the respiratory system is 117. These facts are corroborated not only by our previous study of 1911-1913, but by every mortality investigation analyzing this occupation. In England and Wales the death rates from influenza, bronchitis, and pneumonia among iron foundry, furnace men and laborers were, respectively, 79, 82, 127 per cent above the average.

The conditions responsible for these high ratios for respiratory diseases are undoubtedly of occupational origin. Fumes, dust, fatigue, and especially sudden and extreme variations of temperature are highly conducive to the contraction of respiratory diseases.

Tuberculosis of the respiratory system.—The standardized relative index for tuberculosis is 105. The highest relative index in a significant age period is 157 in the age period 55 to 64 years. The very highest ratio (319) appears in the indefinite age period 65 and over. Low rates are recorded only from ages 25 to 44 years, when they are about 81 per cent of the average. These figures do not necessarily indicate a favorable mortality from this cause. The proportionate mortality is of necessity low, as a result of the high total death rate due to the excessively high death rate from nontuberculous respiratory diseases. At the older ages, however, the very high ratios point to a high death rate. It is possible that the repeated occurrence of nontuberculous respiratory diseases finally makes the worker more susceptible to the attack of the tubercle bacilli. Wright (16) found a high death rate from tuberculosis in the older age groups among foundry workers insured under group insurance plans. He believes this unusual amount of tuberculosis in the older age groups strongly suggests the existence of a dust hazard cumulative in effect. The death rate from tuberculosis has probably declined considerably in the last 10 years. The proportionate mortality ratio has decreased from 21.9 per cent for ages 15 years and over in 1911-1913 to 14.6 per cent in 1922-1924.

Cancer (all forms).—The standardized relative index for cancer is 93. The death rate is probably not less than the average for all occupied males.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 94. The death rate is probably not very different from the average. The ratios are high up to age 55 years; but the relative index is low after age 55, when the greatest number of deaths from these diseases occur. The high ratios at the younger ages are subject to considerable error because of the small number of deaths recorded.

Other diseases of the heart.—The standardized relative index of other diseases of the heart is 82. The ratios are less than average at every age period up to 64 and the total death rate is probably less than the average for all occupied males. Our earlier study for the years 1911-1913 showed high ratios for these causes after age 44. English iron foundry, furnace men and laborers showed a death rate from valvular diseases of the heart 6 per cent above the average and a death rate from other diseases of the heart 13 per cent below the average. Metal molders showed a low death rate for valvular diseases of the heart and a slightly higher rate for other diseases of the heart. Among our iron and steel mill workers the standardized relative index is also low (86).

Nephritis (acute and chronic).—The standardized relative index for nephritis is 88. The ratios do not point to abnormal death rates from this cause.

Accidental or undefined violence.—Accidental violence does not appear to be a more frequent cause of death in this group than among all occupied males. The standardized relative index is 88. The ratios are less than average in every age period and contrast

strikingly with the high ratios for iron and steel mill workers. There are only 3 deaths from burns among the 1,234 deaths recorded for iron-foundry workers.

Janitors and Building Employees¹⁶

THERE is considerable variation in the type of workers included in this group. The average age at death is 57.7 years. Two-thirds of all deaths occurred after age 54, whereas less than half of the deaths of all occupied males occurred at these ages. The mortality rate is apparently somewhat higher than that for all occupied males. In the medico-actuarial investigation (4) the number of deaths among janitors was 12 per cent more than expected, though no single cause accounted for an inordinate number of deaths. In the present study other diseases of the respiratory system, with a standardized relative index of 130, and nephritis, with a standardized relative index of 121, show the highest ratios. Cerebral hemorrhage and other diseases of the heart are about 10 per cent higher than the average, the standardized relative indexes being, respectively, 109 and 110. There are no apparent hazards connected with the work of these men to which we can attribute the high ratios for these diseases. Perhaps the explanation lies in the fact that men, incapacitated for their ordinary work because of the debilities of old age, take janitor jobs.

TABLE 23.—Number and per cent of deaths from specified causes among white male janitors and building employees, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ^a
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	2,243		46	81	213	419	718	766	
Typhoid fever.....	2	0.1	2.2					0.1	
Influenza, pneumonia.....	223	9.9	8.7	8.6	9.9	10.7	9.3	10.3	
Influenza.....	46	2.1	4.3	1.2	2.3	1.0	1.7	2.9	96
Pneumonia (all forms).....	177	7.9	4.3	7.4	7.5	9.8	7.7	7.4	95
Other diseases of the respiratory system.....	40	1.8	2.2	2.5	1.9	1.0	2.1	1.8	130
Tuberculosis of the respiratory system.....	183	8.2	17.4	27.2	21.1	12.9	5.2	2.2	91
Syphilis, tabes dorsalis, and general paralysis of insane.....	49	2.2		3.7	5.6	2.9	2.2	.8	110
Cancer (all forms).....	224	10.0		1.2	6.1	11.0	11.0	11.1	96
Rheumatism (acute and chronic).....	6	.3		1.2		.5	.3	.1	
Diabetes.....	31	1.4		1.2	.5	1.7	1.0	2.0	68
Alcoholism.....	17	.8		1.2	2.3	1.4	.6	.1	
Cirrhosis of the liver.....	24	1.1		1.2	1.4	.2	1.3	1.3	
Chronic occupational poisonings.....	2	.1			.5		.1		
Lead poisoning.....	1				.5				
Other poisonings.....	1						.1		
Cerebral hemorrhage, apoplexy, paralysis.....	215	9.6		2.5	3.8	6.4	11.1	12.8	109
Other diseases of the heart.....	446	19.9	6.5	4.9	12.2	18.6	21.0	24.0	110
Arteriosclerosis.....	33	1.5			.5	.7	1.4	2.5	
Nephritis (acute and chronic).....	254	11.3	2.2	12.3	8.0	10.0	11.8	12.9	121
Suicide (all forms).....	28	1.2	4.3		2.3	1.7	1.3	.7	
Accidental or undefined violence.....	181	8.1	41.3	16.0	9.4	8.6	8.2	4.4	120
Occupational accidents.....	66	2.9	32.6	7.4	4.2	3.1	2.4	.8	
Traumatism by fall.....	45	2.0	4.3	3.7	2.3	1.9	2.8	.9	
Homicide (all forms).....	9	.4	6.5	1.2	1.4	.5			
All other causes.....	276	12.3	8.7	14.8	13.1	11.2	12.1	12.8	
Total.....	2,243	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths.....	69	3.1	32.6	7.4	4.7	3.1	2.5	.9	
Nonoccupational deaths.....	2,174	96.9	67.4	92.6	95.3	96.9	97.5	99.1	

^a See page 18 for explanation of standardized relative index.

¹⁶ Includes building porters, janitors, window cleaners, elevator operators, elevator starters; in schools, offices, warehouses, railroad stations, and buildings. The average age at death is 57.7 years. (See note, p. 19.)

Fatal accidents occur relatively more frequently than among all occupied males. The standardized relative index is 120. Falls caused relatively more deaths than among all occupied males in each age period and are responsible for about one-fourth of all the accidental deaths.

Laborers ¹⁷

THE TITLE "Laborers" includes building laborers and laborers of various undefined classifications. On the whole, the group is of low economic status because their work is unskilled; it is also of a strenuous nature. Their death rate is undoubtedly well above the average. In England and Wales (5) the mortality rate of a group of general and undefined laborers was 44 per cent higher than the average for all occupied and retired males. Every important cause of death except diabetes and appendicitis contributes to the higher death rate in that investigation. In the present study the important causes showing greater than average percentages of death are influenza, pneumonia, and accidents.

TABLE 24.—Number and per cent of deaths from specified causes among white male laborers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index*
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	10,240		704	725	1,268	2,032	2,750	2,761	
Typhoid fever.....	44	0.4	3.0	1.4	0.3	0.2	0.1		
Influenza, pneumonia.....	1,143	11.2	9.1	10.2	13.9	11.9	12.5	8.8	
Influenza.....	209	2.0	2.6	2.2	2.3	1.8	2.3	1.7	109
Pneumonia (all forms).....	934	9.1	6.5	8.0	11.6	10.1	10.2	7.1	120
Other diseases of the respiratory system.....	177	1.7	.6	1.4	1.5	2.2	1.8	1.8	111
Tuberculosis of the respiratory system.....	1,175	11.5	25.9	25.9	19.1	14.2	6.9	3.0	100
Syphilis, tabes dorsalis, and general paralysis of insane.....	205	2.0	.3	2.9	5.0	3.1	1.3	.7	95
Cancer (all forms).....	916	8.9	.6	1.4	3.9	10.5	12.7	10.5	98
Rheumatism (acute and chronic).....	26	.3	.3	.8	.3	.3	.1	.1	
Diabetes.....	98	1.0	1.7	.8	.2	.9	1.2	.9	68
Alcoholism.....	135	1.3	.4	1.9	3.5	2.3	.7	.3	
Cirrhosis of the liver.....	104	1.0	.3	.3	1.2	1.1	1.3	.9	
Chronic occupational poisonings.....	2			.1					
Lead poisoning.....	2			.1					
Cerebral hemorrhage, apoplexy, paralysis.....	809	7.9	.9	1.1	2.4	4.4	10.7	13.9	92
Other diseases of the heart.....	1,734	16.9	4.1	6.9	8.4	15.0	19.6	25.5	94
Arteriosclerosis.....	234	2.3		.3	.6	1.0	2.2	5.2	
Nephritis (acute and chronic).....	898	8.8	2.1	3.0	5.5	8.0	9.6	13.2	83
Suicide (all forms).....	183	1.8	2.0	2.9	3.2	2.1	1.7	.6	
Accidental or undefined violence.....	1,034	10.1	28.3	18.5	14.7	10.7	6.6	4.2	115
Occupational accidents.....	266	2.6	7.4	5.4	5.1	2.8	1.3	.6	
Traumatism by machines.....	53	.5	2.1	1.5	.7	.5	.2	.1	
Traumatism by fall.....	162	1.6	1.6	1.9	2.6	2.0	.9	1.4	
Vehicular accidents.....	343	3.3	10.4	5.4	3.7	3.8	2.5	1.4	
Homicide (all forms).....	83	.8	2.0	2.8	2.4	.5	.3		
All other causes.....	1,240	12.1	18.6	17.4	14.0	11.7	10.6	10.1	
Total.....	10,240	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths.....	285	2.8	7.7	5.5	5.1	3.2	1.5	.7	
Nonoccupational deaths.....	9,955	97.2	92.3	94.5	94.9	96.8	98.5	99.3	

* See page 18 for explanation of standardized relative index.

¹⁷ Includes hod carriers, excavation laborers, house wreckers, house movers (laborers), house shorers and bracers, and unclassified laborers. The average age at death is 53.2 years. (See note, p. 19.)

Typhoid fever.—The typhoid fever ratios are high up to age 34; thereafter they are average or below average, but are based on few deaths. Laborers are often exposed to water of a questionable quality. The percentages of deaths, however, are much lower in each age period than in 1911–1913 and probably represent a true decrease in the death rate in the more recent period.

Respiratory diseases.—Respiratory diseases are more frequent causes of death among laborers than among all occupied males. The standardized relative index for influenza is 109. The highest relative index (128) is found in the age period 55 to 64 years. Pneumonia shows high relative indexes at every age. The standardized relative index is 120. The highest relative index (129) is in the age period 55 to 64 years. Other respiratory diseases also show high ratios. The standardized relative index is 111. In our earlier study the respiratory diseases also showed ratios well above the average. In England and Wales the death rates for influenza, bronchitis, and pneumonia among laborers were, respectively, 34, 95, and 69 per cent above the average. It is difficult to define the specific hazards contributing to the excessive rates from these diseases. Exposure to the weather, to dust, heat, and alcoholism are probably all contributory factors.

Tuberculosis of the respiratory system.—The standardized relative index for tuberculosis is 100. As in our earlier study the ratios are higher than the average in some age periods and lower in others. Except for the indefinite age period 65 and over the highest relative index is 111, in the age period 55 to 64; the lowest relative index (88) is in the period 25 to 34 years. Although the standardized relative index is close to the average, the specific death rates by age are probably higher than among all occupied males, because of the high total death rate. The death rate among laborers in England and Wales was 65 per cent above the average. Laborers have shared proportionately in the decline of the tuberculosis death rate. The percentage of deaths declined from 16.4 per cent for ages 15 years and over in 1911–1913 to 11.5 in 1922–1924.

Cancer (all forms).—The standardized relative index for cancer is 98. The highest relative index is 109, in the age period 45 to 54. The death rate is probably higher than the average. In England and Wales the death rate from cancer among laborers is 38 per cent higher than among all occupied and retired males.

Diabetes.—The standardized relative index is 68. The ratios are very low in every age period except 15 to 24 years, when the relative index is 142. The low ratios point to a low death rate from this cause. Laborers in England and Wales according to the Registrar General showed a death rate for diabetes 21 per cent below the average. The English authorities concluded after studying the mortality from diabetes in five social classes that "it affects chiefly the classes provided with the financial means of overeating and under-exercising." Our findings for this occupation tend to support this conclusion. In explanation of the low ratios for laborers it should be pointed out that men suffering from diabetes are frequently unable to do strenuous work and must, therefore, shift to lighter jobs.

Alcoholism.—An inordinate number of deaths are attributed to alcoholism in every age period. The highest relative index based on a large number of deaths is 184 in the age period 35 to 44 years. In the first age period the relative index is 400, but is based on only three deaths. The high ratios for nephritis and cirrhosis of the liver that usually accompany excessive drinking do not obtain in this instance. The effect of alcoholism is reflected, however, in the higher ratios for arteriosclerosis. The proportion of alcoholic deaths has increased among laborers, whereas among all occupied males the proportion has declined since our earlier study.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 92. A high relative index appears in the age period 15 to 24, but is based on few deaths. An average proportionate mortality ratio is recorded in the age period 25 to 34 years; but after age 35 the ratios are all less than the average. The percentage of deaths for all ages 15 years and over increased from 6.9 per cent in 1911-1913 to 7.9 per cent in 1922-1924.

Other diseases of the heart.—The standardized relative index is 94. Except for the age period 15 to 24 years, where the relative index is 54, the ratios are about average. Because of the high total death rate the actual death rate from this cause is, therefore, probably higher than among all occupied males. In England and Wales the death rates for valvular diseases and other diseases of the heart among laborers are, respectively, 50 and 27 per cent higher than the average for all occupied and retired males. The percentage of deaths for all ages 15 years and over increased from 14.1 per cent in 1911-1913 to 16.9 per cent in 1922-1924.

Arteriosclerosis.—The relative indexes are high in every age period, the highest relative index being 167 in the age period 45 to 54.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 83. The proportionate mortality ratios are below average throughout. In England and Wales, however, the death rate from chronic nephritis among laborers is 27 per cent above the average.

Suicide (all forms).—Contrary to our earlier findings, laborers show high proportions for suicide. In 1911-1913 the ratio was high only for ages 15 to 24, where the relative index was 171. In the present study the highest relative index (125) is also in this age period.

Accidental or undefined violence.—The standardized relative index is 115. The ratios are high in every age period. The highest relative index is 124, in the age period 45 to 54. It is evident that the fatal accident rate is considerably higher than the average. The proportion of deaths for all ages 15 years and over increased from 8.3 per cent in 1911-1913 to 10.1 per cent in 1922-1924, indicating that the accident death rate has not decreased to the same extent as did the other causes of death. About one-quarter of the accidental deaths are of occupational origin.

Homicide (all forms).—The relative indexes for homicide are appreciably higher than the average in every age period except 45 to 54. The highest relative index is 200, in the age period 35 to 44.

Longshoremen and Stevedores¹⁵

No MORTALITY statistics have as yet been published in America showing actual death rates for longshoremen and stevedores. A small group of longshoremen insured in the ordinary department of the Metropolitan Life Insurance Co. during the years 1920-1926 show a mortality about 50 per cent in excess of the average. The proportionate mortality ratios for longshoremen insured in our industrial department indicate, through the inordinate proportion of deaths from pneumonia, nephritis, and accidental violence, that the death rate in this occupation is probably much higher than the average for all occupied males. English statistics (5) offer confirmatory evidence. In 1921-1923, the death rate for stevedores was 62 per cent above the normal; and that of other dock laborers, 53 per cent above. All the numerically important causes share in the higher mortality, except cerebral hemorrhage, apoplexy, and paralysis, which are low among stevedores. Lower than average death rates are also recorded for diabetes, cirrhosis of the liver, and influenza.

TABLE 25.—Number and per cent of deaths from specified causes among white male longshoremen and stevedores, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index*
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	594	-----	26	82	153	140	137	56	-----
Typhoid fever.....	1	0.2	-----	-----	0.7	-----	-----	-----	-----
Influenza, pneumonia.....	67	11.3	7.7	9.8	11.1	15.0	10.2	8.9	-----
Influenza.....	4	.7	-----	2.4	.7	-----	-----	-----	32
Pneumonia (all forms).....	63	10.6	7.7	7.3	10.5	14.3	10.2	8.9	130
Other diseases of the respiratory system.....	8	1.3	-----	-----	1.3	.7	2.9	1.8	87
Tuberculosis of the respiratory system.....	76	12.8	19.2	19.5	13.1	16.4	8.8	-----	80
Syphilis, tabes dorsalis, and general paralysis of insane.....	18	3.0	-----	4.9	4.6	2.9	2.2	-----	110
Cancer (all forms).....	41	6.9	-----	-----	4.6	11.4	10.2	7.1	88
Rheumatism (acute and chronic).....	2	.3	-----	-----	-----	.7	-----	1.8	-----
Diabetes.....	3	.5	3.8	-----	-----	-----	1.5	-----	70
Alcoholism.....	18	3.0	3.8	1.2	7.2	1.4	2.2	-----	-----
Cirrhosis of the liver.....	5	.8	-----	3.7	-----	.7	-----	-----	-----
Cerebral hemorrhage, apoplexy, paralysis.....	19	3.2	-----	-----	1.3	2.9	5.1	10.7	46
Other diseases of the heart.....	96	16.2	7.7	11.0	9.8	12.1	22.6	39.3	106
Arteriosclerosis.....	5	.8	-----	-----	-----	-----	2.2	3.6	-----
Nephritis (acute and chronic).....	55	9.3	7.7	4.9	8.5	7.9	12.4	14.2	114
Suicide (all forms).....	8	1.3	3.8	1.2	2.0	.7	1.5	-----	-----
Accidental or undefined violence.....	92	15.5	23.1	25.6	21.6	13.6	8.0	3.6	137
Occupational accidents.....	46	7.7	7.7	12.2	11.1	8.6	2.9	1.8	-----
Drowning.....	21	3.5	7.7	6.1	3.9	3.6	1.5	1.8	-----
Traumatism by fall.....	20	3.4	3.8	4.9	5.2	4.3	.7	-----	-----
Traumatism by machines.....	4	.7	-----	1.2	.7	.7	.7	-----	-----
Homicide (all forms).....	11	1.9	3.8	9.8	-----	.7	.7	-----	-----
All other causes.....	69	11.6	19.2	8.5	14.4	12.9	8.8	8.9	-----
Total.....	594	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths.....	46	7.7	7.7	12.2	11.1	8.6	2.9	1.8	-----
Nonoccupational deaths.....	548	92.3	92.3	87.8	88.9	91.4	97.1	98.2	-----

* See page 18 for explanation of standardized relative index.

¹⁵ Includes dockmen, dock hands, dock laborers, longshoremen, wallopers (dock), stevedores, laborers unloading ships. The average age at death is 46.9 years. (See note, p. 19.)

Respiratory diseases.—Of the respiratory diseases, pneumonia is the only one which has a sufficient number of deaths to warrant a reliable inference. The standardized relative index is 130. The relative indexes are high in every age period except 25 to 34 years, where the index is 95. The highest relative index (172) appears in the age period 45 to 54. The high pneumonia ratio can perhaps be explained by the continual exposure of longshoremen and stevedores to inclement weather and a general weakened resistance to disease that results from the excessive use of intoxicating liquors. Exposure to harmful dusts is suggested by the English authorities as a possible cause of the high mortality from pneumonia among English stevedores.

Tuberculosis of the respiratory system.—The standardized relative index for tuberculosis is 89. Up to age 44 the relative indexes are very low. In the age periods 45 to 54 and 55 to 64 the ratios are much higher than those of all occupied males, the relative indexes being, respectively, 126 and 142. The higher ratios at the older ages are perhaps the result of weakened resistance caused by cumulative injury to the lungs from frequent respiratory disturbances. The tuberculosis rate apparently has been greatly reduced, especially at the early ages, since 1911–1913. For all ages 15 years and over the proportion of deaths declined from 29.2 per cent to 12.8 per cent. The actual death rate, however, is probably still above the average. In the English figures these men showed a rate 123 per cent above the average.

Alcoholism.—The number of deaths attributed to this cause is very small; nevertheless the consistently high relative indexes are striking and certainly indicate that the actual death rate from alcoholism is very high.

Cancer (all forms).—The standardized relative index for cancer is 88. No deaths are recorded up to age 35. The ratio is high in the age group 45 to 54 (119), but low in the period 55 to 64 (77). Consequently the whole picture regarding cancer mortality is very inconclusive. English stevedores had a death rate from cancer 47 per cent above the average.

Cerebral hemorrhage, apoplexy, paralysis.—The ratios for this cause are remarkably low. The standardized relative index is 46, the lowest figure for this cause found in any of the numerically more important occupations. Low ratios were also found in our earlier study. The number of deaths in both studies, however, is too small to give conclusive results. It is interesting to note that these diseases and diabetes and influenza were the only important ones showing lower than average death rates for stevedores in England.

Other diseases of the heart.—The proportionate mortality for this cause is somewhat higher than the average. The standardized relative index is only 106, but above average indexes are found in every age period except 45 to 54. In the age periods 25 to 34 and 55 to 64 the relative indexes are quite high, being, respectively, 157 and 115. These ratios probably indicate high death rates because of the large total death rate in this occupation.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 114. High ratios are found in every age period except 45 to 54, where the relative index is only 81. In our earlier

study Bright's disease was high in all ages over 54 years and low in the younger ages. The high ratios from this disease are confirmed, however, by the English figure, which showed a death rate from chronic nephritis among stevedores 57 per cent higher than among all occupied and retired males.

Accidental or undefined violence.—Accidents are the chief occupational hazard of longshoremen, the standardized relative index being 137. Only in the first and last age periods, where the deaths are few, are the relative indexes less than average. The highest relative index is 177 in the age period 35 to 44 years. Occupational accidents cause an excessive number of deaths, accounting for 7.7 per cent of the deaths from all causes and for 50 per cent of the deaths from accidents.

Homicide (all forms).—The unusual number of deaths from homicide in the age period 25 to 34 is worthy of mention. There are eight deaths from this cause in that age period out of a total of 11 deaths for all ages. The relative index is 408. No explanation is offered for this peculiar phenomenon. It may be merely the result of chance variation. The figures for all ages, though based on few deaths, indicate a high homicide rate for longshoremen and stevedores.

Machinists¹⁹

MACHINISTS as a group probably experience lower mortality rates than males of our industrial department. A large group of machinists insured in our ordinary department in the years 1915 to 1926 experienced a mortality about 10 per cent above that of standard lives insured in that department. In England and Wales in 1921-1923 (5) several similar occupational groups had death rates below those for all occupied and retired males and individual causes of death showed average ratios. In the present investigation notably higher than average percentages were found for syphilis, and for influenza, the standardized relative indexes being 122 and 112, respectively. Tuberculosis and diabetes each showed an index of 107.

Typhoid fever.—Three-fourths of all the deaths from this disease occur in the first two age periods. In the first period the ratio (92) is lower than average, but in the second it is higher (110). In our earlier study higher ratios occurred at these ages, being, respectively, 131 and 119. We should infer from this that the death rate from typhoid has gone down faster among machinists than among all occupied males.

¹⁹ Includes lathe hands, bench hands, die makers, tool makers, gear cutters and makers, machine hands and repair men in automobile, car, railroad, machine, and other establishments where iron and steel are made into a finished product through the use of lathes, planers, and the usual equipment of a machine shop. The average age at death is 45.2 years. (See note, p. 19.)

TABLE 26.—Number and per cent of deaths from specified causes among white male machinists, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths	4,835		590	902	871	814	992	666	
Typhoid fever	32	0.7	2.4	1.1	0.5	0.4	0.1		
Influenza, pneumonia	488	10.1	11.2	9.4	12.1	10.1	9.5	8.4	
Influenza	112	2.3	4.2	1.9	2.4	1.7	1.9	2.4	112
Pneumonia (all forms)	376	7.8	6.9	7.5	9.6	8.4	7.6	6.0	100
Other diseases of the respiratory system	70	1.4	1.2	.3	2.2	2.1	1.1	2.0	99
Tuberculosis of the respiratory system	820	17.0	29.3	32.5	19.7	13.8	5.9	1.7	107
Syphilis, tabes dorsalis, and general paralysis of insane	139	2.9	.2	3.0	5.4	4.4	2.4	0.6	122
Cancer (all forms)	329	6.8	1.2	1.9	5.5	8.2	12.2	10.4	95
Rheumatism (acute and chronic)	21	.4	.8	.2	.5	.7	.3	.2	
Diabetes	72	1.5	1.4	1.6	1.1	1.4	1.9	1.5	107
Alcoholism	30	.6	.2	.7	1.0	.9	.6	.2	
Cirrhosis of the liver	40	.8		.3	.9	1.0	1.9	.3	
Cerebral hemorrhage, apoplexy, paralysis	1			.1					
Other diseases of the heart	275	5.7	.5	1.6	2.2	5.7	10.4	13.5	96
Arteriosclerosis	670	13.9	5.1	8.4	8.6	16.1	21.2	22.2	103
Nephritis (acute and chronic)	46	1.0				.5	.7	.5	
Suicide (all forms)	412	8.5	3.1	4.9	7.9	10.3	10.5	14.0	104
Accidental or undefined violence	111	2.3	2.5	1.8	4.0	2.3	1.7	1.4	
Occupational accidents	493	10.2	22.4	12.5	10.9	8.0	6.0	4.2	89
Traumatism by fall	133	2.8	4.7	3.2	3.7	2.9	1.7	.5	
Traumatism by machines	44	.9	.7	1.2	.5	1.2	.9	.9	
Homicide (all forms)	46	1.0	2.2	1.8	1.1	.9	.7	.3	
All other causes	37	.8	2.0	1.8	.6	.4	.1		
Total	749	15.5	16.6	18.0	16.8	13.9	13.4	14.6	
Total	4,835	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths	141	2.9	4.7	3.8	3.8	3.1	1.8	.5	
Nonoccupational deaths	4,694	97.1	95.3	96.2	96.2	96.9	98.2	99.5	

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—Most of the percentages for respiratory diseases are very close to average figures. The standardized relative index for influenza is 112 and that for pneumonia is 100. Other diseases of the respiratory system show high relative indexes from ages 35 to 54, but the standardized relative index is 99.

Tuberculosis of the respiratory system.—The standardized relative index for tuberculosis is 107. Previous studies, including our earlier one, have shown high tuberculosis ratios for machinists. In the ages 15 to 24 and 25 to 34, the proportionate mortality is above the average, the relative indexes being 125 and 111, respectively. After age 34 the proportionate mortality is about average, although in the age period 45 to 54 the relative index is 106. The percentages are much lower than they were in 1911–1913, indicating a considerable decline in the rate during the period.

Cancer (all forms).—The standardized relative index for cancer is 95. High relative indexes are found in the age periods 15 to 24 and 35 to 44. The percentages of deaths are consistently higher than in 1911–1913, showing that machinists have probably shared in the general rise in the cancer death rate.

Diabetes.—The standardized relative index is 107. The relative indexes are quite high up to age 44 but thereafter are average or below average.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 96. In only one age period, 25 to 34, is there a marked variation from the ratios of all occupied males (146). The death rate for this cause of death has probably declined since 1911–1913 as is the case among all occupied males.

Other diseases of the heart.—The standardized relative index is 103. The relative indexes for the several age periods indicate no marked differences from the average in the mortality of machinists from this cause.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 104. Only in the age period 55 to 64 is the relative index less than 100. The highest relative index is found in the age period 35 to 44, where it is 118. An occupational influence, however, is not evident.

Suicide (all forms).—Except in the age period 25 to 34, the ratios for suicide are appreciably high. The highest relative index appears in the age period 65 and over, where it is 175. Curiously enough, a very high index (156) is found also in the age period 15 to 24. A high proportion of deaths from this cause was also found in our earlier study, as well as by others who have made mortality investigations. An occupational influence can not be assigned to the death rate for suicide; but it is interesting to note in this occupation, as in a number of others, the concomitant high proportionate mortality ratio for syphilis.

Accidental or undefined violence.—The standardized relative index is 89, with low ratios at all ages except 65 and over. Occupational accidents account for 27 per cent of all accidental deaths. Machinery accidents alone cause nearly 10 per cent of the accidental deaths, giving a figure about twice the average. Falls, however, cause relatively fewer deaths than among all occupied males.

Masons and Bricklayers²⁰

THE MEDICO-ACTUARIAL analysis of occupational mortality (4) found a slightly higher mortality among bricklayers than the standard. The ratio of actual to expected deaths was 108 per cent, although deaths from accidents reached about twice the normal figure. In England and Wales (5) bricklayers show a very favorable death rate, or one only 85 per cent of that of all occupied and retired males. The fatal accident rate for English bricklayers is just about the average. In the present investigation the standardized relative index for accidents is 123. High indexes are also recorded for pneumonia and cancer.

²⁰ Includes foremen and workmen: Stonemasons, bricklayers, masons, bricksetters, and tile layers. The average age at death is 56.2 years. (See note, p. 19.)

TABLE 27.—Number and per cent of deaths from specified causes among white male masons and bricklayers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—					Standardized relative index ¹	
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64		65 and over
Number of deaths.....	1,069		29	72	102	215	296	355	
Typhoid fever.....	3	0.3	6.9	1.4					
Influenza, pneumonia.....	109	10.2	17.2	9.7	13.7	6.0	10.5	11.0	
Influenza.....	16	1.5	6.9	1.4	1.0	.5	1.0	2.3	88
Pneumonia (all forms).....	93	8.7	10.3	8.3	12.7	5.6	9.5	8.7	114
Other diseases of the respiratory system.....	19	1.8		1.4	2.0	1.9	1.4	2.3	98
Tuberculosis of the respiratory system.....	104	9.7	13.8	23.6	17.6	14.4	7.8	3.1	88
Syphilis, tabes dorsalis, and general paralysis of insane.....	20	1.9		1.4	5.9	1.9	2.0	.8	88
Cancer (all forms).....	111	10.4	3.4	4.2	5.9	11.2	11.5	12.1	111
Rheumatism (acute and chronic).....	1	.1				.5			
Diabetes.....	11	1.0		1.4	2.0		.7	1.7	54
Alcoholism.....	10	.9			1.0	1.9	1.4	.3	
Cirrhosis of the liver.....	18	1.7			1.0	.5	3.7	1.4	
Cerebral hemorrhage, apoplexy, paralysis.....	93	8.7	3.4		2.0	7.0	9.8	13.0	101
Other diseases of the heart.....	190	17.8	3.4	9.7	6.9	13.0	22.0	23.1	97
Arteriosclerosis.....	27	2.5				1.4	1.4	5.6	
Nephritis (acute and chronic).....	103	9.6		4.2	4.9	11.6	9.1	12.1	89
Suicide (all forms).....	17	1.6	3.4	2.8	2.9	2.3	1.7	.3	
Accidental or undefined violence.....	94	8.8	27.6	19.4	19.6	10.2	7.1	2.5	123
Occupational accidents.....	35	3.3	3.4	8.3	7.8	3.3	3.0	1.1	
Traumatism by fall.....	30	2.8		8.3	6.9	2.8	2.7	.8	
Homicide (all forms).....	9	.8	3.4	5.6		1.9			
All other causes.....	130	12.2	17.2	15.3	14.7	14.4	10.1	10.7	
Total.....	1,069	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths.....	35	3.3	3.4	8.3	7.8	3.3	3.0	1.1	
Nonoccupational deaths.....	1,034	96.7	96.6	91.7	92.2	96.7	97.0	98.9	

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—The standardized relative index for pneumonia is 114. High relative indexes are displayed at every age period except 45 to 54 years. A very high relative index in the age period 15 to 24 is probably not significant because it is based on few deaths. The number of deaths from influenza and other diseases of the respiratory system are likewise too few to give reliable ratios. The relatively large proportion of deaths from pneumonia in this occupation is possibly due to outdoor exposure. In our earlier analysis bricklayers and plasterers were combined. The ratios for pneumonia varied but little either above or below the general average. Lower than average death rates were recorded for respiratory diseases in the English study.

Tuberculosis of the respiratory system.—The standardized relative index for tuberculosis is 88. There is a gradual increase in the relative indexes for this cause at each successive age period up to 64. Whereas the relative indexes are low up to age 44, thereafter the percentages of deaths are distinctly higher than the corresponding figures for all occupied males. A similar age trend occurred also in 1911–1913 among bricklayers and plasterers combined. The highest relative index (126) occurs in the age period 55 to 64. The progressively increasing relative indexes reflect very likely the result of the cumulative effect of exposure to dust and exposure to all kinds of weather. There has been a considerable decline in the relative indexes at each age up to 54 since the earlier study, suggesting a corre-

sponding decline in the actual death rate. For all ages 15 years and over the proportionate mortality for tuberculosis decreased amazingly, falling from 19 per cent in 1911-1913 to 9.7 per cent in 1922-1924.

Cancer (all forms).—The standardized relative index for cancer is 111. The relative indexes are high in every age period except 55 to 64 years. The increase of the percentages over those in 1911-1913 is considerably greater than the increase which has occurred among all occupied males. The number of deaths involved is small, however, and the inference that the death rate from cancer is increasing at a more rapid rate than among all occupied males is consequently hardly warranted. It is difficult to see an occupational influence in these figures. In the English study of 1921-1923 bricklayers had an average death rate from cancer.

Other diseases of the heart.—The standardized relative index is 97. With the exception of the ratios in the age periods 25 to 34 (139) and 55 to 64 (112) the relative indexes are quite low. It is unlikely that the death rate for this cause differs substantially from that of all occupied males.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 89. The figures do not show significant differences by age period. Only in the age period 45 to 54 is the ratio above normal, the relative index being 120. On the whole, it appears that there is a low incidence of nephritis among bricklayers.

Accidental or undefined violence.—Masons and bricklayers share the accident hazard common to all the building trades. The standardized relative accident index is 123 and the proportionate mortality is higher than the average in every age period up to 64. The highest relative index (161) appears in the age period 35 to 44 years. The proportion of deaths from falls ranges from two to five times the normal. A relatively large number of occupational fatal accidents prevails in every age period except 15 to 24 years. Occupational accidents account for 37 per cent of all accidental deaths.

Merchants and Storekeepers²¹

No RECENT American statistics giving death rates for merchants and storekeepers are available; the English data, however, are instructive. In the report of the Registrar General, 1921-1923 (5), proprietors and managers of wholesale and retail businesses have an average death rate. Low death rates were recorded for tuberculosis and accidents and high death rates for the degenerative diseases. In our analysis also the degenerative diseases show very high ratios. The ratios are so high as to leave little doubt that the actual death rates are higher than the average. Very low ratios are found for tuberculosis and accidents.

²¹ Includes wholesale and retail dealers in various small lines: Stationery, books, boots and shoes, candy, tobacco, groceries, drugs, coal and wood, carpets, dry goods, hardware, flowers, fruit, furniture, fixtures, glassware, harness, hats, jewelry, music, optical goods, newspapers, produce, and butcher shops. The average age at death is 54 years. (See note, p. 19.)

TABLE 28.—Number and per cent of deaths from specified causes among white male merchants and storekeepers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths	3,133	-----	68	240	457	661	938	769	-----
Typhoid fever	7	0.2	1.5	0.8	0.4	0.3	-----	-----	-----
Influenza, pneumonia	270	8.6	4.4	10.0	11.4	6.8	8.2	9.0	-----
Influenza	55	1.8	1.5	2.5	1.5	1.8	1.3	2.2	82
Pneumonia (all forms)	215	6.9	2.9	7.5	9.8	5.0	6.9	6.8	81
Other diseases of the respiratory system	56	1.8	-----	8	2.4	2.1	1.7	1.7	107
Tuberculosis of the respiratory system	242	7.7	23.5	26.7	15.5	7.3	2.7	2.3	77
Syphilis, tabes dorsalis and general paralysis of insane	60	1.9	-----	8	3.5	2.0	2.1	1.2	71
Cancer (all forms)	262	8.4	1.5	1.7	4.4	7.7	12.5	9.0	92
Rheumatism (acute and chronic)	9	.3	-----	4	.4	.5	.3	-----	-----
Diabetes	101	3.2	2.9	2.1	.9	3.0	4.4	3.8	204
Alcoholism	20	.6	-----	2.9	1.3	.8	.2	-----	-----
Cirrhosis of the liver	60	1.9	-----	2.1	1.8	2.7	2.2	1.0	-----
Chronic occupational poisonings	1	-----	-----	-----	-----	.2	-----	-----	-----
Lead poisoning	1	-----	-----	-----	-----	.2	-----	-----	-----
Cerebral hemorrhage, apoplexy, paralysis	331	10.6	1.5	.8	5.7	8.3	13.5	15.6	137
Other diseases of the heart	578	18.4	16.2	10.4	12.7	19.7	20.8	20.7	128
Arteriosclerosis	52	1.7	-----	4	-----	.6	.9	5.1	-----
Nephritis (acute and chronic)	393	12.5	2.9	6.7	8.8	12.4	14.4	15.3	131
Suicide (all forms)	65	2.1	-----	3.3	2.8	3.3	1.5	1.0	-----
Accidental or undefined violence	151	4.8	22.1	9.6	7.2	5.1	2.7	2.7	65
Occupational accidents	19	.6	2.9	.4	1.3	.6	.3	.4	-----
Homicide (all forms)	43	1.4	5.9	4.2	1.3	2.3	.7	1.1	-----
All other causes	432	13.8	17.6	16.3	19.5	15.0	11.2	11.4	-----
Total	3,133	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths	22	.7	2.9	.8	1.3	.8	.4	.4	-----
Nonoccupational deaths	3,111	99.3	97.1	99.2	98.7	99.2	99.6	99.6	-----

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—Influenza and pneumonia are less important causes of death in this group than among all occupied males. The standardized relative indexes for pneumonia and influenza are 81 and 82, respectively. The ratios in the individual age periods are, with few exceptions, below the average. Other diseases of the respiratory system, however, cause a large number of deaths after age 35. The standardized relative index is 107. English “shopkeepers” have death rates from influenza and pneumonia slightly above the average.

Tuberculosis of the respiratory system.—The standardized relative index for tuberculosis is 77. The ratios decrease progressively from 100 in the age period 15 to 24 years to 44 in the period 55 to 64. The low tuberculosis ratios are perhaps a reflection of the better economic condition of these workers as compared with the industrial population as a whole. This is borne out by the fact that store clerks and salesmen who work in about the same environment have a standardized relative index of 104.

Cancer (all forms).—The standardized relative index for cancer is 92. The relative indexes are low at the older ages when cancer is of greatest importance. The death rate is probably less than that of all occupied males. English shopkeepers have a lower than average death rate from cancer.

Diabetes.—The standardized relative index for diabetes is 204. The proportions are consistently high throughout with the exception of the age period 35 to 44, when the proportion is average. In Eng-

land and Wales the death rate from diabetes for a similar occupational group was 48 per cent above the average.

Cirrhosis of the liver.—This disease is inordinately frequent. The highest relative index is 525, in the age period 25 to 34. It is high in every age period except the first, where no deaths are recorded. It is surprising to note that the ratios generally are low for alcoholism and syphilis, which are the commonest causes of cirrhosis of the liver.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is quite high (137), indicating a high death rate for these diseases. The death rate for English shopkeepers is 9 per cent above the average. After age 34 the relative indexes run from 211 in the age period 35 to 44 years to 124 in the age period 55 to 64.

Other diseases of the heart.—At every age except 65 and over this cause of death is more prevalent than among all occupations. The standardized relative index is 128. At the younger ages the excess is greater than at the later periods of life.

Nephritis (acute and chronic).—Nephritis, like the other degenerative diseases, is a more frequent cause of death than among all occupied males. The standardized relative index is 131.

Suicide (all forms).—The ratios for suicide are above average in three of the five working age periods. English shopkeepers had a death rate from suicide 62 per cent above the average.

Accidental or undefined violence.—Accidental or undefined violence is a relatively unimportant cause of death among storekeepers. The standardized relative index is 65. The ratios are very low in every age period. Occupational accidents are very few.

Homicide (all forms).—The hazard of homicidal death among shopkeepers seems to be very great. The relative index is high at every age, reaching the maximum in the age period 45 to 54, where it is 383. The ratio is also more than three times the average in two other age periods, namely, 15 to 24 and 55 to 64 years. Shopkeepers having large sums of money in their possession, are frequently attacked by bandits, and so this cause of death may perhaps be counted occupational in character. However, none of the deaths was classified as definitely of occupational origin, which would indicate that the facts were incompletely reported on the death certificate.

Painters, Paper Hangers, and Varnishers²²

A NUMBER of mortality studies have revealed a somewhat higher than average total death rate for painters. The medico-actuarial investigation of 1913 (4) reported the ratio of actual to expected deaths among journeymen house painters to be 111 per cent. In England and Wales in 1921–1923 (5), the death rate among painters and decorators was about 7 per cent higher than that among all occupied and retired males. These studies and also our 1911–1913 investigation (1) disclose high mortality from lead poisoning, nephritis, cerebral hemorrhage, and accidental violence. In the

²² Includes house, building, and bridge painters, all scaffold painters, frescoers, grainers, decorators, wood finishers, carriage painters, interior finishers, paper hangers, and unspecified painters (does not include sign writers, letterers, and gilders). The average age at death is 51.9 years. (See note, p. 19.)

present analysis we find confirmatory evidence of the higher incidence of these causes of death, although considerable improvement has taken place since our previous study. It is interesting to note that there were 54 deaths from chronic occupational lead poisoning among painters, which was over three-fourths of all deaths from this cause among white male industrial policyholders.

TABLE 29.—Number and per cent of deaths from specified causes among white male painters, paper hangers, and varnishers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—					Standardized relative index ¹	
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64		65 and over
Number of deaths.....	2,740	-----	107	249	452	650	707	575	-----
Typhoid fever.....	4	0.1	3.7	-----	-----	-----	-----	-----	-----
Influenza, pneumonia.....	223	8.1	13.1	9.6	10.4	7.5	7.5	6.3	-----
Influenza.....	28	1.0	.9	1.6	1.8	.5	1.0	.9	54
Pneumonia (all forms).....	195	7.1	12.1	8.0	8.6	7.1	6.5	5.4	100
Other diseases of the respiratory system.....	30	1.1	.9	1.2	1.1	.9	1.3	1.0	76
Tuberculosis of the respiratory system.....	333	12.2	26.2	28.1	21.5	12.3	6.6	1.9	102
Syphilis, tabes dorsalis and general paralysis of insane.....	71	2.6	-----	3.6	4.2	3.4	2.3	.9	106
Cancer (all forms).....	235	8.6	.9	2.0	4.4	10.8	10.6	11.1	93
Rheumatism (acute and chronic).....	6	.2	-----	.8	.2	-----	.3	.2	-----
Diabetes.....	26	.9	-----	1.2	.9	.6	1.3	1.0	61
Alcoholism.....	28	1.0	-----	1.2	2.0	-----	1.2	1.1	-----
Cirrhosis of the liver.....	34	1.2	-----	.8	.9	1.8	1.3	1.2	-----
Chronic occupational poisonings.....	55	2.0	.9	1.2	3.3	2.5	1.8	1.2	-----
Lead poisoning.....	54	2.0	.9	1.2	3.3	2.3	1.8	1.2	-----
Other poisonings.....	1	-----	-----	-----	-----	-----	-----	.2	-----
Cerebral hemorrhage, apoplexy, paralysis.....	248	9.1	-----	4	5.3	5.4	12.0	17.9	109
Other diseases of the heart.....	420	15.3	2.8	7.6	10.8	14.9	16.8	23.1	91
Arteriosclerosis.....	42	1.5	-----	-----	.2	.9	1.7	4.0	-----
Nephritis (acute and chronic).....	289	10.5	2.8	4.0	6.2	12.0	12.6	14.1	111
Suicide (all forms).....	41	1.5	1.9	2.4	2.2	1.7	1.0	.9	-----
Accidental or undefined violence.....	298	10.8	29.0	17.7	11.7	10.2	9.9	5.9	118
Occupational accidents.....	117	4.3	12.1	8.4	4.2	3.5	4.5	1.6	-----
Traumatism by fall.....	126	4.6	6.5	8.0	5.3	3.8	5.0	2.6	-----
Homicide (all forms).....	16	.6	3.7	1.6	.9	.6	-----	-----	-----
All other causes.....	341	12.4	14.0	16.5	13.7	13.2	11.9	9.2	-----
Total.....	2,740	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths.....	173	6.3	13.1	9.6	7.5	6.0	6.5	2.8	-----
Nonoccupational deaths.....	2,567	93.7	86.9	90.4	92.5	94.0	93.5	97.2	-----

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—The percentages for respiratory diseases in almost every age period are appreciably less than the corresponding figures for all occupied males. Pneumonia, however, displays a very high relative index in the age period 15 to 24 (189). The standardized relative indexes for influenza, pneumonia, and other diseases of the respiratory system are, respectively, 54, 100, and 76. The ratios for these diseases were also low in our earlier study.

Tuberculosis of the respiratory system.—The death rate from tuberculosis is apparently not appreciably different from the average. The relative indexes do not deviate much above or below 100, except in the age period 15 to 24, where the excess is 12 per cent. The standardized relative index is 102. The average mortality is corroborated by the experience of England and Wales for 1921–1923 and by our earlier study. The decline in proportionate mortality from this cause since 1911–1913 has been very favorable, indicating

a decline in the death rate at least equal to that among all occupied males.

Cancer (all forms).—The standardized relative index for cancer is 93. The percentage of deaths is appreciably above average in only one age period, 45 to 54, where the relative index is 113. At all other ages the percentages are about average or below average. The cancer death rate we should infer, therefore, does not deviate greatly from the average. Low ratios were found also in our earlier study. In England and Wales the death rate from cancer among painters and decorators is about 7 per cent higher than among all occupied and retired males.

Lead poisoning.—Two per cent of all the deaths in this occupation result from lead poisoning, the highest proportion occurring in the age period 35 to 44 years, where it is 3.3 per cent. Secondary effects of lead poisoning are shown in the higher than average ratios for apoplexy, paralysis, and nephritis. There were exactly the same number of deaths in 1911–1913 as in 1922–1924. The proportionate mortality in each age period was practically the same. But, as there were probably more painters insured with the company in the later period, these figures apparently indicate an actual decline in the death rate from lead poisoning. It should be pointed out in this connection that there has been a decline of 50 per cent in the death rate from lead poisoning among white males 15 years and over between the years 1912 and 1923. Such a large decrease in the total death rate could be brought about only if conditions among painters improved, as more than half of the deaths from lead poisoning occurred among painters.

In England painters are apparently less exposed to the lead hazard than in America. In the former country, less than 1 per cent of all deaths are due to lead poisoning, as compared with 2 per cent in our group of painters.

Cerebral hemorrhage, apoplexy, and paralysis.—The proportionate mortality for this cause is higher than among all occupied males at the significant ages, except in the age period 45 to 54 years, where the relative index is 92. The standardized relative index is 109. The highest relative index is 196, in the age period 35 to 44. Lead absorption is undoubtedly an important causative factor in these high ratios.

Other diseases of the heart.—The standardized relative index is 91. The percentages for this cause are high in the age periods 25 to 34 and 35 to 44, where the relative indexes are 109 and 117, respectively. At the other ages the percentages are all less than average. This occupation does not appear to exert any harmful influence on the heart. In England and Wales, however, the death rate from valvular heart disease among painters is 13 per cent above the average.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 111. The percentages are higher than those among all occupied males at the older ages, when nephritis is of greater importance. In the age period 45 to 54 the relative index is highest (124) and at the ages 55 to 64 it is 115. One can see here also the cumulative effect of lead upon the kidneys. The high relative indexes at the older ages are confirmed by pathological investigations

and by our previous study covering the years 1911-1913. The death rate from chronic nephritis among painters in England and Wales is 90 per cent higher than that of all occupied and retired males.

Accidental or undefined violence.—As in the other building trades, the proportionate mortality from accidental violence is higher than that of all occupied males. The standardized relative index is 118. Only in the age period 35 to 44 is the relative index low (96). The highest relative index (160) is in the age period 55 to 64. It seems certain, therefore, that painters, paper hangers, and varnishers have a high death rate from accidental violence. Falls account for 42 per cent of all accidental deaths, while among all occupied males the corresponding figure is 13 per cent. The relative indexes for occupational accidental deaths are high in every age period except 35 to 44. In the medico-actuarial investigation also, accidents accounted for more than the normal proportion of deaths. English painters, on the other hand, showed an average death rate from accidents. The percentage of deaths for all ages 15 years and over in the Metropolitan experience has increased from 8.7 per cent in 1911-1913 to 10.8 per cent in 1922-1924. Although this is a greater proportionate increase than is found for all occupied males, it should not necessarily be construed as representing an unfavorable trend in the death rate, but as probably due to a steeper decline in the death rate for other causes of death among painters.

Plumbers, Gas Fitters, and Steam Fitters²³

ON THE whole, the death rates for these occupations are probably lower than those for all occupations combined in our industrial experience. In the report of the Registrar General for 1921-1923 (5), plumbers and also gas fitters and pipe fitters show lower than average mortality rates. The medico-actuarial investigation of 1913 (4) reports the ratio of actual to expected deaths among journeymen, plumbers, and steam fitters to be 99 per cent. In the present investigation the proportionate mortality is notably above average for nephritis, syphilis, and suicide. The percentages of deaths from influenza, cerebral hemorrhage, apoplexy, and paralysis, and accidental violence are also somewhat higher than average. Deaths from heart diseases are relatively infrequent.

Respiratory diseases.—Of the respiratory diseases, pneumonia is the only one which accounts for a sufficient number of deaths to give reliable ratios. The standardized relative index is 90. The relative indexes are high only in the age period 15 to 24 (109), and in the indefinite period 65 and over (146). It appears, therefore, that the death rate from pneumonia among plumbers is probably lower than that of all occupied males.

²³ Includes pipe fitters, gas fitters, steam fitters, plumbers, plumbing repairers, pipe cutters, and plumbers' helpers. The average age at death is 45 years. (See note, p. 19.)

TABLE 30.—Number and per cent of deaths from specified causes among white male plumbers, gas fitters, and steam fitters, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—					Standardized relative index*	
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64		65 and over
Number of deaths.....	1,263		100	227	275	330	206	125	
Typhoid fever.....	5	0.4	3.0	0.4		0.3			
Influenza, pneumonia.....	121	9.6	9.0	10.1	9.8	9.1	8.7	11.2	
Influenza.....	23	1.8	2.0	2.6	1.5	.6	3.4	1.6	103
Pneumonia (all forms).....	98	7.8	7.0	7.5	8.4	8.5	5.3	9.6	90
Other diseases of the respiratory system.....	10	.8		1.3	.7	.9		1.6	36
Tuberculosis of the respiratory system.....	196	15.5	23.0	26.0	23.6	11.5	4.9	.8	95
Syphilis, tabes dorsalis, and general paralysis of insane.....	42	3.3		2.2	6.9	2.4	3.9	1.6	126
Cancer (all forms).....	89	7.0	2.0	2.6	3.6	9.4	11.2	13.6	93
Rheumatism (acute and chronic).....	3	.2	1.0	.4					
Diabetes.....	18	1.4	2.0	1.3	1.8	1.8	.5	.8	96
Alcoholism.....	9	.7			1.8	1.2			
Cirrhosis of the liver.....	10	.8			1.5	.9	1.5		
Cerebral hemorrhage, apoplexy, paralysis.....	75	5.9		1.3	3.3	6.4	11.7	14.4	108
Other diseases of the heart.....	143	11.3	2.0	6.6	7.6	12.4	14.6	27.2	75
Arteriosclerosis.....	13	1.0			.4	.3	2.4	4.8	
Nephritis (acute and chronic).....	131	10.4	5.0	5.3	8.4	15.5	12.1	12.0	131
Suicide (all forms).....	37	2.9	3.0	2.6	4.0	3.0	3.4		
Accidental or undefined violence.....	150	11.9	28.0	16.7	10.9	9.1	9.2	4.0	111
Occupational accidents.....	41	3.2	6.0	6.6	3.6	1.8	1.9		
Traumatism by fall.....	26	2.1	3.0	1.8	1.8	2.1	3.4		
Absorption of irrespirable, irritating, or poisonous gases.....	11	.9		.4	1.1	1.2	1.0	.8	
Homicide (all forms).....	15	1.2	2.0	2.6	1.5	.9			
All other causes.....	196	15.5	20.0	20.3	14.2	14.5	16.0	8.0	
Total.....	1,263	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths.....	42	3.3	7.0	6.6	3.6	1.8	1.9		
Nonoccupational deaths.....	1,221	96.7	93.0	93.4	96.4	98.2	98.1	100.0	

* See page 18 for explanation of standardized relative index.

Tuberculosis of the respiratory system.—The standardized relative index for tuberculosis is 95. The highest relative index (114) is in the age period 35 to 44. The relative indexes are less than average at every other age. In England and Wales, the tuberculosis death rate for plumbers and for gas fitters and pipe fitters in 1921–1923 was somewhat less than that for all occupied and retired males. In the United States the medico-actuarial investigation of 1913 reports that journeymen plumbers and steam fitters had a death rate from tuberculosis which was above the standard. The latter statement is confirmed by the ratios of the Metropolitan industrial experience of 1911–1913. In that experience the relative index was slightly below average in the first age period, but the relative indexes were progressively higher in each age period up to 55 to 64 years. The present analysis indicates a favorable decline. The percentage of deaths for all ages, 15 years and over, has decreased from 31.6 per cent in 1911–1913 to 15.5 per cent in 1922–1924.

Cancer (all forms).—The standardized relative index for cancer is 93. At ages 35 to 64 when the percentages for this cause are significant the relative indexes are low. The very high relative indexes between the ages 15 to 34 are inconclusive because of the small number of deaths recorded at those ages.

Lead poisoning.—The exposure to lead in this occupation is not severe enough to cause deaths from lead poisoning. During the three years in which 1,263 deaths were recorded among plumbers, gas

fitters, and steam fitters, not one was reported as due to lead intoxication. In the earlier study one death was recorded. It may well be, however, that this is merely the result of inaccurate reporting of causes on death certificates. English plumbers are apparently exposed to a greater lead hazard, as there were 14 deaths recorded from lead poisoning among them in the years 1921-1923. The far-reaching constitutional effects of lead absorption are clearly reflected in our figures, however, by the high ratios for cerebral hemorrhage and nephritis. The recent English figures also showed high death rates for these diseases, as did also our earlier analysis.

Cerebral hemorrhage, apoplexy, paralysis.—This cause is one of the few principal ones showing consistently high ratios. The standardized relative index is 108. That this is not a casual occurrence is corroborated by the high death rate for cerebral hemorrhage among plumbers, gas fitters, and pipe fitters in England and Wales in 1921-1923. The rate for ages 20 to 65 was 43 per cent higher than average among plumbers, and 36 per cent higher among gas fitters and pipe fitters. Lead absorption, as has already been suggested, is probably an important factor. The decline in the death rate for this cause since 1911-1913 has apparently been relatively greater than among all occupied males.

Other diseases of the heart.—The proportionate mortality ratios for heart disease point to a favorable death rate from this cause. The standardized relative index is 75. The relative indexes are low in every age period except 65 and over and are generally lower also than those in 1911-1913.

Nephritis (acute and chronic).—Nephritis exhibits the highest relative indexes of any of the main causes of death. The standardized relative index is 131. The indexes vary from 110 to 185, the latter appearing in the age period 15 to 24 where only five deaths are recorded. Of the significant figures, 160 in the age period 45 to 54 is the highest. In England and Wales the death rate from chronic nephritis among plumbers is almost twice the average. Lead absorption is probably an important causative factor in this result.

Suicide (all forms).—There appears to be no condition inherent in the occupation under consideration to which the high ratios of deaths by suicide can be attributed. The highest relative index is 243 in the age period 55 to 64. The number of deaths is small enough undoubtedly to allow large deviations, but the consistently high ratios suggest a true excess in the mortality from this cause.

Accidental or undefined violence.—The standardized relative index for accidents is 111. The ratios are higher than average in every age period except 35 to 44. The highest relative index is 148 in the age period 55 to 64. Occupational accidents are fewer than among all occupied males. The proportion of deaths from falls, however, is considerably higher than average in every age period. There were also relatively more deaths from absorption of irrespirable gases than among all occupied males.

Policemen ²⁴

IT IS COMMON knowledge that the policeman's duties are fraught with danger. The degree of hazard, however, is perhaps not fully

²⁴ Includes city policemen, marshals, detectives, constables, and sheriffs. The average age at death is 47.9 years. (See note, p. 19.)

realized. Not less than 8.6 per cent of the deaths at all ages occurred in the line of duty; of these, 4.7 per cent were due to accidental causes, in the restricted sense used in this text, and 3.9 per cent were due to homicide during active service. The latter figure is very probably an understatement because of inaccurate reporting, for homicide (all forms) was responsible for 7 per cent of the deaths. The high proportion of homicidal deaths is corroborated by the analysis of the mortality of city policemen made by the late Frederick S. Crum (17) of the Prudential Life Insurance Co. From information supplied by the chiefs of police, Crum found that 7.7 per cent of all the deaths of policemen between 1915 and 1918 were due to homicide. The actual death rate from this cause was 1 per 1,000. Up to age 24, 40.9 per cent of the deaths of insured policemen were of occupational origin, and from 25 to 34 years 20.5 per cent of the deaths were so classified. After age 34 years, however, the proportion becomes distinctly less. Of the important diseases, pneumonia, diabetes, and nephritis cause the heaviest excess of deaths in our industrial department experience; heart disease is probably also somewhat more prevalent than the average at the older ages. These high ratios suggest a high total death rate, which is confirmed by the medico-actuarial investigation (4). City policemen had a ratio of actual to expected deaths of 139 per cent and marshals, sheriffs, and constables 134 per cent.

TABLE 31.—Number and per cent of deaths from specified causes among white male policemen, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	700		22	132	142	148	164	92	
Typhoid fever.....	2	0.3		0.8	0.7				
Influenza, pneumonia.....	66	9.4	13.6	4.5	10.6	11.5	8.5	12.0	
Influenza.....	7	1.0			.7	2.7	1.2		55
Pneumonia (all forms).....	59	8.4	13.6	4.5	9.9	8.8	7.3	12.0	108
Other diseases of the respiratory system.....	8	1.1		.8	1.4	.7	1.2	2.2	61
Tuberculosis of the respiratory system.....	75	10.7	18.2	18.9	21.1	6.8	2.4	2.2	70
Syphilis, tabes dorsalis, and general paralysis of insane.....	19	2.7		3.0	3.5	4.1	2.4		105
Cancer (all forms).....	56	8.0		1.5	4.2	6.8	17.1	10.9	104
Rheumatism (acute and chronic).....	1	.1	4.5						
Diabetes.....	12	1.7			.7	2.0	3.7	2.2	119
Alcoholism.....	2	.3				.7			
Cirrhosis of the liver.....	5	.7			.7	1.4	1.2		
Cerebral hemorrhage, apoplexy, paralysis.....	34	4.9			2.1	5.4	7.3	12.0	71
Other diseases of the heart.....	89	12.7		4.5	4.9	15.5	18.9	23.9	82
Arteriosclerosis.....	6	.9				.7	1.2	3.3	
Nephritis (acute and chronic).....	78	11.1		2.3	8.5	15.5	18.3	10.9	141
Suicide (all forms).....	23	3.3		6.1	4.9	3.4	.6	2.2	
Accidental or undefined violence.....	81	11.6	40.9	26.5	11.3	7.4	3.0	5.4	120
Occupational accidents.....	33	4.7	27.3	12.9	4.2	2.0	.6		
Vehicular accidents.....	48	6.9	31.8	14.4	5.6	5.4	.6	5.4	
Homicide (all forms).....	49	7.0	22.7	18.2	4.9	6.8	1.8		
Occupational homicides.....	27	3.9	13.6	7.6	3.5	4.7	1.2		
All other causes.....	94	13.4		12.9	11.7	11.5	12.2	13.0	
Total.....	700	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths.....	60	8.6	40.9	20.5	7.7	6.8	1.8		
Nonoccupational deaths.....	640	91.4	59.1	79.5	92.3	93.2	98.2	100.0	

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—The number of deaths for diseases of the respiratory system, other than pneumonia, is too small to warrant consideration. The proportionate mortality for pneumonia is sufficiently higher than the average to indicate an excessive death rate from this cause. The standardized relative index is 108. In the age period 15 to 24 the relative index is highest (213), although the three deaths in this period are too few to give a reliable index. From 35 to 54 years the index is 106. Exposure to the weather is probably an important causative factor in these high ratios.

Tuberculosis of the respiratory system.—The proportionate mortality for tuberculosis is generally much less than for all occupied males. The standardized relative index is 70. In the age period 35 to 44, however, the relative index is 101. The figures are difficult to interpret because of the wide variations in the ratios, but they suggest a lower than average incidence of this disease.

Cancer (all forms).—The standardized relative index for cancer is 104. The relative indexes are low in every age period, except 55 to 64, where the ratio is 30 per cent in excess of that of all occupied males.

Other diseases of the heart.—The standardized relative index is 82. Up to age 44 heart disease is relatively unimportant. Thereafter, however, normal ratios are exhibited. The highest relative index is 102, in the age period 45 to 54. Because of the high total death rate these ratios indicate an excessive number of deaths from diseases of the heart at the older ages.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 141. At the ages 35 to 64 nephritis shows the highest relative indexes of any of the important diseases. The highest relative index (166) appears in the age period 55 to 64. Exposure to the weather is probably an important causative factor.

Suicide (all forms).—There are no deaths from suicide in the first age period out of a total of 22 deaths from all causes. The ratios are very high in the ages 25 to 54, the highest relative index in these ages being 218 in the age period 25 to 34. A very low ratio is recorded for the period 55 to 64 years, but the ratio is again high in the last period. The figures indicate on the whole, a high mortality from suicide among policemen. The familiarity with and the ready availability of firearms is an important factor. We note also a greater incidence of syphilis, a disease frequently associated with high suicide rates.

Accidental or undefined violence.—The standardized relative index is 120. In the age periods 15 to 24 and 25 to 34 the relative indexes are high, being 165 and 160, respectively. Thereafter the proportionate mortality is less than among all occupied males up to age 64. This may be due in part to the fact that many policemen are taken from active duty at the older ages. Occupational accidents account for 41 per cent of all accidental deaths and are very important up to age 34. In the age period 15 to 24 the relative index is 396 and at 25 to 34 it is 202.

Homicide (all forms).—Homicide looms up as one of the important causes of death among policemen in every age period except 65 and over. The relative indexes vary from four to over twelve

times the normal. In the first age period, 15 to 24, when more than 22 per cent of all deaths are due to homicide, it is the second largest cause of death, being surpassed only by accidental violence.

Railway Enginemen and Trainmen ²⁵

THE OUTSTANDING feature in regard to the mortality of railroad enginemen and trainmen is the large number of deaths due to accident. The health of these workers is, on the whole, good; not only are there no severe health hazards, but, in addition, many workers are employed only after careful physical examination and are thereafter examined periodically. Because of the severe accident hazard, however, the death rate for this group of railroad workers has probably been above the average. No death rates are available for a comparable classification of railroad men, but some mortality data are at hand for a few of the individual occupations included under this title. In the medico-actuarial investigation (4) the ratio of actual to expected deaths among passenger trainmen was 137 per cent. The death rate from accidents was six times the normal. The ratio for locomotive engineers was 160 per cent; and the death rate from accidents was eight times the normal. Among locomotive firemen the mortality ratio was 190 per cent, with a death rate from accidents of nine times the normal.

There has been, however, a most gratifying reduction in the fatal accident rate among these workers since the medico-actuarial study was completed, which has favorably affected the total death rate. We are fortunate in having for comparison a special study of the mortality of locomotive engineers published in the December, 1923, *Statistical Bulletin* of the Metropolitan Life Insurance Co., which shows clearly how great this improvement has been. The results of this study are so instructive that we are reprinting the article in full.

The special hazards of the locomotive engineer's occupation seem not to reduce his longevity prospect below that of males in the general population. From figures recently submitted by the Locomotive Engineer's Mutual Life and Accident Insurance Association, it was calculated in our office that the American locomotive engineer in 1922 at the age of 28 had an expectation of 41.14 years, and this may be compared with the figure of 40.55 years for 1921 among males in the United States registration States at age 27.²⁶ The mortality experience of American males insured in the ordinary departments of life-insurance companies for the period 1900-1915 showed an expectation of 39.36 years at age 28. This figure would now be much higher in view of the vastly improved mortality experience since the table was prepared. Locomotive engineers, therefore, appear to have an expectation of life about as good as that for the average American male of corresponding age.

The last 10 years have seen a substantial decline in mortality among locomotive engineers. Between ages 31 and 55, the declines ranged from 32 to 44 per cent. Beyond age 55 the evidence is not clear because of the relatively small numbers exposed to risk. In the following table we show certain age data for mortality from all causes of death combined.

²⁵ Includes railway engineers and firemen operating freight or passenger trains—coal or oil burning locomotives; railway trainmen, freight (conductors, brakemen, flagmen, trainmen); railway trainmen, passenger (conductors, brakemen, baggagemen, flagmen, railway mail and express employees, and ticket collectors). The average age at death is 43.2 years. (See note, p. 19.)

²⁶ Life-table values for United States registration States available only at central ages; that is, 27, 32, 37, etc.

CAUSES OF DEATH, BY OCCUPATION

Death rates per 1,000, and expectation of life, at specified ages, Brotherhood of Locomotive Engineers, 1922 and 1912

Age period	Death rate per 1,000			Expectation of life					
	1922	1912	Per cent decline, 1922-1912	Brotherhood of Locomotive Engineers, 1922		United States registration States, males, 1921		American Men Ult., 1900-1915	
				Central age	Expectation of life	Central age	Expectation of life	Central age	Expectation of life
26 to 30	2.89	2.89		28	41.14	27	40.55	28	39.36
31 to 35	2.96	4.73	37.4	33	36.68	32	36.46	33	35.19
36 to 40	4.19	7.42	43.5	38	32.27	37	32.41	38	30.99
41 to 45	6.08	9.69	37.3	43	28.00	42	28.47	43	26.84
46 to 50	7.81	11.54	32.3	48	23.86	47	24.61	48	22.83
51 to 55	12.56	19.30	34.9	53	19.87	52	20.87	53	19.05
56 to 60	25.05	25.03	1.1	58	16.45	57	17.36	58	15.58
61 to 65	28.95	34.01	14.9	63	13.39	62	14.12	63	12.47
66 to 70	51.72	55.85	7.4	68	10.57	67	11.23	68	9.77
71 to 75	85.75	70.77	121.2	73	8.71	72	8.75	73	7.49
76 to 80	94.67	103.45	8.5	78	7.31	77	6.68	78	5.62
81 to 85	100.78	295.45	65.9	83	5.15	82	5.06	83	4.14

¹ Increase.

The most gratifying fact in this mortality experience is the decline in the accident death rate. In 1912, fatal accidents occurred at a rate of 318 per 100,000; in 1922, the rate was 167 per 100,000. This reduction of nearly one-half reflects a vast improvement in safety provisions for the operating personnel of our American railway systems and accounts for a large part of the saving in mortality at the age range from 31 to 55 years. The typhoid fever death rate for this occupation declined from 29 per 100,000 in 1912 to 2 per 100,000 in 1922. The tuberculosis death rate showed a drop from 55 to 40 per 100,000 in 10 years.

Increases were recorded in the crude death rates for certain of the diseases characteristic of middle life and old age. Bearing in mind the change in age distribution of this group between 1912 and 1922, we "standardized" the calculation of death rates for diseases of the heart and blood vessels—that is to say, we assumed the age distribution of 1922 to hold for 1912 also, and found that for organic heart diseases the death rate in 1922 was 74 per cent higher than in 1912. Among males in the United States registration area, between 1910 and 1921, there was a decrease of 9 per cent for comparable ages in the standardized death rate. For cerebral hemorrhage and apoplexy the increase in the death rate between 1912 and 1922 was 11.4 per cent, but among males in the general population there was a decrease of 2.2 per cent. These increases in the death rate for two important diseases of middle life and old age were not sufficient, however, to affect adversely the life-expectation figures, possibly because most of the deaths fell in the advanced ages having a small proportion of the total exposure to risk. Bright's disease showed a decrease of 36 per cent between 1912 and 1922 for locomotive engineers, as compared with a decrease of 23 per cent for males in the general population.

We can use this study as a basis for comparison in analyzing the mortality experience of the group of railroad engineers and trainmen under study in the present investigation, bearing in mind that the industrial group includes firemen, conductors, and brakemen as well as engineers.

TABLE 32.—Number and per cent of deaths from specified causes among white males, railway enginemen and trainmen, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—					Standardized relative index ¹	
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64		65 and over
Number of deaths	769		73	208	161	112	124	91	
Typhoid fever	2	0.3			0.6		0.8		
Influenza, pneumonia	41	5.3		6.3	6.2	3.6	7.3	5.5	
Influenza	12	1.6		1.4	1.2	2.7	1.6	2.2	75
Pneumonia (all forms)	29	3.8		4.8	5.0	.9	5.6	3.3	43
Other diseases of the respiratory system	3	.4		.5	.6			1.1	12
Tuberculosis of the respiratory system	85	11.1	17.8	17.3	15.5	8.0	.8	1.1	61
Syphilis, tabes dorsalis, and general paralysis of insane	17	2.2		1.4	4.3	2.7	1.6	2.2	80
Cancer (all forms)	50	6.5		4.3	2.5	10.7	12.1	11.0	97
Diabetes	16	2.1	2.7	1.9	1.2	3.6	1.6	2.2	154
Alcoholism	2	.3			.6		.9		
Cirrhosis of the liver	10	1.3			1.2	2.7	2.4	2.2	
Cerebral hemorrhage, apoplexy, paralysis	46	6.0		.5	.6	9.8	12.9	18.7	118
Other diseases of the heart	71	9.2		3.4	6.8	12.5	17.7	18.7	75
Arteriosclerosis	3	.4					.8	2.2	
Nephritis (acute and chronic)	66	8.6		2.9	6.8	13.4	13.7	18.7	114
Suicide (all forms)	6	.8		1.0	2.5				
Accidental or undefined violence	230	29.9	67.1	45.7	32.9	13.4	12.1	3.3	241
Occupational accidents	183	23.8	53.4	37.5	25.5	8.9	10.5	2.2	
Railroad accidents	174	22.6	54.8	35.1	23.6	9.8	8.1	2.2	
Homicide (all forms)	8	1.0	1.4	2.4	1.2				
All other causes	113	14.7	11.0	12.5	16.1	18.8	16.1	13.2	
Total	769	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths	184	23.9	53.4	38.0	25.5	8.9	10.5	2.2	
Nonoccupational deaths	585	76.1	46.6	62.0	74.5	91.1	89.5	97.8	

¹ See page 18 for explanation of standardized relative index.

Typhoid fever.—There were only 2 deaths from typhoid in 1922–1924 out of 769 deaths from all causes. The low incidence of typhoid is even more gratifying when viewed in the light of the tremendous decline in mortality which has occurred since 1911–1913. In that period there were 26 deaths from typhoid fever out of a total of 947 deaths from all causes, high relative indexes being recorded especially at the younger ages. Much of the improvement is due to the activities of the railroads themselves in the betterment of sanitary facilities for their employees; some of it is the tangible result of the general public health movement.

Respiratory diseases.—The respiratory diseases are infrequent causes of death. The standardized relative indexes for influenza, pneumonia, and other diseases of the respiratory system are, respectively, 75, 43, and 12. Although the ratios are based on but few deaths, they undoubtedly represent low death rates from these causes. In England and Wales, also, locomotive engine drivers, firemen, and cleaners have low death rates from the respiratory diseases. In the medico-actuarial investigation the mortality from pneumonia among locomotive engineers was likewise below normal.

Tuberculosis of the respiratory system.—Tuberculosis is also much less frequent than among all occupied males. The standardized relative index is 61 and the ratios are very low in every age period. These figures are confirmed by the several studies mentioned above.

The proportionate mortality for all ages 15 years and over decreased from 14 per cent in 1911-1913 to 11.1 per cent in 1922-1924. Among locomotive engineers the death rate from tuberculosis declined from 55 per 100,000 in 1912 to 40 per 100,000 in 1922. Medical selection and supervision are clearly important factors in the very low incidence of tuberculosis among these men.

Cancer (all forms).—The standardized relative index is 97. The death rate from cancer is probably above the average.

Diabetes.—The standardized relative index for diabetes is 154. To be sure, the number of deaths upon which the ratio is based is quite small; but we have confirmatory evidence of a high mortality from this cause in the figures of the Registrar General of England and Wales, 1921-1923. In that study, the death rate from diabetes among locomotive engine drivers, firemen, and cleaners was 34 per cent higher than among all occupied and retired males and diabetes was the only cause of death which showed an appreciably excessive death rate in this occupational group. The reason for the high death rate from this cause is quite obscure, though some condition in the occupation, possibly nervous strain, is perhaps influential. Joslin (18) in his recent work on diabetes recorded the fact that one chief surgeon of a railroad found 44 instances of glycosuria among 1,673 engineers and further study showed that the majority of these men with glycosuria were really diabetics. About 20 per cent of all the engineers were overweight. He cites also that at the meeting of the medical and surgical section of the American Railway Association (Circular No. M. & S. 61) it was stated that the chief surgeon of a certain railroad employing approximately 50,000 men in its train operations and movements reported that 0.05 per cent of all trainmen have diabetes; of the engine men alone 1.07 per cent were diabetics. The age factor, he says, may be of importance in evaluating these statistics.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 118. The ratios are high at the older ages. The proportionate mortality for all ages 15 years and over increased from 3.4 per cent in 1911-1913 to 6 per cent in 1922-1924. This trend is in agreement with that shown in the special study of locomotive engineers, where the increase in the death rate between 1912 and 1922 was 11.4 per cent.

Other diseases of the heart.—The standardized relative index is 75. The ratios are low in every age period. The trend, however, since our earlier occupational mortality study is upward. The proportion for all ages 15 years and over increased from 5.4 per cent in 1911-1913 to 9.2 per cent in the present study. The marked increase in the rate for heart disease was also a feature in the special study of locomotive engineers, the death rate in 1922 being 74 per cent higher than in 1912.

Nephritis (acute and chronic).—Nephritis is relatively a more common cause of death among railway enginemen and trainmen than among all occupied males. The standardized relative index is 114. It is probable that the death rate from nephritis has declined considerably since the earlier study. Among locomotive engineers there was a 36 per cent decline in the death rate from Bright's disease between 1912 and 1922.

Accidental or undefined violence.—Accidental violence is the first cause of death among railway enginemen and trainmen and accounts for 29.9 per cent of all the deaths. In the age period 15 to 24, 67.1 per cent of the deaths are due to accidents. High ratios are found in every age period up to 65. The standardized relative index is 241. The highest relative index is 275 in the age period 25 to 34. Railroad accidents alone cause 22.6 per cent of the deaths from all causes at ages 15 years and over and 54.8 per cent of the deaths in the age period 15 to 24 years. The tremendous decrease in the importance of accidental violence as a cause of death is outstanding, as we have already said. The proportionate mortality for all ages 15 years and over decreased from 42.3 per cent in 1911–1913 to 29.9 per cent in the present study. Among locomotive engineers there was a reduction of almost one-half in the fatal-accident rate. The figures clearly indicate what a well-organized safety movement can accomplish.

Railway Track and Yard Workers ²⁷

RAILWAY track and yard workers experience an extremely high mortality from accidental violence. In our earlier study, 1911–1913 (1), 20.8 per cent of all the deaths were attributed to accidents, while 15.9 per cent of all the deaths were due to accidents in the years 1922–1924. It is the high fatal-accident rate which is undoubtedly responsible, in a great measure, for the high total death rate among these railroad workers. The medico-actuarial report (4) gives ratios of actual to expected deaths in two similar railroad groups; those whose work takes them more or less into the yards showed a ratio of 141 per cent and those who supervise the tracks, one of 126 per cent—the rates for accidents being four and three times the normal, respectively. The relative indexes in this occupation for accidental causes do not vary much according to age. The large number of deaths from accidents tends to make the proportion of deaths from all other causes low. Nevertheless, influenza shows a standardized relative index of 118 and cancer a standardized relative index of 101.

Respiratory diseases.—Of the respiratory diseases, influenza displays the highest relative indexes, with a standardized relative index of 118. Pneumonia ratios do not differ much from the normal. The standardized relative index is 92. The number of deaths from other diseases of the respiratory system is too small to give reliable ratios.

Tuberculosis of the respiratory system.—The proportionate mortality ratios for tuberculosis are all lower than the normal. The standardized relative index is 87. The death rate from tuberculosis is probably not very different from the average.

Cancer (all forms).—The standardized relative index for cancer is 101. In the first age period no deaths are recorded. High relative indexes are noted at the ages between 25 and 54. In the age period 55 to 64, however, the relative index is 87, and the ratio is low also in the indefinite period 65 and over. No occupational influence affecting the death rate from this cause is apparent.

²⁷ Includes section laborers, switchmen, track walkers, roundhouse workers, car cleaners, airbrake inspectors and repairers, crossing watchmen and flagmen, car sealers, and track repairers and graders. The average age at death is 52.2 years. (See note, p. 19.)

TABLE 33.—Number and per cent of deaths from specified causes among white male railway track and yard workers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	2,617	.....	156	250	345	513	751	602	.....
Typhoid fever.....	9	0.3	1.9	0.4	1.2	.....	0.1	.....	.....
Influenza, pneumonia.....	251	9.6	9.6	7.2	10.4	11.5	9.3	8.8	.....
Influenza.....	57	2.2	3.2	.4	4.3	2.7	1.6	1.7	118
Pneumonia (all forms).....	194	7.4	6.4	6.8	6.1	8.8	7.7	7.1	92
Other diseases of the respiratory system.....	29	1.1	1.9	.4	1.7	.8	1.2	1.0	81
Tuberculosis of the respiratory system.....	274	10.5	16.0	27.6	18.6	11.7	5.9	2.0	87
Syphilis, tabes dorsalis, and general paralysis of insane.....	51	1.9	.....	2.0	4.9	2.7	1.2	1.0	83
Cancer (all forms).....	232	8.9	.....	3.2	5.8	10.9	11.5	10.3	101
Rheumatism (acute and chronic).....	7	.3	1.3	.....	.6	.4	.1	.....	.....
Diabetes.....	41	1.6	1.9	.4	.9	1.4	1.9	2.2	97
Alcoholism.....	14	.5	.....	.....	1.7	1.2	.3	.....	.....
Cirrhosis of the liver.....	26	1.0	.....	.4	.6	1.0	2.0	.....	.....
Cerebral hemorrhage, apoplexy, paralysis.....	207	7.9	.....	2.0	2.0	4.7	12.1	13.3	100
Other diseases of the heart.....	398	15.2	5.8	5.2	8.7	13.3	19.8	21.4	92
Arteriosclerosis.....	47	1.8	.....	.....	.9	.6	1.6	4.8	.....
Nephritis (acute and chronic).....	231	8.8	3.8	3.2	2.0	10.1	9.9	14.0	86
Suicide (all forms).....	44	1.7	1.3	1.6	2.9	2.3	1.6	.7	.....
Accidental or undefined violence.....	415	15.9	46.2	29.6	22.3	13.3	10.9	7.0	177
Occupational accidents.....	270	10.3	30.8	22.4	14.2	8.6	6.7	3.8	.....
Railroad accidents.....	244	9.3	27.6	20.4	13.3	7.6	6.3	3.0	.....
Homicide (all forms).....	15	.6	.6	2.4	1.2	.2	.3	2	.....
All other causes.....	326	12.5	9.6	14.4	13.6	14.0	10.4	13.0	.....
Total.....	2,617	100.0	100.0	100.0	100.0	100.0	100.0	100.0	.....
Occupational deaths.....	274	10.5	30.8	22.4	14.5	8.8	6.9	3.8	.....
Nonoccupational deaths.....	2,343	89.5	69.2	77.6	85.5	91.2	93.1	96.2	.....

¹ See page 18 for explanation of standardized relative index.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 100.

Other diseases of the heart.—The standardized relative index is 92. The deviations from the average, however, are not large enough to be interpreted as indicative of low death rates. The rates are probably slightly higher than those for all occupied males.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 86. At the ages 45 to 54 and 55 to 64, where the number of deaths is large enough to give reliable ratios, the relative indexes are 104 and 90, respectively.

Accidental or undefined violence.—Accidental or undefined violence is the primary hazard among these railroad workers, the standardized relative index being 177. The ratios run from 155 to 186. The latter figure appears in the age period 15 to 24 years. Occupational accidents account for 65 per cent of all accidental deaths. Railroad accidents are the cause of 59 per cent of the accidental deaths and over 9 per cent of all the deaths in this occupation. The death rate from accidental violence has undoubtedly decreased at every age since 1911–1913.

Saloon Keepers and Bartenders²⁸

THIS TITLE includes saloon keepers and bartenders insured in Canada, and those men in the United States who have remained in their old establishments selling soft drinks and who continue to be designated as saloon keepers and bartenders. There were only 457 deaths in the three years 1922-1924, as compared with 2,190 in the years 1911-1913 (1). Because of the small numbers, the proportionate mortality ratios in many instances are not conclusive. The occupation, however, is an extremely interesting one because of the light it throws on the effects of alcoholism.

All previous studies agree in showing excessive death rates for the occupations in this group. The medico-actuarial investigation (4) reported upon 13 occupation classes involving exposure to the liquor hazard. Every class except proprietors and managers of distilleries showed a ratio of actual to expected deaths well above the average. Proprietors of saloons, billiard rooms, pool rooms, and bowling alleys who attended bar had a ratio of actual to expected deaths of 173, while those who stated they did not attend bar had a ratio of 182. Bar men in England and Wales in 1921-1923 had a death rate almost twice that of all occupied and retired males. High death rates were exhibited from every cause except diabetes and appendicitis. Proportionate mortality ratios can not show such a condition as this. They do, however, point out clearly those diseases most affected by alcoholism.

TABLE 34.—Number and per cent of deaths from specified causes among white male saloon keepers and bartenders, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index*
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	457	-----	5	56	122	140	93	41	-----
Influenza, pneumonia.....	44	9.6	-----	12.5	10.7	10.7	6.5	7.3	-----
Influenza.....	7	1.5	-----	3.6	1.6	1.4	-----	2.4	56
Pneumonia (all forms).....	37	8.1	-----	8.9	9.0	9.3	6.5	4.9	88
Other diseases of the respiratory system.....	4	.9	-----	-----	1.6	-----	2.2	-----	65
Tuberculosis of the respiratory system.....	70	15.3	40.0	21.4	23.0	14.3	7.5	2.4	114
Syphilis, tabes dorsalis, and general paralysis of insane.....	26	5.7	-----	3.6	6.6	7.1	4.3	4.9	179
Cancer (all forms).....	37	8.1	-----	1.8	4.1	7.1	16.1	14.6	101
Diabetes.....	9	2.0	-----	-----	1.6	1.4	-----	5.4	157
Alcoholism.....	15	3.3	-----	1.8	7.4	2.9	1.1	-----	-----
Cirrhosis of the liver.....	24	5.3	-----	1.8	5.7	9.3	2.2	2.4	-----
Cerebral hemorrhage, apoplexy, paralysis.....	27	5.9	-----	-----	2.5	7.1	9.7	12.2	94
Other diseases of the heart.....	61	13.3	-----	7.1	11.5	15.0	15.1	19.5	84
Arteriosclerosis.....	1	.2	-----	-----	-----	-----	1.1	-----	-----
Nephritis (acute and chronic).....	59	12.9	20.0	14.3	13.9	10.0	12.9	17.1	175
Suicide (all forms).....	6	1.3	-----	3.6	.8	-----	-----	2.4	-----
Accidental or undefined violence.....	19	4.2	-----	5.4	2.5	5.0	5.4	2.4	34
Homicide (all forms).....	12	2.6	20.0	12.5	1.6	1.4	-----	-----	-----
All other causes.....	43	9.4	20.0	14.3	6.6	7.1	10.8	14.6	-----
Total.....	457	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths.....	1	.2	-----	-----	-----	-----	1.1	-----	-----
Nonoccupational deaths.....	456	99.8	100.0	100.0	100.0	100.0	98.9	100.0	-----

* See page 18 for explanation of standardized relative index.

²⁸ Includes bartenders and proprietors of cafés, saloons, and liquor stores. The average age at death is 48 years. (See note, p. 19.)

Although the number of deaths from alcoholism is small, the consistently high ratios point to an inordinate incidence of this condition. The highest relative index (390) appears in the age period 35 to 44. Nephritis and cirrhosis of the liver also have very high relative indexes. The standardized relative index for nephritis is 175. The relative indexes for cirrhosis of the liver are from four to six times the normal in the age periods 25 to 54. That the greater frequency of these diseases is a direct effect of alcoholism is corroborated by every mortality study of persons who drink alcohol to excess. Syphilis is associated with alcoholism and occurs very frequently as a cause of death in the liquor trades. This study shows a standardized relative index for syphilis, tabes dorsalis, and general paralysis of the insane of 179. Homicide is another cause of death indirectly attributed to the excessive use of alcoholic liquor. Deaths from homicide for all ages combined are relatively three times as frequent as the average. Tuberculosis is also a more frequent cause of death than among all occupied males. The standardized relative index is 114. Cerebral hemorrhage and heart disease show lower proportionate mortality ratios, the standardized relative indexes being 94 and 84, respectively. The standardized relative index for accidents in this experience is so low (34) as to merit special comment. It is interesting to note, however, that English barmen had a more than average accident rate.

Shoe Factory Workers²⁹

SHOE MANUFACTURING, as a whole, is not inherently a hazardous industry. The medico-actuarial investigation (4) reports a ratio of 101 per cent actual of expected deaths among shoe manufacture operatives. The death rate in England and Wales (5) for two types of shoe factory operatives was 10 and 12 per cent above the average. In both studies, tuberculosis is the cause of an excessive number of deaths. That this condition is not casual is confirmed by several other analyses of deaths in this industry. In the Metropolitan industrial experience, tuberculosis displays high proportionate mortality ratios in every age period from age 25 to 64. The standardized relative index is 118. The highest relative index (131) appears in the age period 55 to 64. In the first age period a normal ratio prevails. Except for a few dusty processes, employing relatively few people, it is difficult to point to any specific hazards which would account for the high tuberculosis incidence. Probably the explanation is the general insanitary condition of the factory, fatigue, and the fact that weaker individuals are attracted to this type of work.

²⁹ Includes foremen and workers in the process of manufacturing shoes: Beaders, binders, bottomers, corders, crimpers, crowners, shoe cutters, tinkers, edgers, heel makers, liners, solers, vampers, and welters. The average age at death is 47.4 years. (See note, p. 19.)

TABLE 35.—Number and per cent of deaths from specified causes among white male shoe factory workers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	834	-----	109	116	132	130	135	162	-----
Typhoid fever.....	7	0.8	0.9	2.6	0.8	0.8	0.5	-----	-----
Influenza, pneumonia.....	80	9.6	6.4	11.2	12.1	11.5	8.1	8.6	-----
Influenza.....	17	2.0	1.8	2.6	1.5	2.3	.5	3.7	78
Pneumonia (all forms).....	63	7.6	4.6	8.6	10.6	9.2	7.6	4.9	103
Other diseases of the respiratory system.....	9	1.1	.9	.9	.8	1.5	.5	1.9	62
Tuberculosis of the respiratory system.....	137	16.4	23.9	35.3	25.8	15.4	8.1	.6	118
Syphilis, tabes dorsalis, and general paralysis of insane.....	16	1.9	.9	.9	3.8	1.5	3.2	.6	86
Cancer (all forms).....	72	8.6	.9	2.6	3.0	9.2	13.0	17.3	96
Rheumatism (acute and chronic).....	2	.2	1.8	-----	-----	-----	-----	-----	-----
Diabetes.....	9	1.1	-----	.9	.8	.8	1.6	1.9	66
Alcoholism.....	8	1.0	-----	1.7	.8	1.5	1.6	-----	-----
Cirrhosis of the liver.....	5	.6	-----	-----	-----	.8	.5	1.9	-----
Cerebral hemorrhage, apoplexy, paralysis.....	54	6.5	.9	1.7	3.0	3.0	9.7	15.4	84
Other diseases of the heart.....	126	15.1	6.3	13.8	9.8	16.2	16.2	24.1	101
Arteriosclerosis.....	13	1.6	-----	-----	.8	.8	1.6	4.9	-----
Nephritis (acute and chronic).....	68	8.2	2.8	3.4	6.0	9.2	15.1	8.0	111
Suicide (all forms).....	24	2.9	4.6	3.4	3.8	3.0	1.6	1.9	-----
Accidental or undefined violence.....	64	7.7	22.0	7.8	9.8	4.6	5.4	1.2	73
Occupational accidents.....	3	.4	.9	.9	.8	-----	-----	-----	-----
Traumatism by machines.....	1	.1	.9	-----	-----	-----	-----	-----	-----
Homicide (all forms).....	4	.5	.9	-----	.8	.8	-----	.6	-----
All other causes.....	136	16.3	26.6	13.8	18.2	19.2	13.0	11.1	-----
Total.....	834	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths.....	5	.6	.9	.9	.8	.8	-----	.6	-----
Nonoccupational deaths.....	829	99.4	99.1	99.1	99.2	99.2	100.0	99.4	-----

¹ See page 18 for explanation of standardized relative index.

Pneumonia is also more prevalent than among all occupied males from age 25 years to 54, the highest relative index being 114 in the age period 35 to 44. The standardized relative index is 103. Accidental violence is very low throughout. The standardized relative index is 73. Out of a total of 834 deaths from all causes only 1 fatality was due to machinery. Suicide is particularly prevalent at every age. In the age period 15 to 24 the percentage of deaths from suicide is almost three times the normal and for all ages combined the relative index is 161. Other causes of death do not exhibit important or significant variations and, apparently, the total death rate does not differ markedly from the average.

Stationary Engineers and Firemen⁸⁰

THE MORTALITY rate of stationary engineers and firemen insured in our industrial department is probably somewhat higher than the average for all occupied males. In the medico-actuarial investigation of 1913 (4), the mortality of a group of stationary firemen not engaged in hazardous industries was 10 per cent more than expected. A group of stationary engineers insured in the ordinary department of the Metropolitan Life Insurance Co. during the years 1915 to 1926 showed an average mortality when compared with standard

⁸⁰ Includes steam boiler and engine operators in factories, power houses, building construction, mines (above ground), and shipyards. The average age at death is 53.8 years. (See note, p. 19.)

lives, while stationary firemen showed an excess mortality of over 75 per cent. English stationary engine and crane drivers had a mortality rate which was 6 per cent less than that of all occupied and retired males in the years 1921-1923 (5).

The highest standardized relative index found for any cause in the present study (124) is for cancer. Other causes showing notably high percentages of deaths are pneumonia and other diseases of the respiratory system, diabetes, nephritis, and accidental violence. An outstanding feature of the mortality of these workers is the very low percentages found for tuberculosis.

TABLE 36.—Number and per cent of deaths from specified causes among white male stationary engineers and firemen, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	1,565	-----	38	97	224	358	493	355	-----
Typhoid fever.....	9	0.6	5.3	3.1	0.9	0.3	-----	0.3	-----
Influenza, pneumonia.....	138	8.8	15.8	11.3	10.7	8.4	9.1	6.2	-----
Influenza.....	25	1.6	2.6	2.1	1.8	1.7	1.8	.8	95
Pneumonia (all forms).....	113	7.2	13.2	9.3	8.9	6.7	7.3	5.4	107
Other diseases of the respiratory system.....	24	1.5	5.3	-----	1.8	2.0	.6	2.3	119
Tuberculosis of the respiratory system.....	116	7.4	13.2	22.7	12.9	9.2	4.5	1.4	68
Syphilis, tabes dorsalis, and general paralysis of insane.....	39	2.5	-----	2.1	5.4	4.2	1.2	1.1	100
Cancer (all forms).....	193	12.3	-----	2.1	7.6	12.3	15.6	14.9	124
Rheumatism (acute and chronic).....	7	.4	-----	1.0	.9	-----	.6	-----	-----
Diabetes.....	33	2.1	-----	2.1	1.3	.8	3.2	2.5	118
Alcoholism.....	7	.4	-----	-----	1.3	.6	-----	.6	-----
Cirrhosis of the liver.....	17	1.1	2.6	-----	-----	2.2	1.0	.8	-----
Cerebral hemorrhage, apoplexy, paralysis.....	122	7.8	-----	2.1	.9	5.0	10.1	14.1	87
Other diseases of the heart.....	264	16.9	2.6	6.2	12.9	17.0	17.6	22.5	97
Arteriosclerosis.....	23	1.5	-----	-----	-----	1.1	1.6	3.1	-----
Nephritis (acute and chronic).....	174	11.1	2.6	4.1	9.4	8.9	14.4	12.7	116
Suicide (all forms).....	23	1.5	2.6	2.1	1.3	1.4	1.4	1.4	-----
Accidental or undefined violence.....	149	9.5	26.3	19.6	15.6	8.9	7.5	4.5	114
Occupational accidents.....	66	4.2	15.8	11.3	5.8	3.9	3.7	1.1	-----
Burns (conflagration excepted).....	15	1.0	-----	3.1	.9	.6	1.2	.6	-----
Traumatism by machines.....	20	1.3	10.5	4.1	1.3	1.1	.8	.3	-----
Homicide (all forms).....	7	.4	2.6	2.1	.4	.8	-----	-----	-----
All other causes.....	220	14.1	21.1	19.6	16.5	16.8	11.4	11.3	-----
Total.....	1,565	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths.....	68	4.3	15.8	11.3	5.8	3.9	3.9	1.4	-----
Nonoccupational deaths.....	1,497	95.7	84.2	88.7	94.2	96.1	96.1	98.6	-----

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—Of the respiratory diseases, pneumonia is the only one responsible for a sufficient number of deaths to permit analysis. The standardized relative index is 107. The relative indexes are high only at the younger ages. After age 34 the percentages are consistently less than those of all occupied males.

Tuberculosis of the respiratory system.—The death rate from tuberculosis is clearly very low. The standardized relative index is 68. The relative indexes are very low in every age period, never exceeding 77. The reasons for this result are not clear, since these men, especially firemen, are generally obliged to work in very hot, and often dusty, confined spaces. Their freedom from tuberculosis is perhaps due to the fact that only sturdy individuals can carry on this type of work.

Cancer (all forms).—Cancer is the second largest cause of death among stationary engineers and firemen and accounts for 12.3 per cent of the deaths from all causes combined. The standardized relative index is 124. The relative indexes are high in every age period except 15 to 24, when no deaths from this cause are recorded. It is interesting to note that in England and Wales the death rate from cancer (all forms) among stationary engine and crane drivers was slightly above the average and the rate for cancer of the stomach was 30 per cent higher than that of all occupied and retired males. It is possible that exposure to radiant heat may be a contributory factor.

Cerebral hemorrhage, apoplexy, paralysis.—The proportionate mortality from this cause is rather low, the standardized relative index being 87. Low ratios are found at all of the significant ages.

Other diseases of the heart.—The ratios are high at the ages 35 to 54 years, but the low ratios in the other age periods bring the standardized relative index down to 97. This figure, however, probably represents an actual death rate somewhat higher than the average because of the higher total death rate. In England and Wales the death rate from valvular diseases of the heart among stationary engine and crane drivers is 26 per cent above that of all occupied and retired males, while the death rate for other heart disease is 21 per cent below the average.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 116. The highest relative index (140) occurs in the age period 35 to 44. The ratio is also high in the age period 55 to 64 years, where the relative index is 131. The relative indexes for the other age periods range from 92 to 96.

Accidental or undefined violence.—The relative index is high in every age period. The standardized relative index is 114. The excessive number of deaths from accident is clearly of occupational origin, the relative indexes for occupational accidents running from 118 to 229. Burns and machinery accidents cause an inordinate number of deaths. In the age period 15 to 24, fatalities from machinery accidents account for 10.5 per cent of all the deaths in that age period, as compared with 1.3 per cent among all occupied males.

Store Clerks and Salesmen ⁸¹

THE DEATH rate for salesmen and clerks in retail stores, an occupation possessing no apparent serious occupational hazard, is probably below average. Notably high standardized relative indexes are found for diabetes and nephritis, while the ratios for accidents are very low. In England and Wales (5) for the years 1921-1923, salesmen and shop assistants as a class had an average total death rate. However, open shop (fish, meat, etc.) workers showed a very high rate—28 per cent above average.

⁸¹ Includes clerks, cashiers, salesmen, messengers, and window dressers in wholesale and retail stores; meat cutters in retail butcher stores; clerks, buyers, and floorwalkers in department stores. The average age at death is 42.7 years. (See note, p. 19.)

TABLE 37.—Number and per cent of deaths from specified causes among white male store clerks and salesmen, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	3,302	-----	621	578	551	621	537	394	-----
Typhoid fever.....	21	0.6	1.8	0.3	0.5	0.8	-----	-----	-----
Influenza, pneumonia.....	281	8.5	8.5	8.1	11.6	8.4	7.3	6.6	-----
Influenza.....	62	1.9	1.8	2.0	3.3	1.0	1.3	2.0	87
Pneumonia (all forms).....	219	6.6	6.8	6.1	8.3	7.4	6.0	4.6	86
Other diseases of the respiratory system.....	39	1.2	1.6	.9	.7	1.1	1.1	1.8	74
Tuberculosis of the respiratory system.....	577	17.5	24.3	33.9	20.0	12.9	6.3	1.5	104
Syphilis, tabes dorsalis, and general paralysis of insane.....	87	2.6	.8	3.6	4.9	3.5	1.8	.8	110
Cancer (all forms).....	206	6.2	1.3	2.4	4.7	7.2	13.4	10.4	95
Rheumatism (acute and chronic).....	16	.5	.8	.7	.2	.3	.2	.8	-----
Diabetes.....	60	1.8	1.0	1.0	1.6	1.8	3.2	2.8	137
Alcoholism.....	20	.6	-----	.5	1.3	1.3	.4	-----	-----
Cirrhosis of the liver.....	36	1.1	-----	.3	1.1	1.6	2.2	1.5	-----
Chronic occupational poisonings.....	1	-----	-----	-----	.2	-----	-----	-----	-----
Lead poisoning.....	1	-----	-----	-----	.2	-----	-----	-----	-----
Cerebral hemorrhage, apoplexy, paralysis.....	190	5.8	.6	1.4	3.4	8.1	9.7	14.5	106
Other diseases of the heart.....	490	14.8	11.1	8.8	10.0	16.3	19.9	27.2	109
Arteriosclerosis.....	30	.9	-----	.2	-----	.5	1.1	5.1	-----
Nephritis (acute and chronic).....	294	8.9	2.7	4.0	10.0	12.2	12.8	13.7	121
Suicide (all forms).....	76	2.3	1.8	3.8	3.1	2.4	1.5	.8	-----
Accidental or undefined violence.....	285	8.6	18.8	10.6	6.9	7.1	3.0	2.3	67
Occupational accidents.....	21	.6	1.1	.9	.4	.5	.4	.5	-----
Homicide (all forms).....	35	1.1	1.8	2.6	1.5	.2	-----	-----	-----
All other causes.....	558	16.9	23.0	16.8	18.3	14.3	16.2	10.4	-----
Total.....	3,302	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths.....	23	.7	1.1	.9	.5	.6	.4	.5	-----
Nonoccupational deaths.....	3,279	99.3	98.9	99.1	99.5	99.4	99.6	99.5	-----

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—The proportionate mortality for respiratory diseases is, on the whole, less than among all occupied males. In only a few ages are the relative indexes more than 100. The standardized relative indexes for influenza, pneumonia, and other diseases of the respiratory system are 87, 86, and 74, respectively. Low relative indexes are found also for pneumonia and influenza among merchants and storekeepers, who have the same occupational environment. Salesmen and shop assistants in England and Wales also showed low death rates from these diseases in the years 1921–1923.

Tuberculosis of the respiratory system.—The ratios for tuberculosis are about average, the relative indexes fluctuating slightly above or below 100 up to age 64. The standardized relative index is 104. In only one age period, 25 to 34, is there an appreciable variation, which shows a ratio 15 per cent above that for all occupied males. Although from the standpoint of hygiene the industrial environment in this occupation is very similar to that found among bookkeepers and office assistants, the proportionate mortality for tuberculosis is much lower. This difference is perhaps attributable to the greater activity of store clerks and salesmen.

Cancer (all forms).—The relative indexes for cancer are high in the ages 15 to 44. The highest relative index (120) is in the period 25 to 34. In spite of the high ratios recorded for this cause at the younger ages, it would appear that the death rate is not higher than that of all occupied males. The standardized relative

index is 95. In the age period 45 to 54, when the cancer rate assumes an important position, the relative index is 75 and in the next age period, 55 to 64, the ratio is about average. There are apparently no occupational influences affecting the cancer rate among store clerks and salesmen.

Diabetes.—The standardized relative index is 137. High relative indexes are recorded in every age period after 35. English salesmen and shop assistants have a death rate from diabetes 46 per cent above the average.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 106. The relative indexes are high up to age 54. In the age period 55 to 64 the relative index is 89. In England and Wales salesmen and shop assistants have average mortality.

Other diseases of the heart.—The standardized relative index is 109. The proportionate mortality is high in every age period. The relative indexes decrease with age, the maximum being 146 in the age period 15 to 24 and the minimum 101 in the age period 55 to 64. This tendency is perhaps associated with physical weakness among the younger people entering this occupation and their gradual weeding out.

Nephritis (acute and chronic).—Nephritis shows high mortality percentages after age 34, the highest relative index (149) appearing in the age period 35 to 44. The standardized relative index is 121. English salesmen and shop assistants as a group showed a death rate from chronic nephritis 5 per cent below the average.

Suicide (all forms).—A high proportion of deaths from suicide is found in every age period. The highest relative index (136) is recorded for the age period 25 to 34. With the exception of this one ratio, the relative indexes do not indicate actually higher death rates, in view of the probably favorable total death rate.

Accidental or undefined violence.—The relative indexes for accidents are conspicuously low at every age period, the highest being 83 in the age period 45 to 54 and the lowest being 48 in the age period 55 to 64. The standardized relative index is 67. Occupational accidents are very few.

Tailors and Other Clothing Workers ³²

THOUGH garment workers are usually described as being engaged in unhealthful occupations, all available death rates for this group are very close to average. In the medico-actuarial investigation (4), the number of deaths among journeyman tailors was 99 per cent of the number expected. In the intercompany group insurance mortality experience (9), clothing workers showed a ratio of actual to expected deaths of 80.1 per cent as compared with a percentage of 90.2 for all industries. In England and Wales (5), the death rate among tailors, tailors' pressers, and machinists was 2 per cent above the average and among cutters of textile goods and clothing (not machine cutters) it was 17 per cent above the average. Cer-

³² Includes foremen and workmen in garment factories and tailor shops, making suits, coats, cloaks, and overalls; Tailors, cloth cutters, buttonhole makers, clothing cutters, clothing designers, machine operators on suits, coats, cloaks, and overalls, clothing pressers and trimmers. Makers of waists, ties, caps, handkerchiefs, scarfs, shirts, collars, cuffs, corsets, gloves, and other small articles of clothing. (Excludes all textile workers.) The average age at death is 53.8 years. (See note, p. 19.)

tain causes of death are more frequently found than among all occupied males; but these are counterbalanced by low rates for other diseases, thus maintaining the total death rate at an average level. Tuberculosis, especially at the younger ages, has been found much more prevalent among these workers. The present study indicates that tuberculosis is still a problem of the industry. Higher ratios are also found for cancer, other diseases of the heart, and nephritis. Diabetes is extremely prevalent, the proportion of deaths from this cause being 85 per cent above the average for the ages 15 to 64 years. The very low accident ratio is the most gratifying feature of the mortality picture.

TABLE 38.—Number and per cent of deaths from specified causes among white male tailors and other clothing workers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths.....	1, 175		57	90	124	241	390	273	
Typhoid fever.....	4	0.3	3.5	1.1	0.8				
Influenza, pneumonia.....	108	9.2	5.3	14.4	8.9	9.1	9.2	8.4	
Influenza.....	16	1.4		3.3	1.6	2.5	.8	.7	78
Pneumonia (all forms).....	92	7.8	5.3	11.1	7.3	6.6	8.5	7.7	97
Other diseases of the respiratory system.....	22	1.9			.8	2.9	2.3	1.8	104
Tuberculosis of the respiratory system.....	136	11.6	42.1	34.4	23.4	10.8	4.9	2.6	118
Syphilis, tabes dorsalis, and general paralysis of insane.....	26	2.2		3.3	2.4	4.1	1.5	1.5	89
Cancer (all forms).....	121	10.3			6.5	11.6	14.9	9.9	113
Rheumatism (acute and chronic).....	4	.3		1.1		.8	.3		
Diabetes.....	36	3.1	1.8		.8	3.3	4.9	2.6	185
Alcoholism.....	4	.3			.8	.4	.5		
Cirrhosis of the liver.....	11	.9			.8	.4	1.0	1.8	
Cerebral hemorrhage, apoplexy, paralysis.....	101	8.6			2.4	5.8	10.8	15.4	94
Other diseases of the heart.....	232	19.7	10.5	8.9	13.7	20.3	20.8	26.0	123
Arteriosclerosis.....	18	1.5		1.1	.8	.8	1.8	2.6	
Nephritis (acute and chronic).....	123	10.5	3.5	3.3	11.3	10.8	11.5	12.1	115
Suicide (all forms).....	20	1.7	3.5	3.3	4.0	1.2	1.5	.4	
Accidental or undefined violence.....	55	4.7	19.3	6.7	8.1	2.1	3.3	3.7	56
Homicide (all forms).....	6	.5	1.8	3.3	.8	.4			
All other causes.....	148	12.6	8.8	18.9	13.7	14.9	10.8	11.4	
Total.....	1, 175	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Nonoccupational deaths.....	1, 175	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—Standardized relative indexes for influenza and pneumonia and other respiratory diseases are 78, 97, and 104, respectively.

Tuberculosis of the respiratory system.—The standardized relative index for tuberculosis is 118. The relative indexes are high up to age 44, the highest relative index (179) being found in the age period 15 to 24 years. In the following age periods the ratios are 117 and 113, respectively; but after age 44 the ratios are below average. The high ratios in the younger ages especially indicate the disadvantages of this occupation when considered in connection with the racial composition of these workers. In this country garment workers are recruited largely from Jewish and Italian stocks, among whom tuberculosis is less frequently found than among other foreign race stocks. In England and Wales clothing workers ap-

parently suffer inordinately from tuberculosis, for among cutters and tailors the death rates for tuberculosis of the respiratory system are, respectively, 88 and 42 per cent higher than the average.

Several investigators, notably Schereschewsky (19), Landis (20), and Robinson and Wilson (21), found, on physical examination of garment workers, an excessive number of cases of tuberculosis. They attributed their high figures to low wages, the stress and strain of piecework, faulty posture, and insanitary home conditions. More recently Price (22), who has had under constant observation the health of more than 100,000 garment workers, found that about 1 per cent of the workers in this industry have tuberculosis, a finding not very different from the average among all occupied persons.

Among tailors and clothing workers insured in the industrial department the percentage of deaths from tuberculosis for all ages 15 years and over has decreased from 18.9 per cent in 1911-1913 to 11.6 in 1922-1924. Undoubtedly there has been a marked improvement in the economic position of these workers since the earlier studies were made. The old sweatshops have been largely abolished, wages have been increased, hours of labor shortened, and factory conditions generally improved. Nevertheless, the high proportions found in this investigation show clearly that there is still room for improvement, especially among the younger workers.

Cancer (all forms).—The standardized relative index for cancer is 113. No deaths were recorded up to age 34. After age 34, except for the indefinite age period 65 and over, the ratios are higher than average. In the age period 35 to 44 years the relative index is 151; the figure decreased to 113 in the age period 55 to 64.

Diabetes.—The standardized relative index for diabetes is 185. The number of deaths at the younger ages is too small to yield significant ratios. Between the ages 45 and 64 years, however, the percentages are more than twice the average. The high ratio is probably due to the racial composition of the group. Jews, among whom diabetes is known to be very common, form a large proportion of American clothing workers.

Other diseases of the heart.—The standardized relative index is 123. The relative indexes are high at every age period. The highest relative index (149) is found in the age period 35 to 44. There is no apparent direct occupational influence on the incidence of these diseases.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 115. The highest relative index (169) appears in the age period 35 to 44.

Suicide (all forms).—Up to age 44, the relative incidence of suicide is quite high. Schereschewsky has pointed out that the garment workers suffer inordinately from neurasthenia and suggests that low wages and irregularity of employment are important causative factors. There is undoubtedly a direct relationship between the prevalence of neurasthenia and the frequency of suicidal deaths.

Accidental or undefined violence.—Accidental causes are responsible for relatively few deaths in the clothing industry and are unimportant from an industrial point of view. The standardized relative index is 56. No fatal occupational accidents were recorded.

Teamsters and Drivers ³³

TEAMSTERS have been found to have higher death rates than the average. In the medico-actuarial study (4) they showed a ratio of actual to expected deaths of 116 per cent. Death rates from accidents and pneumonia were 50 per cent above the standard. In the English study (5) the mortality of men driving horse-drawn vehicles was 38 per cent higher than that of all occupied and retired males. All the important causes of death showed higher death rates than the average, diseases of the respiratory system being especially high. In the present study accidents and syphilis show high standardized relative indexes. The indexes for all the other numerically important causes with the exception of diabetes run from 92 to 103, indicating, in view of the high total death rate, a somewhat higher than average incidence of these causes among teamsters and drivers.

TABLE 39.—Number and per cent of deaths from specified causes among white male teamsters and drivers, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—						Standardized relative index ¹
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over	
Number of deaths	3,601	-----	331	566	733	742	701	528	-----
Typhoid fever	19	0.5	3.6	0.5	0.4	-----	0.1	-----	-----
Influenza, pneumonia	369	10.2	8.2	12.2	13.8	10.8	7.3	7.8	-----
Influenza	73	2.0	1.5	3.2	2.5	1.9	1.3	1.7	97
Pneumonia (all forms)	296	8.2	6.6	9.0	11.3	8.9	6.0	6.1	102
Other diseases of the respiratory system	57	1.6	1.5	2.5	1.1	1.3	1.0	2.5	95
Tuberculosis of the respiratory system	560	15.6	19.9	25.6	23.6	14.2	8.6	2.1	103
Syphilis, tabes dorsalis, and general paralysis of insane	101	2.8	.3	2.5	4.0	5.0	2.0	1.1	111
Cancer (all forms)	270	7.5	1.8	1.9	3.3	9.4	14.0	11.6	101
Rheumatism (acute and chronic)	14	.4	1.2	.7	.4	-----	.3	.2	-----
Diabetes	41	1.1	1.2	.7	1.1	.9	1.7	1.1	84
Alcoholism	50	1.4	.6	1.6	2.0	1.9	1.3	.2	-----
Cirrhosis of the liver	38	1.1	-----	-----	.7	1.8	2.0	1.1	-----
Cerebral hemorrhage, apoplexy, paralysis	218	6.1	.6	1.1	2.5	5.7	10.4	14.6	96
Other diseases of the heart	473	13.1	3.3	8.3	8.9	14.4	18.3	21.8	92
Arteriosclerosis	47	1.3	-----	-----	.3	.7	1.7	5.3	-----
Nephritis (acute and chronic)	282	7.8	1.2	3.7	6.8	8.5	10.8	12.9	92
Suicide (all forms)	54	1.5	1.5	3.0	2.2	1.5	.3	.6	-----
Accidental or undefined violence	490	13.6	28.1	19.8	13.5	11.6	9.6	6.3	124
Occupational accidents	224	6.2	9.4	9.5	6.4	5.4	5.6	2.5	-----
Automobile accidents	104	2.9	8.2	4.4	2.3	2.7	1.1	1.3	-----
Vehicular accidents (excluding automobile accidents)	151	4.2	6.0	6.7	4.6	2.7	3.9	2.3	-----
Homicide (all forms)	38	1.1	3.9	2.3	1.0	.5	.1	-----	-----
All other causes	480	13.3	23.0	13.6	14.6	11.9	10.6	11.0	-----
Total	3,601	100.0	100.0	100.0	100.0	100.0	100.0	100.0	-----
Occupational deaths	225	6.2	9.4	9.5	6.5	5.4	5.6	2.5	-----
Nonoccupational deaths	3,376	93.8	90.6	90.5	93.5	94.6	94.4	97.5	-----

¹ See page 18 for explanation of standardized relative index.

Respiratory diseases.—On the whole, the diseases of the respiratory system are probably more frequent in this occupation group than among all occupied males. The standardized relative index for influenza is 97. The relative indexes at ages 25 to 54 are high,

³³ Includes drivers and teamsters: Mail, express, moving van, truck, warehouse, cab, hack, and retail store. Drivers were classified with this group when no mention was made in the death certificate as to whether they were driving automobiles or horse-drawn vehicles. The average age at death is 46.6 years. (See note, p. 19.)

the highest relative index (139) being recorded in the age period 25 to 34. Pneumonia is high in every age period up to age 54. The standardized relative index is 102. The highest relative index (122) appears in the age group 35 to 44. In the medico-actuarial investigation of 1913 the proportion of deaths from pneumonia among teamsters was 50 per cent greater than the standard. Other respiratory diseases show very high ratios in our group from age 15 to 34. After age 34, however, the proportionate mortality is quite low. The standardized relative index is 95. The high incidence of respiratory diseases in this occupation is probably associated with exposure to inclement weather and with alcoholism. These high ratios contrast strangely with the low ratios found for chauffeurs.

Tuberculosis of the respiratory system.—The standardized relative index for tuberculosis is 103. The proportionate mortality from ages 15 to 34 years is low. The actual death rate in this age period, however, is probably above the average in view of the high total death rate. The fact that the relative indexes increase with age, reaching a maximum (139) in the age period 55 to 64 suggests the presence of a cumulative tuberculosis hazard in this occupation; but the exact nature of this hazard is difficult to define.

Cancer (all forms).—The standardized relative index for cancer is 101. Except for the very high relative index (164) in the age period 15 to 24, the relative indexes indicate death rates from cancer slightly above average. The high ratio in the first age period is probably a chance variation as few deaths were recorded at these ages.

Syphilis, tabes dorsalis, and general paralysis of insane.—The standardized relative index is 111, indicating a high death rate for these diseases.

Alcoholism.—Alcoholism causes 1.4 per cent of all the deaths. The relative indexes are high in every age period. The death rate from this cause is unquestionably high. The frequency of this cause of death undoubtedly contributes to the higher ratios found for respiratory diseases, cirrhosis of the liver, arteriosclerosis, and accidental violence.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 96. The percentages for these causes are about average in the several ages and are indicative of a higher than average death rate, because of the probably high total death rate.

Other diseases of the heart.—The standardized relative index is 92. Average proportionate mortality is also recorded for this cause of death at most ages. In the age period 25 to 34, however, the relative index is 119.

Arteriosclerosis.—The percentages are above the average after age 34. The higher ratios are associated with very high ratios for alcoholism in this occupation.

Nephritis (acute and chronic).—The standardized relative index is 92. The proportionate mortality points to average or slightly higher than average death rates from this cause.

Accidental or undefined violence.—The ratios for accidental violence reflect the characteristic hazard of teamsters and drivers. The standardized relative index is 124, which may be compared with an index of 146 for the kindred occupation, chauffeurs. The relative

indexes are quite high in every age period, the highest indexes being recorded at the older ages. The nervous and physical exactions of this pursuit are apparently best met by younger men. Occupational accidents account for almost one-half of all accidental deaths. Automobiles are responsible for more than the average number of deaths, the relative index for all ages 15 years and over being 132. Injuries by vehicles other than automobiles also cause a large proportion of the accidental deaths, 151 out of 490 fatal accidents being thus classified. The high ratios for accidental violence are confirmed by the combined insurance company experience reported in the medico-actuarial investigation of 1913. In this report the deaths from accidents among teamsters are 50 per cent greater than the standard.

Homicide (all forms).—Homicide is above the average in only the first age period, 15 to 24 years, when the relative index is 217. This compares with a ratio of 256 for chauffeurs. After this age the percentages for teamsters are below average, while chauffeurs show a very high ratio (200) in the next age period, 25 to 34 years.

Textile Mill Workers ³⁴

PERRY, IN his exhaustive study of cotton-mill workers of Fall River from 1908 to 1912 (23), found a higher death rate for male cotton-mill operatives than for nonoperatives, ages 15 to 44 years. In the medico-actuarial investigation (4), cotton-factory operatives and woolen-mill operatives had ratios of actual to expected deaths of 108 and 113 per cent, respectively. The most recent American figures are for the intercompany group insurance mortality experience covering the years 1922 to 1926 (9). In this study textile industries (excluding hemp, jute, rope, and cordage, and bleaching, dyeing, printing, and finishing) showed a ratio of actual to expected deaths of 87.4 per cent as compared with 90.2 per cent for all industries combined. The report of the Registrar General of England and Wales, 1921 to 1923 (5), records that among 16 titles of occupations in the textile industry all but three showed total mortality rates above the average for all occupied and retired males.

In view of the high total death rate in our industrial department, it is very probable that the death rate for insured textile workers is not above the average for all occupations.

In the present investigation the highest relative indexes are found for cerebral hemorrhage (127), influenza (119), tuberculosis of the respiratory system (116), and nephritis (112). English textile workers showed consistently high death rates for all degenerative diseases. Only 7 of the 16 titles, however, showed above average death rates for tuberculosis.

³⁴Includes operatives in cotton, silk, wool, and linen mills (card-room workers, spinners, weavers, pickers, ballers, beamers, braker hands, combers, creelers, doffers, quillers, reelers, shearers, spoolers, warpers, winders, knitters, darners, lacers, loopers, ribbers, seamers, clippers, passementerie workers, flax dressers, stretchers, throwsters, burliers, nappers, and skeiners), and all operatives in carpet, sail, awning, tent, thread, mat, veil, sack, shoddy, stocking, and other minor textile industries. (Excludes cordage, hemp, and dyeing and finishing mill workers.) The average age at death is 49.8 years. (See note, p. 19.)

TABLE 40.—Number and per cent of deaths from specified causes among white male textile mill workers (except cordage, hemp, dyeing, and finishing), by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—					Standardized relative index ¹	
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64		65 and over
Number of deaths.....	3,512		414	378	424	611	896	789	
Typhoid fever.....	42	1.2	6.0	2.1	1.2	0.7			
Influenza, pneumonia.....	316	9.0	8.7	10.6	9.2	9.7	8.5	8.4	
Influenza.....	79	2.2	3.1	2.9	3.1	2.1	1.7	1.8	119
Pneumonia (all forms).....	237	6.7	5.6	7.7	6.1	7.5	6.8	6.6	85
Other diseases of the respiratory system.....	48	1.4	1.4	.8	1.2	.8	1.6	1.9	83
Tuberculosis of the respiratory system.....	517	14.7	29.5	31.7	26.2	14.9	6.1	2.3	116
Syphilis, tabes dorsalis, and general paralysis of insane.....	44	1.3		1.1	3.5	2.5	.9	.3	63
Cancer (all forms).....	293	8.3	1.0	1.6	4.2	9.8	13.2	11.0	100
Rheumatism (acute and chronic).....	5	.1	.2		.2	.3			
Diabetes.....	43	1.2	.2	1.9	1.4	1.6	1.2	1.0	91
Alcoholism.....	24	.7		.3	1.9	1.3	.6	.3	
Cirrhosis of the liver.....	29	.8	.2		.2	.8	1.7	.9	
Cerebral hemorrhage, apoplexy, paralysis.....	318	9.1	.7	1.9	3.1	9.7	12.1	16.2	127
Other diseases of the heart.....	489	13.9	3.6	5.3	7.1	11.6	18.6	23.6	82
Arteriosclerosis.....	55	1.6				1.0	1.3	4.7	
Nephritis (acute and chronic).....	349	9.9	1.9	5.0	7.1	10.5	13.3	13.8	112
Suicide (all forms).....	53	1.5	1.0	1.6	2.6	2.9	1.0	.6	
Accidental or undefined violence.....	286	8.1	22.7	12.4	8.0	7.0	5.4	2.5	81
Occupational accidents.....	30	.9	1.4	1.1	2.1	.8	.3	.4	
Traumatism by machines.....	20	.6	1.4	.8	1.4	.3	.1	.3	
Homicide (all forms).....	20	.6	2.4	1.1	.7	.3	.1		
All other causes.....	581	16.5	20.3	22.8	22.2	14.6	14.5	12.4	
Total.....	3,512	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths.....	34	1.0	1.4	1.1	2.4	1.1	.4	.4	
Nonoccupational deaths.....	3,478	99.0	98.6	98.9	97.6	98.9	99.6	99.6	

¹ See page 18 for explanation of standardized relative index.

Typhoid fever.—The proportionate mortality from typhoid fever is extremely high at every age period. The relative indexes are all over 200 up to age 54, after which no deaths occurred. Although the percentages of deaths from this cause among textile workers are lower than in 1911–1913, the relative indexes are much larger because the decline of typhoid among all occupied males probably has been greater than that among textile mill workers. The high ratios in this occupation are probably due to poor sanitary supervision of the small mill towns in which the industry is established. A geographical analysis of this group according to States indicates that the ratios are very much higher in southern than in northern mills.

Respiratory diseases.—As a group, respiratory diseases are not responsible for an inordinate number of deaths in this occupation. Influenza, however, exhibits percentages which are about 25 per cent in excess of the average in every age period up to age 54. The standardized relative index is 119. The ratios for pneumonia and other respiratory diseases are consistently low, the standardized relative indexes being 85 and 83, respectively.

Tuberculosis of the respiratory system.—The proportionate mortality for tuberculosis is high. The standardized relative index is 116. The highest relative index (126) is in the age period 35 to 44 years. Although the percentages are less than in 1911–1913 they are still above those of all occupied males. In the English report for 1921–1923, 7 of the 16 occupational titles showed death rates from tu-

berculosis above the average. Very high death rates, however, were recorded for only three titles. One class, namely, wool and worsted, card, comb or frame (not spinning frame) tenters, showed a rate 59 per cent above average. The introduction of the latest types of ventilators and humidifiers should greatly improve atmospheric conditions in textile mills and thus effect a material improvement in the mortality from tuberculosis among these workers.

Cancer (all forms).—The percentages of deaths for cancer are about average. The standardized relative index is 100. The relative indexes are higher, however, than in 1911–1913. It appears therefore that the cancer rate among textile workers has increased to a greater extent than among all occupied males. It would be interesting to obtain figures for particular occupations in this industry, but unfortunately the occupation code does not permit this. In England, an excessive incidence of cutaneous cancer of the scrotum has been observed among mule spinners. The skin area particularly involved is the left side of the scrotum. The condition is found only rarely in this country.

Diabetes.—As in our earlier study, the relative index for diabetes is higher at most age periods than that for all occupied males. The highest relative index (158) is in the age period 25 to 34. The standardized relative index, however, is 91.

Cerebral hemorrhage, apoplexy, paralysis.—The standardized relative index is 127. This figure is higher than that for any other important cause of death among textile workers. High ratios are found in every age period. In 1911–1913, however, the proportionate mortality was appreciably higher than average only in the age period 45 to 54. Textile workers, therefore, have apparently not experienced as great a decline in the death rate from this cause as workers generally. Except for a large proportion of deaths from nephritis, the usual conditions associated with high rates from cerebral hemorrhage are absent. Syphilis and alcoholism are also not very common and heavy labor or overstrain can be ruled out as causative factors. The English figures are remarkable in that they show high death rates not only from cerebral hemorrhage and nephritis but from all the degenerative diseases, including heart disease and arteriosclerosis, which are, with few exceptions, higher than average in the 16 occupations of the textile industry analyzed in the report of the Registrar General. It is concluded in that report that conditions of work in textile mills apparently promote degenerative changes of the kidneys, heart, and blood vessels. As has already been pointed out, our latest figures for American textile-mill workers agree with the English findings only as far as cerebral hemorrhage and nephritis are concerned. The specific industrial conditions conducive to degenerative changes are obscure. Perhaps the hot and humid atmosphere surrounding some of the processes in textile mills is an etiological factor.

Other diseases of the heart.—The percentages for heart disease compare favorably with the average. The standardized relative index is 82. The variations from the ratios of 1911–1913 are not significant. English textile workers, however, showed high death rates for heart diseases.

Nephritis (acute and chronic).—The standardized relative index for nephritis is 112. After age 24, nephritis shows percentages which are somewhat higher than among all occupied males. The highest relative index (121) appears in the age period 55 to 64. In England and Wales both cotton and woolen mill operatives show much higher death rates from chronic nephritis than do all occupied and retired males.

Accidental or undefined violence.—The percentages for accidental or undefined violence are much smaller than average. The standardized relative index is 81. Occupational accidents are few.

Watchmen and Guards³⁵

THE HIGH average age at death (60.5 years) of watchmen and guards is their characteristic feature. The occupation is frequently a terminal one which is often undertaken after the worker has been more or less disabled and is therefore unable to carry on his regular occupation. Up to age 44 the deaths are so few that the ratios are inconclusive for specific causes of death. Then again, more than one-third of the deaths occurred in the indefinite age period 65 years and over, which makes it very difficult to evaluate our mortality figures.

TABLE 41.—Number and per cent of deaths from specified causes among white male watchmen and guards, by age periods, 1922 to 1924

Cause of death	Ages 15 years and over		Per cent of deaths during age period—					Standardized relative index	
	Number	Per cent	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64		65 and over
Number of deaths.....	3,132		14	47	156	500	1,205	1,210	
Typhoid fever.....	2	0.1			0.6	0.2			
Influenza, pneumonia.....	255	8.1	7.1	4.3	6.4	9.0	8.9	7.4	
Influenza.....	43	1.4		2.1	1.3	1.2	1.5	1.3	62
Pneumonia (all forms).....	212	6.8	7.1	2.1	5.1	7.8	7.4	6.1	78
Other diseases of the respiratory system.....	52	1.7			4.5	1.2	1.0	2.2	96
Tuberculosis of the respiratory system.....	212	6.8		29.8	23.7	11.6	5.9	2.6	81
Syphilis, tabes dorsalis, and general paralysis of insane.....	58	1.9		6.4	5.8	2.2	1.6	1.3	114
Cancer (all forms).....	344	11.0		2.1	5.1	12.4	12.2	10.4	105
Rheumatism (acute and chronic).....	8	.3		2.1		.2	.2	.3	
Diabetes.....	62	2.0		4.3	.6	1.8	2.1	2.1	125
Alcoholism.....	9	.3		6.4	2.6	.2		.1	
Cirrhosis of the liver.....	37	1.2			.6	2.2	1.3	.7	
Cerebral hemorrhage, apoplexy, paralysis.....	374	11.9			3.2	7.6	11.5	15.9	108
Other diseases of the heart.....	646	20.6		8.5	14.1	16.8	21.1	23.3	106
Arteriosclerosis.....	67	2.1				1.8	1.8	3.0	
Nephritis (acute and chronic).....	379	12.1		6.4	9.6	9.8	11.8	14.0	109
Suicide (all forms).....	48	1.5		4.3	3.2	2.0	1.5	1.1	
Accidental or undefined violence.....	216	6.9	71.4	14.9	5.8	7.8	7.4	5.1	145
Occupational accidents.....	50	1.6	14.3	6.4	2.6	1.8	1.7	.9	
Traumatism by fall.....	34	1.1	7.1			.6	1.4	1.1	
Homicide (all forms).....	23	.7	14.3	4.3	2.6	.4	.7	.3	
Occupational homicides.....	13	.4		2.1	1.3	.4	.4	.2	
All other causes.....	340	10.9	7.1	6.4	11.5	12.8	11.0	10.0	
Total.....	3,132	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Occupational deaths.....	70	2.2	14.3	8.5	4.5	2.4	2.3	1.4	
Nonoccupational deaths.....	3,062	97.8	85.7	91.5	95.5	97.6	97.7	98.6	

* See page 18 for explanation of standardized relative index.

³⁵ Includes building, bank, and asylum guards and watchmen. The average age at death is 60.5 years. (See note, p. 19.)

The outstanding feature of the mortality record is the high frequency of homicidal deaths, more than one-half of which were of occupational origin. Although the actual number of deaths from this cause is small, the relative indexes are consistently very high. For all ages combined the relative index is 213. Only in the age period 45 to 54, where the relative index is 67, is the proportion of deaths less than among all occupied males. The degenerative diseases have slightly higher than average percentages. The standardized relative indexes for cerebral hemorrhage, other diseases of the heart, and nephritis are, respectively, 108, 106, and 109. Diabetes is more common than among all occupied males, the standardized relative index being 125. The respiratory diseases are comparatively infrequent causes of death. Accidental violence has a standardized relative index of 145. The highest relative index (288) occurs in the age period 15 to 24; but this figure is probably a chance variation, the number of deaths for all causes combined in this age period being only 14. Occupational accidents account for 23 per cent of all accidental deaths.

CHAPTER 3

Principal Causes of Death

IN SEVERAL places in the preceding chapters we have referred briefly to each of the principal causes of death in relation to occupation; in this chapter we shall bring this scattered material together for convenient reference and special analysis. Under each cause of death the occupations will be listed in order according to their proportionate mortality as that is shown by their standardized relative indexes. We note as we proceed with such a classification, that occupations having a similar exposure to specific health hazards frequently fall into small groups, thus suggesting that there is a definite cause and effect relationship between a particular industrial hazard and a particular cause of death.

In the preceding chapter, we have limited our reference to the mortality records of 33 occupations. This was because the small number of deaths in the remaining occupations did not warrant detailed analysis. In this chapter we have included the full list of 72 occupations in relation to the most important causes of death, namely, pneumonia, tuberculosis of the respiratory system, diseases of the heart, nephritis, and accidents. This additional material has given us a larger number of occupations exposed to specific health hazards and should enhance the value of our analysis. Except where otherwise indicated, only occupied white male industrial policyholders 15 years of age or over are included.

No standardized relative indexes were calculated for the numerically less important causes of death. Since the proportionate mortality ratios for different occupations vary considerably when classified by age periods, no accurate listing of occupations in order of mortality is practicable. Only those occupations have been selected for discussion, therefore, which showed high ratios for a given cause of death in at least three age periods.

Typhoid Fever

IN RECENT years typhoid fever has been a minor cause of death. It was responsible for only 597 deaths among our white male industrial policyholders 15 years and older during the years 1922-1924. The average age at death, 28.9 years, compares with 31.1 years in our earlier study of 1911-1913. Table 42 presents death rates per 100,000 for the year 1923 and the per cent of decline in the death rate since 1912, classified according to age periods.

TABLE 42.—*Death rates in 1923 and per cent of decline in death rate from typhoid fever between 1912 and 1923*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Death rate per 100,000 in 1923.....	6.2	9.7	5.0	3.9	4.0	4.9	1.7
Per cent of decline in death rate, 1912 to 1923.....	72.2	60.1	81.3	80.7	78.7	70.5	79.8

The death rate among white male wage earners 15 years and older in 1923 was 6.2 per 100,000, representing a decline of 72.2 per cent since 1912—a greater relative decline than was registered for any other cause of death. This great decline in the typhoid fever death rate stands out as a prominent achievement in the practical application of public-health knowledge to modern life and industry. The highest death rate is found in the ages 15 to 24 years, where it is 9.7 per 100,000. In 1912 the highest rate, 26.8 per 100,000, appeared in the age period 25 to 34. Marked decreases in the death rate are recorded in every age period. The greatest decline (81.3 per cent) took place in the age period 25 to 34 years.

The importance of typhoid fever in relation to other causes of death is shown in Table 43, which gives according to age periods the per cent of deaths from typhoid fever in the years 1922–1924 and in 1911–1913.

TABLE 43.—Per cent of deaths from typhoid fever, 1922–1924 and 1911–1913

Item	Ages 15 and over	Age period (years)					
		15–24	25–34	35–44	45–54	55–64	65 and over
Per cent of total deaths, 1922 to 1924.....	0.6	2.6	1.0	0.5	0.3	0.1	0.0
Per cent of total deaths, 1911 to 1913.....	1.5	5.2	2.7	1.4	.8	.4	.2

Typhoid fever is of less importance in relation to other causes than it was in our earlier study, being responsible for 0.6 per cent of all deaths in 1922 to 1924, as compared with 1.5 per cent in the period 1911–1913. This situation has developed out of the fact that the death rate for typhoid fever has declined much more than has the death rate from all causes combined between the two periods under discussion. The disease is of the greatest importance in the age period 15 to 24 years, when it accounted for 2.6 per cent of all deaths. This is also the age period in which the highest death rate occurs.

The incidence of typhoid fever bears a direct relationship to the sanitation of the community. Hence, its prevalence in particular occupations is chiefly dependent on the location of the industry. Thus high ratios are recorded among farmers and farm laborers, since sanitation in rural communities is undoubtedly less highly advanced than in cities. Textile mill workers, likewise, probably owe their high incidence of typhoid fever to the location of many plants in semirural southern communities. Men employed in seafaring occupations also show high ratios. Here again the facilities for sanitation are often limited and there is great room for improvement. Furthermore, these men are frequently exposed to typhoid in foreign ports where it is prevalent. The higher ratios among coal miners are clearly due to the difficulties in maintaining adequate sewage disposal in the mines as well as to poor sanitization of the small, semirural mining towns. Stationary engineers and firemen show higher-than-average ratios, perhaps because many of them are in

construction camps, mines, quarries, etc., where sanitary provisions are temporary and crude. High ratios were found also for iron and steel mill workers.

Among the occupations with especially low ratios for typhoid fever are longshoremen and stevedores, watchmen and guards, railway enginemen and trainmen, and policemen. Saloonkeepers and bartenders, among whom there were 457 deaths from all causes, had none from typhoid fever.

Influenza

THERE were 2,083 deaths from influenza among our white male industrial policyholders 15 years of age and older during the years 1922-1924. The average age at death was 46.9 years. In 1911-1913 the average age at death was 53.3 years. Table 44 presents death rates per 100,000 for the year 1923, together with the per cent of increase in the death rate since 1912, classified by age periods.

TABLE 44.—Death rates in 1923 and per cent of increase in death rate from influenza between 1912 and 1923

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Death rate per 100,000 in 1923.....	31.4	11.3	15.9	29.3	43.0	82.5	180.9
Per cent of increase in death rate, 1912 to 1923.....	157.4	222.9	341.7	306.9	144.3	116.0	101.0

The death rate among white male wage earners, ages 15 years and older, in 1923 was 31.4 per 100,000. The lowest rate, 11.3 per 100,000, is found in the age period 15 to 24. The rate increases with age up to 82.5 in the age period 55 to 64 years. The death rate in 1923 was 157.4 per cent greater than in 1912, the greatest increase being recorded in the age period 25 to 34 where the rate in 1923 was almost four and one-half times that of 1912. We can not draw conclusions, however, as to the trend of this disease by a comparison of the rates for two single years as there are wide fluctuations in the death rate from influenza from year to year. Furthermore, the year 1923 was one in which influenza was extraordinarily prevalent.

The importance of influenza in relation to all other causes of death is shown in Table 45, which gives the per cent of deaths from influenza in the years 1922-1924 and 1911-1913.

TABLE 45.—Per cent of deaths from influenza, 1922-1924 and 1911-1913

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Per cent of total deaths, 1922 to 1924.....	2.0	2.4	2.3	2.4	1.7	1.8	1.8
Per cent of total deaths, 1911 to 1913.....	.8	.6	.5	.6	.7	1.0	1.3

Influenza was responsible for 2 per cent of the deaths in 1922-1924 and of 0.8 per cent of the deaths in 1911-1913. In the earlier period it was of greatest relative importance at the older ages; but in 1922-1924 it reached its greatest importance among the younger workers.

The highest proportion of deaths from influenza was found for coal miners (underground). The occupations following in order of incidence were iron-foundry workers, furniture and other woodworkers, cigar makers and tobacco workers, and iron and steel mill workers. Farmers and farm laborers are high up on the list with an index of 121. The very high standardized relative index for coal miners (188) and for iron-foundry workers (182) point unmistakably to the influence of occupational exposure.

As we should expect, there is a close correlation in the occupational incidence of influenza and pneumonia. We have computed the coefficient of correlation of the standardized relative indexes for influenza and pneumonia to be 0.499 ± 0.088 . There is also a close agreement in the incidence of other respiratory diseases and influenza and pneumonia, although several exceptions may be found, largely the result of the small number of deaths in many occupations for influenza and other diseases of the respiratory system. Coal miners, iron-foundry workers, and iron and steel mill workers are among the five occupations showing the highest ratios from each of these three diseases. Since pneumonia is the most important respiratory disease, its standardized relative index is the most reliable index of the cause and effect relationship between occupational hazard and diseases of the respiratory system. The detailed discussion of the respiratory diseases as a group has therefore been given in the section on pneumonia.

TABLE 46.—Occupations in order of standardized relative indexes for influenza, 1922 to 1924

Occupation	Standardized relative index, ages 15 to 64	Occupation	Standardized relative index, ages 15 to 64
Coal miners (underground).....	187.9	Stationary engineers and firemen.....	95.3
Iron-foundry workers.....	181.6	Electricians.....	91.4
Furniture and other wood workers.....	123.7	Masons and bricklayers.....	87.7
Cigar makers and tobacco workers.....	123.5	Store clerks and salesmen.....	86.8
Iron and steel mill workers.....	122.8	Merchants and storekeepers.....	81.6
Farmers and farm laborers.....	120.7	Shoe-factory workers.....	78.4
Textile (except cordage, hemp, dyeing, and finishing) mill workers.....	119.2	Tailors and other clothing workers.....	78.4
Railway track and yard workers.....	118.1	Compositors, printers, and pressmen.....	77.4
Machinists.....	111.9	Railway engineers and trainmen.....	75.4
Carpenters.....	110.8	Fishermen, oystermen, sailors, and marine workers.....	64.4
Laborers.....	108.9	Chauffeurs.....	62.6
Blacksmiths.....	105.0	Watchmen and guards.....	62.4
Plumbers, gas fitters, and steam fitters.....	102.9	Bakers.....	59.9
All occupations (excluding retired).....	100.0	Saloon keepers and bartenders.....	56.0
Clerks, bookkeepers, and office assistants.....	99.1	Policemen.....	55.1
Teamsters and drivers.....	96.6	Painters, paper hangers, and varnishers.....	54.1
Janitors and building employees.....	95.6	Longshoremen and stevedores.....	31.5

Pneumonia (All Forms)

THERE WERE 8,138 deaths from pneumonia among our white male industrial policyholders 15 years of age and older during the years 1922-1924. The average age at death was 48.7 years. Table 47 presents death rates per 100,000 for the year 1923 and the percentage decline in the death rate since 1912, classified according to age periods.

TABLE 47.—*Death rates in 1923 and per cent of decline in death rate from pneumonia (all forms) between 1912 and 1923*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Death rate per 100,000 in 1923.....	92.5	21.3	45.3	88.2	148.4	269.8	515.9
Per cent of decline in death rate, 1912 to 1923.....	26.2	13.4	42.4	35.2	26.4	18.0	18.4

The death rate among white male wage earners, ages 15 years and older, in 1923 was 92.5 per 100,000. The lowest rate, 21.3, is found in the age period 15 to 24. The rate increases sharply with age and reaches 269.8 in the age period 55 to 64. There was a decline of 26.2 per cent in the death rate for all ages since 1912. Substantial decreases are recorded in every age period. The greatest decline (42.4 per cent) took place in the age period 25 to 34 years.

The importance of pneumonia in relation to other causes of death is shown in Table 48, which gives the per cent of deaths from pneumonia (all forms) in the years 1922-1924. (Comparable figures for 1911-1913 are not available.)

TABLE 48.—*Per cent of deaths from pneumonia (all forms), 1922-1924*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Per cent of total deaths, 1922 to 1924.....	7.7	6.4	7.7	9.3	8.3	7.9	6.6

Pneumonia was responsible for 7.7 per cent of all the deaths in 1922-1924. It is of the greatest relative importance in the age period 35 to 44 years, when it accounted for 9.3 per cent of all the deaths.

Fatigue due to strenuous labor, inhalation of irritating gases and dusts, heat accompanied by sudden variations of temperature and exposure to inclement weather, together with wetting and chilling, all appear to be factors which make the worker highly susceptible to the organisms producing pneumonia. The wide variations in the proportionate mortality of pneumonia among the different occupations leave no doubt that industry is a causative factor in the in-

cidence of this disease. The five occupations with the highest standardized relative indexes were iron-foundry workers with 220, cordage and hemp mill workers with 184, polishers (iron and steel products) with 183, coal miners (underground) with 150, iron and steel mill workers with 142. The following occupations, in addition to the first five, have standardized relative indexes for pneumonia more than 20 per cent above the average: Rubber-factory workers (135), hucksters and peddlers (132), roofers (131), longshoremen and stevedores (130), brick, tile, and terra cotta workers (127), boiler makers (124), glass workers (121). It is interesting to note that among the occupations with the very highest ratios for pneumonia, influenza, and other diseases of the respiratory system are found coal miners (underground), iron-foundry workers, and iron and steel workers. It is quite certain, therefore, that the industrial environment in these occupations contributes largely to the contraction of infections of the respiratory system. Laborers also have high indexes for these three diseases, while blacksmiths and furniture and other wood workers have high indexes for influenza and pneumonia.

TABLE 49.—Occupations in order of standardized relative indexes for pneumonia (all forms), 1922 to 1924

Occupation	Standardized relative index, ages 15 to 64	Occupation	Standardized relative index, ages 15 to 64
Iron-foundry workers	220.1	Barbers and hairdressers	96.1
Cordage and hemp mill workers	184.4	Janitors and building employees	95.3
Polishers (iron and steel products)	183.2	Waiters and hotel servants	94.4
Coal miners (underground)	150.2	Electricians	94.3
Iron and steel mill workers	141.9	Compositors, printers, and pressmen	92.4
Rubber-factory workers	134.8	Railway track and yard workers	91.9
Hucksters and peddlers	132.1	Pottery workers	91.2
Roofers	130.9	Chauffeurs	91.0
Longshoremen and stevedores	130.4	Cooks (hotel and restaurant)	90.8
Brick, tile, and terra-cotta workers	127.1	Plumbers, gas fitters, and steam fitters	89.6
Boiler makers	123.6	Brass-foundry workers	89.6
Glassworkers	120.5	Hotel and restaurant keepers	89.4
Laborers	119.7	Tinners (shop) and tinware workers	89.3
Blacksmiths	119.7	Paper and pulp mill workers	88.4
Miners (underground), excluding coal miners	117.3	Sailors (Navy)	88.4
Stonecutters	117.3	Shoemakers (cobblers)	88.2
Street and sewer cleaners	115.4	Saloon keepers and bartenders	87.8
Masons and bricklayers	113.7	Farmers and farm laborers	87.3
Cement and lime workers	111.7	Textile (dyeing, bleaching, and finishing) mill workers	87.2
Oil-refinery workers	109.4	Fishermen, oystermen, sailors, and marine workers	86.4
Plasterers	108.4	Store clerks and salesmen	85.8
Policemen	107.6	Textile (except cordage, hemp, dyeing, and finishing) mill workers	84.9
Furniture and other wood workers	107.4	Carpenters	83.8
Stationary engineers and firemen	107.2	Letter carriers	83.0
Shoe-factory workers	102.9	Merchants and storekeepers	81.1
Bakers	101.9	Firemen (city department)	79.7
Teamsters and drivers	101.8	Watchmen and guards	78.3
Saw and planing mill workers	101.7	Cigar makers and tobacco workers	78.0
Chemical and explosives factory workers	101.4	Hat workers (wool and felt hats)	74.3
Painters, paper hangers, and varnishers	100.4	Agents and canvassers	72.1
Machinists	100.4	Slaughter and packing house workers	70.7
Hostlers and stablemen	100.1	Cutlers and grinders	52.9
All occupations (excluding retired)	100.0	Electric linemen	47.9
Structural-iron workers	99.2	Railway enginemen and trainmen	43.4
Laundry workers	98.8	Soldiers	28.6
Tailors and other clothing workers	97.0		
Clerks, bookkeepers, and office assistants	96.9		
Street-railway workers	96.3		

All of these findings are in agreement with earlier studies of occupational mortality, especially the previous study by the Metropolitan Life Insurance Co. of the causes of death by occupation, covering the years 1911 to 1913. They also agree very closely with the findings of the Registrar General of England and Wales, in the decennial report on occupational mortality for the years 1921 to 1923. The 10 occupations in the British study showing the highest death rates from pneumonia, in descending order, are brass-foundry laborers, grinders of cutlery, stevedores, cotton blow-room operatives, iron-foundry laborers, cotton carders, puddlers, metal polishers, "other" dock laborers, and costermongers. The most noteworthy exceptions to these general findings are the low percentages of deaths found in our study for cutlers and grinders, brass-foundry workers, and pottery workers, all of whom are exposed to the hazards which we have found associated with a high percentage of deaths from pneumonia. The number of deaths from all causes for each of these classes was small. Their low percentages may therefore be due to chance variation.

The five occupation groups showing the lowest indexes are soldiers, railway enginemen and trainmen, electric linemen, cutlers and grinders, and slaughter and packing house workers. A few sedentary occupations are also found with low indexes.

Other Diseases of the Respiratory System ¹

THERE WERE 1,614 deaths from other diseases of the respiratory system among our white male industrial policyholders 15 years of age and older during the years 1922-1924. The average age at death was 52 years. Table 50 presents death rates per 100,000 for the year 1923, and the per cent of decline in the death rate since 1912, classified according to age periods.

TABLE 50.—*Death rates in 1923 and per cent of decline in death rate from other diseases of the respiratory system between 1912 and 1923*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Death rate per 100,000 in 1923.....	18.2	3.7	5.0	12.1	31.5	56.7	139.9
Per cent of decline in death rate, 1912 to 1923.....	36.4	35.1	54.1	28.4	12.5	26.5	45.5

The death rate among white male wage earners, ages 15 years and older, in 1923 was 18.2 per 100,000. The lowest death rate, 3.7

¹ Includes the following titles of the International List of Causes of Death: 97, diseases of the nasal fosse and their annexa; 98, diseases of the larynx; 99, bronchitis; 102, pleurisy; 103, congestion and hemorrhagic infarct of the lung; 104, gangrene of the lung; 105, asthma; 106, pulmonary emphysema; 107, other diseases of the respiratory system (tuberculosis excepted).

per 100,000, is found in the ages 15 to 24 years. The rate increases with age and reaches 56.7 in the age period 55 to 64 years. Between 1912 and 1923 the rate for all ages decreased 36.4 per cent, substantial decreases being recorded in every age period. The greatest decline (54.1 per cent) occurred in the age period 25 to 34 years.

The importance of these diseases of the respiratory system in relation to other causes of death is shown in Table 51, which gives the per cent of deaths from these diseases in the years 1922-1924. (Comparable figures for 1911-1913 are not available.)

TABLE 51.—Per cent of deaths from other diseases of the respiratory system, 1922-1924

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Per cent of total deaths, 1922 to 1924.....	1.5	1.1	1.0	1.4	1.7	1.6	1.8

Other diseases of the respiratory system were responsible for 1.5 per cent of the deaths in 1922-1924. These diseases are relatively of least importance in the age period 25 to 34, when they accounted for 1 per cent of all the deaths. They are of greatest relative importance in the period 65 and over, when they accounted for 1.8 per cent.

The occupations showing the highest relative indexes for other diseases of the respiratory system are underground coal miners, janitors and building employees; iron and steel mill workers, stationary engineers and firemen, and iron-foundry workers. We have already discussed under pneumonia the occupational influences affecting the diseases of the respiratory system. The specific effect of dust on diseases included in the title "other diseases of the respiratory system" is clearly revealed in the unusually high standardized relative index (238) for underground coal miners. This finding is the result of the large number of deaths from miners' asthma assigned to this title.

TABLE 52.—Occupations in order of standardized relative indexes for other diseases of the respiratory system, 1922 to 1924

Occupation	Standardized relative index, ages 15 to 64	Occupation	Standardized relative index, ages 15 to 64
Coal miners (underground).....	237.9	Fishermen, oystermen, sailors, and marine workers.....	82.3
Janitors and building employees.....	129.6	Railway track and yard workers.....	81.4
Iron and steel mill workers.....	122.4	Compositors, printers, and pressmen.....	79.3
Stationary engineers and firemen.....	119.0	Painters, paperhangers, and varnishers.....	75.8
Iron-foundry workers.....	116.7	Chauffeurs.....	74.8
Carpenters.....	113.6	Store clerks and salesmen.....	73.8
Laborers.....	111.2	Electricians.....	72.3
Merchants and storekeepers.....	106.7	Farmers and farm laborers.....	68.5
Tailors and other clothing workers.....	104.3	Saloon keepers and bartenders.....	65.2
All occupations (excluding retired).....	100.0	Furniture and other wood workers.....	62.7
Machinists.....	98.7	Shoe-factory workers.....	62.3
Masons and bricklayers.....	98.4	Policemen.....	61.4
Watchmen and guards.....	95.7	Cigar makers and tobacco workers.....	42.6
Teamsters and drivers.....	95.0	Plumbers, gas fitters, and steam fitters.....	36.2
Bakers.....	92.5	Blacksmiths.....	34.3
Clerks, bookkeepers, and office assistants.....	90.1	Railway enginemen and trainmen.....	12.4
Longshoremen and stevedores.....	87.2		
Textile (except cordage, hemp, dyeing, and finishing) mill workers.....	82.6		

Tuberculosis of the Respiratory System

THERE WERE 14,172 deaths from tuberculosis of the respiratory system among the white male industrial policyholders, age 15 years and over, during the years 1922-1924. The average age at death was 38.2 years, as compared with 37.1 years in 1911-1913. Table 53 presents death rates per 100,000 for the year 1923, together with the per cent of decline in the death rate since 1912, classified by age periods.

TABLE 53.—Death rates in 1923 and per cent of decline in death rate from tuberculosis of the respiratory system between 1912 and 1923

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Death rate per 100,000 in 1923.....	149.7	80.2	162.5	196.1	218.5	200.0	183.4
Per cent of decline in death rate, 1912 to 1923.....	53.2	49.4	60.2	62.6	49.6	38.0	22.4

The death rate among white male wage earners age 15 years and over in 1923 was 149.7 per 100,000. The rate rose from a minimum of 80.2 per 100,000 in the age period 15 to 24 years to a maximum of 218.5 at ages 45 to 54 years and then receded to 200 in the age period 55 to 64 years. There was a decline of 53.2 per cent in the death rate for all ages between 1912 and 1923. Notable decreases were recorded at every age period, the greatest diminution being 62.6 per cent in the age group 35 to 44 years. As was to be expected, the decline in the rate has been greatest at those ages of life at which the highest death rates were registered in 1912. By all odds, the very substantial reduction in the tuberculosis death rate among male wage earners, at the time of life when family responsibilities are greatest, has been the most encouraging single feature of public health work during the decade under consideration.

The importance of tuberculosis in relation to other causes of death is shown in Table 54, which gives the per cent of deaths from this cause in the years 1922-1924 and 1911-1913.

TABLE 54.—Per cent of deaths from tuberculosis of the respiratory system, 1922-1924 and 1911-1913

Item	Ages 15 and over	Age period (years)—					
		15-24	25-34	35-44	45-54	55-64	65 and over
Per cent of total deaths, 1922 to 1924.....	13.4	23.5	29.4	20.8	13.0	6.2	2.6
Per cent of total deaths, 1911 to 1913.....	20.5	33.8	40.9	32.9	18.5	8.6	2.9

Tuberculosis was responsible for 13.4 per cent of the deaths in 1922-1924 and 20.5 per cent of the deaths in 1911-1913. This decline in relative importance has been due to the fact that the death rate for tuberculosis has decreased to a much greater extent than the total

death rate. Tuberculosis in the years 1922-1924 was the second largest cause of death among white male wage earners 15 years of age and over, whereas in 1911-1913 it was the primary cause. At the ages 25 to 34 and 35 to 44, however, it was still the largest cause of death in the later period. It was of greatest relative importance among those in the ages between 25 and 34 years.

Industrial environment has long been recognized as a most important contributory factor in the causation of tuberculosis. Abundant data, both American and foreign, substantiate this conclusion. No more convincing proof, however, is afforded of the important rôle which industry plays in the causation of tuberculosis than the striking differences in the mortality picture of males and females insured in our industrial department. Taking the figures for 1923 as illustrative, we find that between the ages of 1 and 9 the rate for males exceeds that of females by about 10 per cent. On the other hand, from ages 10 to 19 years the rate for females is about twice that for males; while in the age period 20 to 24 years the excess of female over male mortality is 28 per cent. At age 25 the situation changes, and from then on the rate for males exceeds that of females at every age up to 74 years, the maximum difference being recorded in the age period 55 to 64 years, when the male rate is about two and one-half times that of the female rate. Males are therefore at the greatest disadvantage in the working ages of life, when the number of men engaged in industry is largest; and during those years women, for the most part, are employed in the sheltered occupations of the home. The same situation is revealed when we compare the mortality from tuberculosis of male industrial policyholders with that of males in the general population. In 1923 the mortality of male policyholders up to age 19 was lower than that of males in the general population. Beginning with age 20, the rate for insured males becomes greater and remains greater up to age 74, the maximum difference being recorded in the age period 45 to 54 years. Apparently the child of the wage earner starts out in life with a better physical endowment than the child of his more prosperous neighbor, but breaks down later in life under the stress and strain of his industrial employment.

What are these industrial influences which result in the higher mortality from tuberculosis among wage earners? An examination of Table 55 reveals at once the very harmful effect of exposure to hard and sharp siliceous and other mineral and metallic dust. Miners (underground), excluding coal miners, have the highest mortality, the standardized relative index being 82 per cent above the average. Pottery workers, stonecutters, cutlers and grinders, polishers, and glassworkers are all exposed in varying degrees to this type of dust and are likewise among the occupations with the highest ratios of deaths from tuberculosis.

Valuable data might be obtained if we had a classification of occupations by type of mineral dust to which the workers are exposed. It would then be possible to estimate the relative harmfulness of each type of dust. Unfortunately the classification in use does not allow such a grouping.

That alcoholism predisposes to tuberculosis is corroborated by the relative positions of waiters and hotel servants, and saloon keepers

and bartenders. Both groups have very high indexes for tuberculosis, that of the former being 141 and the latter 114.

A number of occupations where there is exposure to organic dusts are high up on the list. Thus among those with high tuberculosis indexes are found barbers and hairdressers, furniture and other wood workers, bakers, textile-mill workers, hatters and hat workers (wool and fur felt), and cigar makers and tobacco workers. These data are in general agreement with other studies in various countries. In none of these occupations, however, do we meet with extremely high indexes such as are found where there is exposure to silica. X-ray studies of certain workers exposed for years to organic dusts showed that these men had no pulmonary changes other than those found in people living in cities. It is conceivable, therefore, that organic dust merely conveys the tubercle bacilli in large numbers to their sites of growth.

Cigar makers and tobacco workers have long been identified as occupations with an inordinate incidence of tuberculosis. In Table 55 they appear sixth in the list, with a ratio of 135. Although the cause of such excessive rates is controversial, it seems probable that a combination of influences is at work. Exposure to dust and nicotine and the general insanitary conditions of the workshops are perhaps all injurious to the health of the worker. We must not overlook the fact, however, that wages are low and that an occupation such as this is likely to attract men of poor physique and low resistance.

Cordage and hemp mill operatives include a number of workers in jute who are exposed to inorganic dust, as well as many workers exposed to purely organic dust.

Laundry workers have a standardized ratio of 134. The excessive number of deaths from tuberculosis in this occupational group can perhaps be accounted for in part by the hot and humid atmosphere of the plant. A small number of the workers are also exposed to infected materials.

A few occupations in which poisoning is a hazard are separately included in the table. Thus, brass foundry workers have a relative index of 126. Painters, paper hangers, and varnishers, and rubber factory operatives are only slightly above the average, the standardized relative indexes being only 102 and 109, respectively. Chemical and allied trades and dyeing, bleaching, and finishing of textile products have ratios that are slightly lower than the average. The correlation between exposure to poison and incidence of tuberculosis is hard to see in these figures. The conglomerate occupational groups are no doubt responsible in part for the irregularity. For an accurate estimation of the effect of industrial intoxication on the phthisis rate we should have a more detailed occupational classification. Incidentally, it is interesting to note that the lower ratio for chemical workers in this study is in agreement with the latest figure in England and Wales, where the death rate from tuberculosis among chemical workers is about 75 per cent of that of all occupied and retired males. It has frequently been suggested that these workers are protected to some extent by the inhala-

tion of gases and fumes which have an antiseptic effect. The subject merits a thorough investigation.

We now come to a group of general factory employments that display a relatively high incidence of tuberculosis, though not associated with any specific industrial hazards. This class includes tailors and other clothing workers, compositors, printers and pressmen, shoe factory operatives, cobblers, and slaughter and packing house employees. Collis and Greenwood (24) have tersely stated the possible cause of high rates in such occupations, as follows:

The rôle of the factory is, by confinement in monotonously ventilated rooms and by causing general fatigue, to reduce the resistance of the operative to those sources of infection to which he is exposed in the natural course of life, to make him react more sharply to home influences than does his wife or sister.

The high ratio for clerks, bookkeepers, and office assistants is probably explainable on the same theory. The element of selection of these occupations by men of poor physique must also be considered.

An examination of the occupations showing low ratios for tuberculosis with a view to ascertaining whether industrial conditions may exert a favorable as well as an unfavorable influence is complicated by the fact that most of these occupations are associated with the highest ratios for accidents. Coal miners, with a standardized relative index of 48, is the last occupation on the list. Much experimentation and many conjectures attempt to explain the consistently low incidence of tuberculosis among coal miners the world over. No consensus of opinion has been reached. It appears to be possible that there is something in the chemical properties of coal which exerts a protective influence against the tubercle bacillus. In the proportionate mortality ratios the low incidence of tuberculosis among coal miners is exaggerated because of the high accident rate, but the relative freedom from tuberculosis is still evident, even when allowance is made for this factor. Cement and lime workers also show a lower ratio than the average. It has been held that lime dust, like coal, has a protective action. In this study, the very high ratio for accidents accounts entirely for the low ratio from tuberculosis. The number of deaths, however, is too few to give conclusive results. Railroad workers, the skilled building trades, and a number of outdoor occupations are among the lowest on the list. In most of these occupations, likewise, the accident ratio distorts the picture. In fact, the accident ratios are so high for most of these outdoor workers that it is safe to conclude that the incidence of tuberculosis among them does not differ much from the average. Certainly no markedly favorable influence is discernible.

It is surprising to note that unlike previous mortality studies, the standardized relative index for farmers and farm laborers does not fall below the average for all occupations. In fact, the standardized relative index is actually 7 per cent above the average. It is our opinion that the actual death rate from tuberculosis among farmers and farm laborers is not higher than among our industrial males. The higher proportion of deaths from this disease, in all probability, is due to the fact that the death rate from all of the principal causes of death, including tuberculosis, is lower among farmers than among

all occupied males, but the death rate from tuberculosis is relatively not as low as that from other causes. The data available are not sufficient to decide the question. It will be seen from the table that the percentage of deaths from tuberculosis among farmers is about 4 per cent greater in 1922-1924 than in 1911-1913, while the proportion for all occupied males has declined about 34 per cent during the period. Apparently farmers and farm laborers have not participated in the general improvement in tuberculosis mortality brought about by intensive public health activities during the past decade; as a result, their former great advantage over the industrial worker has been to a large extent, if not entirely, wiped out.

In the last column of Table 55 is given the per cent of decline between the years 1911 (second six months) to 1913 and 1922 to 1924 in the crude proportion of deaths from tuberculosis for ages 15 years and over in each occupation. When the figure for a particular occupation is compared with that for all occupied males, we obtain a rough estimate of the relative change of the importance of tuberculosis in that occupation. It is gratifying to observe that nearly every occupation has shared, in some measure, in the general decline of the disease. What is more important, substantial decreases have been recorded for some of the occupations where the incidence of tuberculosis was greater than that for all occupied males. Among these are cutlers and grinders, 42.8 per cent; cigar makers and tobacco workers, 56.1 per cent; compositors, printers, and pressmen, 38.6 per cent; brass foundry workers, 44.7 per cent; and barbers and hairdressers, 41.8 per cent. The greatest decrease, 64.7 per cent, is recorded among street and sewer cleaners. A few increases have been registered, but most of these are probably not indicative of real increases in the death rate. Thus, coal miners show an apparent increase of 36.5 per cent. This is probably due to the fact that the decrease, if any, for tuberculosis has been much less proportionately than that for all other causes. The increase indicated for farmers is probably also explainable on the same grounds.

The enormous increase in the ratio for soldiers is not significant, because there was a considerable difference in the age distribution of deaths among insured soldiers in the two periods, due, in all probability, to the changed character of the Army personnel brought about by the war. In the period 1911-1913 the average age at death of insured soldiers was 45.6 years and in the period 1922-1924, 29.3 years. It should be pointed out that any group of persons about 29 years of age will show a higher crude proportion of deaths from tuberculosis than a similarly employed group about 45 years old. We can not, therefore, compare the crude proportionate mortality from tuberculosis for soldiers in the two periods. Likewise, the average age at death of sailors (Navy) was 29.3 years in the period 1911-1913 and 27.7 years in the period 1922-1924,

TABLE 55.—Occupations in order of standardized relative indexes for tuberculosis of the respiratory system, 1922 to 1924, and per cent of deaths due to tuberculosis, 1922 to 1924 and 1911 (second 6 months) to 1913

Occupation	Standardized relative index, ages 15 to 64 years, 1922 to 1924	Per cent of deaths due to tuberculosis (ages 15 years and over)		Per cent of decline between 1911 (second 6 months) to 1913 and 1922 to 1924
		1922 to 1924	1911 (second 6 months) to 1913	
Miners (underground), excluding coal miners.....	182.2	28.9	28.0	1 3.2
Pottery workers.....	176.2	26.4	29.9	11.7
Stonecutters.....	144.3	19.5	27.6	29.3
Waiters and hotel servants.....	140.7	22.1	(?)	(?)
Cutlers and grinders.....	135.4	14.7	25.7	42.8
Cigar makers and tobacco workers.....	135.1	10.4	23.7	56.1
Laundry workers.....	134.2	20.3	28.0	27.5
Compositors, printers, and pressmen.....	130.6	21.5	35.0	38.6
Brass-foundry workers.....	126.1	17.2	31.1	44.7
Barbers and hairdressers.....	125.9	15.2	26.1	41.8
Glassworkers.....	123.5	18.6	28.3	34.3
Clerks, bookkeepers, and office assistants.....	122.8	22.7	34.8	34.8
Polishers (iron and steel products).....	121.8	21.0	29.7	29.3
Shoe-factory workers.....	118.2	16.4	(?)	(?)
Tailors and other clothing workers.....	118.2	11.6	18.9	38.6
Furniture and other wood workers.....	118.1	12.8	19.9	35.7
Cordage and hemp mill workers.....	117.9	13.9	34.1	59.2
Slaughter and packing house workers.....	117.5	15.2	24.7	38.5
Shoemakers (cobblers).....	116.5	9.6	(?)	(?)
Bakers.....	116.1	14.9	17.8	16.3
Soldiers.....	116.0	35.1	13.0	1 170.0
Hat workers (wool and felt hats).....	115.9	12.8	25.4	49.6
Textile (excluding cordage, hemp, dyeing, and finishing) mill workers.....	115.9	14.7	21.2	30.7
Saloon keepers and bartenders.....	114.1	15.3	24.9	38.6
Cooks (hotel and restaurant).....	113.6	15.1	(?)	(?)
Rubber-factory workers.....	108.5	15.3	25.7	48.5
Machinists.....	107.3	17.0	24.9	31.7
Farmers and farm laborers.....	107.2	10.0	9.6	1 4.2
Street-railway workers.....	106.0	15.2	29.0	47.6
Iron-foundry workers.....	104.6	14.6	22.8	36.0
Store clerks and salesmen.....	103.9	17.5	27.8	37.1
Brick, tile, and terra-cotta workers.....	102.9	13.6	17.1	20.5
Teamsters and drivers.....	102.8	15.6	(?)	(?)
Tinners (shop) and tinware workers.....	102.4	13.1	23.3	43.8
Painters, paper hangers, and varnishers.....	101.8	12.2	21.1	42.2
Oil-refinery workers.....	100.5	16.0	22.2	27.9
Laborers.....	100.2	11.5	16.1	28.6
All occupations (excluding retired).....	100.0	13.4	20.2	33.7
Hucksters and peddlers.....	99.2	11.4	22.1	48.4
Plasterers.....	98.4	11.0	18.7	41.2
Hotel and restaurant keepers.....	98.2	11.7	(?)	(?)
Chemical and explosives factory workers.....	97.4	13.4	13.1	1 2.3
Chauffeurs.....	96.5	23.6	(?)	(?)
Textile (dyeing, bleaching, and finishing) mill workers.....	95.3	8.7	16.6	47.6
Sailors (Navy).....	95.3	24.7	18.8	1 31.4
Plumbers, gas fitters, and steam fitters.....	95.1	15.5	31.0	50.0
Agents and canvassers.....	94.5	13.3	20.8	36.1
Janitors and building employees.....	91.1	8.2	17.3	52.6
Carpenters.....	89.5	9.3	14.4	35.4
Longshoremen and stevedores.....	88.6	12.8	29.3	56.3
Masons and bricklayers.....	87.8	9.7	18.1	46.4
Railway track and yard workers.....	87.0	10.5	10.3	1 1.9
Letter carriers.....	87.0	12.6	26.3	52.1
Iron and steel mill workers.....	86.3	12.0	15.8	24.1
Electricians.....	85.9	17.9	32.6	45.1
Fishermen, oystermen, sailors, and marine workers.....	85.7	11.9	14.0	15.0
Boiler makers.....	85.3	15.0	25.9	42.1
Electric linemen.....	84.7	14.6	11.8	1 23.7
Paper and pulp mill workers.....	84.4	11.7	26.7	56.2
Cement and lime workers.....	84.2	12.7	14.9	14.8
Hostlers and stablemen.....	81.5	8.5	17.8	52.2
Sawmill and planing mill workers.....	81.1	10.0	16.5	39.4
Watchmen and guards.....	80.5	6.8	(?)	(?)
Merchants and storekeepers.....	77.1	7.7	10.9	29.4
Blacksmiths.....	75.8	7.6	13.0	41.5
Street and sewer cleaners.....	75.0	6.0	17.0	64.7
Structural-iron workers.....	74.4	11.8	20.1	41.3
Policemen.....	70.4	10.7	(?)	(?)
Firemen (city department).....	69.5	10.6	12.8	17.2
Stationary engineers and firemen.....	67.7	7.4	13.2	43.9
Roofers.....	64.7	10.6	22.1	48.0
Railway enginemen and trainmen.....	61.2	11.1	12.7	12.6
Coal miners (underground).....	47.6	7.1	5.2	1 36.5

1 Increase.

? Not available.

Cancer (All Forms)

THERE WERE 8,632 deaths from cancer among our white male industrial policyholders 15 years of age and older during the years 1922-1924. The average age at death was 57.5 years, as compared with an average age at death of 57.8 years in 1911-1913. Table 56 presents death rates per 100,000 for the year 1923, together with the percentage increase in the death rate since 1912 classified by age periods.

TABLE 56.—*Death rates in 1923 and per cent of increase in death rate from cancer (all forms) between 1912 and 1923*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Death rate per 100,000 in 1923.....	94.9	3.4	9.7	42.4	166.6	436.2	755.4
Per cent of increase in death rate, 1912 to 1923.....	22.3	36.0	47.0	6.8	15.5	30.6	29.3

The death rate among white male wage earners 15 years of age and older in 1923 was 94.9 per 100,000. Up to age 34, cancer is one of the minor causes of death; but thereafter the rate increases very rapidly with age. In the age period 55 to 64 the rate was 436.2, the second largest cause of death. Cancer is one of the few important causes of death that has increased in frequency since 1912. For all ages combined the death rate in 1923 was 22 per cent higher than in 1912. The greatest increase is recorded in the age period 25 to 34, where the rate was 47 per cent higher than in the earlier year. Part of the increase is due to the fact that the disease is more frequently diagnosed accurately than in previous years, but this does not account for the entire increase.

The importance of cancer in relation to other causes of death is shown in Table 57, which gives the per cent of deaths from cancer in the years 1922-1924 and 1911-1913.

TABLE 57.—*Per cent of deaths from cancer (all forms) in 1922-1924 and in 1911-1913*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Per cent of total deaths, 1922 to 1924.....	8.2	1.1	2.0	4.3	9.6	13.2	11.2
Per cent of total deaths, 1911 to 1913.....	4.9	.7	.8	2.3	5.9	8.7	7.3

Cancer was responsible for 8.2 per cent of the deaths in 1922-1924. It is of greatest relative importance in the age period 55 to 64 years, where it accounted for 13.2 per cent of all the deaths. Except for influenza, which was especially prevalent in 1923, cancer has shown a greater increase in relative importance since 1912 than any other disease.

No correlation of specific conditions and the incidence of cancer is apparent from the analysis of occupational mortality in our industrial department. None of the 33 occupations for which the standardized relative index was calculated shows an extremely high proportion of deaths. Carpenters show the highest index (129), followed by blacksmiths, bakers, stationary engineers and firemen, and furniture and other wood workers. Coal miners are credited with the lowest cancer index. The next lowest ratios are found among longshoremen and stevedores, fishermen and oystermen, sailors and marine workers, merchants and storekeepers, and plumbers, gas fitters, and steam fitters.

Recently the British Medical Research Council (25) made an exhaustive investigation of cancer mortality according to site of cancer and occupation, based upon the occupational mortality statistics of the Registrar General of England and Wales covering the years 1910 to 1912 (5). The conclusions of the council in part were as follows:

When we come to summarize briefly the results of the present investigation, it must be acknowledged that, though confirmatory evidence has been obtained of some views already more or less generally accepted as to the close association of some types of cancer with exposure to particular risks incurred in certain forms of employment, e g., chimney-sweepers' cancer and mule-spinners' cancer, evidence in support of such a connection between the nature of the employment and other forms of cancer, especially those localized internally, can not be regarded as more than suggestive.

The results of the analysis of the occupational mortality of industrial policyholders as shown in Table 58 are entirely consistent with this opinion.

TABLE 58.—Occupations in order of standardized relative indexes for cancer (all forms), 1922-1924

Occupation	Standardized relative index, ages 15 to 64	Occupation	Standardized relative index, ages 15 to 64
Carpenters.....	129.3	Compositors, printers and pressmen.....	100.7
Blacksmiths.....	127.4	All occupations (excluding retired).....	100.0
Bakers.....	125.6	Textile (except cordage, hemp, dyeing, and finishing) mill workers.....	99.5
Stationary engineers and firemen.....	124.4	Laborers.....	97.8
Furniture and other wood workers.....	122.2	Railway enginemen and trainmen.....	97.1
Cigar makers and tobacco workers.....	118.2	Janitors and building employees.....	96.3
Electricians.....	115.5	Shoe-factory workers.....	95.7
Tailors and other clothing workers.....	112.6	Store clerks and salesmen.....	95.4
Chauffeurs.....	112.1	Machinists.....	94.5
Masons and bricklayers.....	110.9	Painters, paper hangers, and varnishers.....	93.3
Iron and steel mill workers.....	106.5	Iron-foundry workers.....	92.8
Watchmen and guards.....	104.9	Plumbers, gas fitters, and steam fitters.....	92.6
Policemen.....	103.6	Merchants and storekeepers.....	91.7
Clerks, bookkeepers, and office assistants.....	101.7	Fishermen, oystermen, sailors, and marine workers.....	88.6
Teamsters and drivers.....	101.4	Longshoremen and stevedores.....	88.4
Railway track and yard workers.....	101.2	Coal miners (underground).....	65.7
Farmers and farm laborers.....	101.2		
Saloon keepers and bartenders.....	100.9		

Diabetes

THERE WERE 1,529 deaths from diabetes among our white male industrial policyholders 15 years of age and older during the years 1922-1924. The average age at death was 51.6 years. In 1911-1913 the average age at death was 49.7 years. Table 59 presents death

rates per 100,000 for the year 1923 together with the percentage change in the death rate since 1912, classified by age periods.

TABLE 59.—*Death rates in 1923 and per cent of increase or decrease in death rate from diabetes between 1912 and 1923*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Death rate per 100,000 in 1923.....	17.8	4.1	6.6	8.3	26.0	72.4	115.6
Per cent of increase or decrease in death rate, 1912 to 1923.....	+12.7	-6.8	-14.3	-5.7	+2.8	+60.9	+10.8

The death rate among white male wage earners, ages 15 years and older, in 1923, was 17.8 per 100,000. The rate is comparatively low at the younger ages, but increases to 72.4 per 100,000 in the age period 55 to 64 years. Between 1912 and 1923 the death rate from diabetes for all ages 15 years and older increased 12.7 per cent. The greatest increase (61 per cent) is recorded in the age period 55 to 64 years. Up to age 45 the rates were slightly less than in 1912.

The importance of diabetes in relation to other causes of death is shown in Table 60, which gives the per cent of deaths from diabetes in the years 1922-1924 and 1911-1913.

TABLE 60.—*Per cent of deaths from diabetes, 1922-1924 and 1911-1913*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Per cent of total deaths, 1922 to 1924.....	1.4	1.2	1.2	0.9	1.4	2.0	1.6
Per cent of total deaths, 1911 to 1913.....	1.0	1.0	.7	.7	1.0	1.3	1.0

Diabetes was responsible for 1.4 per cent of all the deaths in 1922-1924, as compared with 1 per cent in the years 1911-1913. In every age period diabetes was of greater relative importance in the later than in the earlier study. It is of greatest relative importance in the age period 55 to 64 years, where 2 per cent of the deaths were due to this disease.

Although exceptions are numerous, the listing of occupations shows a high proportion of the sedentary and inactive occupations have high ratios for diabetes, while most of the more strenuous occupations show lower than average ratios. The occupations with the highest standardized relative indexes are merchants and storekeepers, 204; tailors and other clothing workers, 185; saloon keepers and bartenders, 157; railway engine men and trainmen, 154; and electricians, 140.

Joslin (18) finds obesity to be correlated to a high degree with diabetes. It may be that obesity is more common among men in sedentary and inactive pursuits. This seems to be borne out in the case

of locomotive engineers. According to Joslin, one railroad surgeon found 20 per cent of a group of 1,673 railroad engineers to be overweight. The severe nervous strain to which they are subjected has also been suggested as a possible factor in the high diabetes rate for locomotive engineers. Among tailors and clothing workers, in addition to the sedentary character of the work, there is the racial factor. A large proportion of these workers are Jews, who are known to suffer inordinately from diabetes. Joslin (18) stresses the fact that these people as a group habitually overeat. He ascribes the high incidence to this rather than to inherent racial predisposition.

The prevalence of diabetes among sedentary workers may also be partially accounted for by the shifting of diabetics in laborious occupations to jobs requiring less strenuous exertion.

In the report of the Registrar General of England and Wales the occupations with the highest death rates from diabetes are: Glass blowers, skilled glasshouse workers, other skilled glass workers (not in glasshouse), tin and copper miners, wool sorters, cotton blow-room operatives, publicans, wool weavers, dentists, textile warehousemen, and tobacco factory operatives. The coincidence of high rates among three glass-working occupations together with the peculiar age distribution of deaths from diabetes in these occupations is accepted as possibly significant of some occupational influence. In our study of glass workers only one death from diabetes was recorded in a total of 323 deaths from all causes; whereas one could have expected about 4 or 5 deaths.

TABLE 61.—Occupations in order of standardized relative indexes for diabetes, 1922 to 1924

Occupation	Standardized relative index, ages 15 to 64 years	Occupation	Standardized relative index, ages 15 to 64 years
Merchants and storekeepers.....	203.6	Railway track and yard workers.....	97.4
Tailors and other clothing workers.....	185.3	Plumbers, gas fitters, and steam fitters.....	96.1
Saloon keepers and bartenders.....	156.7	Cigar makers and tobacco workers.....	93.8
Railway enginemen and trainmen.....	154.4	Textile (except cordage, hemp, dyeing, and finishing) mill workers.....	90.5
Electricians.....	140.2	Teamsters and drivers.....	83.5
Store clerks and salesmen.....	137.2	Furniture and other wood workers.....	81.4
Fishermen, oystermen, sailors, and marine workers.....	126.4	Farmers and farm laborers.....	77.2
Watchmen and guards.....	125.1	Blacksmiths.....	76.9
Chauffeurs.....	122.3	Longshoremen and stevedores.....	69.5
Clerks, bookkeepers, and office assistants.....	120.5	Laborers.....	67.7
Bakers.....	119.5	Janitors and building employees.....	67.6
Policemen.....	119.4	Shoe-factory workers.....	66.1
Stationary engineers and firemen.....	118.2	Painters, paper hangers, and varnishers.....	60.8
Machinists.....	107.1	Carpenters.....	58.7
Iron and steel mill workers.....	106.6	Masons and bricklayers.....	54.1
Compositors, printers, and pressmen.....	105.1	Coal miners (underground).....	50.7
All occupations (excluding retired).....	100.0	Iron-foundry workers.....	27.3

Cirrhosis of the Liver

THERE WERE 1,128 deaths from cirrhosis of the liver among our white male industrial policyholders 15 years of age and older, during the years 1922-1924. The average age at death was 55.1 years

as compared with the average age at death of 52 years in 1911-1913. Table 62 presents death rates per 100,000 for the year 1923 together with the per cent of decline in the death rate since 1912, classified by age periods.

TABLE 62.—*Death rates in 1923 and per cent of decline in death rate from cirrhosis of the liver between 1912 and 1923*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Death rate per 100,000 in 1923.....	12.5	0.4	1.8	8.6	23.2	56.3	79.6
Per cent of decline in death rate, 1912 to 1923.....	65.4	53.6	86.4	78.9	72.6	51.7	51.9

The death rate among white male wage earners 15 years of age and older in 1923 was 12.5 per 100,000. The rate was 0.4 per 100,000 in the age period 15 to 24 years and increased with age to 23.2 at the ages 45 to 54 and 56.3 in the age period 55 to 64. There was a decline of 65.4 per cent in the death rate from cirrhosis of the liver between 1912 and 1923. The decrease was greatest (86.4 per cent) at ages 25 to 34 years. In every age period the death rate declined more than 50 per cent. It is interesting to note that the death rate from cirrhosis of the liver decreased to a greater extent than that of alcoholism.

The importance of cirrhosis of the liver in relation to other causes of death is shown in Table 63, which gives the per cent of deaths from this cause in the years 1922-1924 and 1911-1913.

TABLE 63.—*Per cent of deaths from cirrhosis of the liver, 1922-1924 and 1911-1913*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Per cent of total deaths, 1922 to 1924.....	1.1	0.1	0.4	0.9	1.6	1.5	1.1
Per cent of total deaths, 1911 to 1913.....	2.3	.2	1.2	2.6	3.8	3.1	1.8

Cirrhosis of the liver was responsible for 1.1 per cent of the deaths in 1922-1924. There has been a considerable decline in its relative importance since 1911-1913. This condition was brought about by the fact that there was a greater reduction in the death rate from this cause than in the total death rate between the two periods. Hepatic cirrhosis is relatively of greatest importance at the ages between 45 and 54 years, when it accounted for 1.6 per cent of all the deaths.

Saloon keepers and bartenders showed a far higher ratio for this cause of death than any other occupation. This is in agreement with the findings of the Registrar General of England and Wales, who records that the comparative mortality figures for cirrhosis

of the liver among the liquor trades varied from over 4 to more than 11 times that of all occupied and retired males. In our study, high ratios were also found for merchants and storekeepers, iron and steel mill workers, and railway enginemen and trainmen. The lowest ratios are shown by fishermen, oystermen, sailors, and marine workers; shoe-factory workers; chauffeurs; tailors and other clothing workers; and iron-foundry workers. The Registrar General of England and Wales finds a high correlation between cirrhosis and chronic nephritis. In our study saloon keepers, merchants and storekeepers, and railway enginemen and trainmen show high percentages of deaths from both these causes. On the other hand, with the exception of saloon keepers and bartenders, there is no correspondence in our study between the occupations showing the highest ratios for cirrhosis of the liver and those showing the highest ratios for alcoholism. We should look to some other influence, perhaps occupational, for an explanation of the high ratios for railway enginemen and trainmen and merchants and storekeepers. It must be remembered also that the number of deaths from cirrhosis in each occupation is small and the percentages are therefore subject to wide fluctuations. The high ratios in these two occupations may be merely accidental.

Cerebral Hemorrhage, Apoplexy, and Paralysis

THERE WERE 7,616 deaths from these conditions among our white male industrial policyholders 15 years of age and older during the years 1922-1924. The average age at death was 60.7 years. In 1911-1913 the average age at death was 60.9 years. Table 64 presents death rates per 100,000 for the year 1923 together with the per cent of decline in the death rate since 1912, by age periods.

TABLE 64.—*Death rates in 1923 and per cent of decline in death rate from cerebral hemorrhage, apoplexy, and paralysis, between 1912 and 1923*

Item	Ages 15 and over	Age period (years)					65 and over
		15-24	25-34	35-44	45-54	55-64	
Death rate per 100,000 in 1923.....	88.1	1.4	4.8	22.4	100.9	363.0	1097.1
Per cent of decline in death rate, 1912 to 1923.....	19.5	26.3	55.1	38.6	19.0	15.0	9.4

The death rate among white male wage earners 15 years of age and older in 1923 was 88.1 per 100,000. Like the other degenerative diseases, cerebral hemorrhage is a minor cause of death at the young ages. In the age period 15 to 24 years the rate was 1.4 per 100,000. The rate rises to 100.9 in the age period 45 to 54 and to 363 in the period 55 to 64 years. There was a decline of 19.5 per cent in the death rate for all ages since 1912. A substantial decline in the death rate was recorded for every age, the greatest decline (55.1 per cent) being recorded in the age period 25 to 34 years.

The importance of cerebral hemorrhage in relation to other causes of death is shown in Table 65, which shows the per cent of deaths from this cause in 1922-1924 and in 1911-1913.

TABLE 65.—Per cent of deaths from cerebral hemorrhage, apoplexy, and paralysis, 1922-1924 and 1911-1913

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Per cent of total deaths, 1922 to 1924	7.2	6.5	1.1	2.7	5.9	10.9	14.4
Per cent of total deaths, 1911 to 1913	6.2	5	1.2	2.3	5.2	9.6	13.4

Cerebral hemorrhage was responsible for 7.2 per cent of all the deaths in 1922-1924, and for 6.2 per cent of the deaths in 1911-1913. Its greater relative importance in the later period is due to the fact that the death rate from these diseases has not declined as fast as the total death rate from all causes. The proportion of deaths in the age period 55 to 64 years (10.9 per cent) is the highest among the significant age periods.

The occupations showing the highest proportion of deaths from cerebral hemorrhage, apoplexy, and paralysis are merchants and storekeepers, blacksmiths, cigar makers and tobacco workers, textile operatives, and railway enginemen and trainmen. Painters and janitors also have high ratios for this cause of death. The lowest proportion is found among longshoremen and stevedores. Bakers, coal miners, policemen, electricians, fishermen and oystermen, etc., also show low proportions. Occupational characteristics common to the various occupations showing either high or low ratios are not apparent. The high ratios of painters perhaps reflect the effect of lead absorption. As we should expect, there is a fairly close correspondence between the occupational incidence of cerebral hemorrhage, apoplexy, and paralysis and nephritis. Nine of the 15 occupations showing higher than average ratios for cerebral hemorrhage, apoplexy, and paralysis also show higher than average ratios for nephritis.

TABLE 66.—Occupations in order of standardized relative indexes for cerebral hemorrhage, apoplexy, and paralysis, 1922 to 1924

Occupation	Standardized relative index, ages 15 to 64	Occupation	Standardized relative index, ages 15 to 64
Merchants and storekeepers	136.8	Machinists	95.9
Blacksmiths	134.3	Teamsters and drivers	95.8
Cigar makers and tobacco workers	133.8	Chauffeurs	94.6
Textile (except cordage, hemp, dyeing, and finishing) mill workers	127.2	Iron and steel mill workers	94.4
Railway enginemen and trainmen	118.1	Iron-foundry workers	93.6
Painters, paper hangers, and varnishers	109.3	Tailors and other clothing workers	93.6
Janitors and building employees	109.3	Saloon keepers and bartenders	93.5
Furniture and other wood workers	108.5	Laborers	92.3
Watchmen and guards	108.0	Carpenters	91.5
Plumbers, gas fitters, and steam fitters	107.8	Stationary engineers and firemen	86.9
Clerks, bookkeepers, and office assistants	107.5	Shoe-factory workers	84.2
Store clerks and salesmen	106.2	Fishermen, oystermen, sailors, and marine workers	83.2
Farmers and farm laborers	102.9	Electricians	79.4
Masons and bricklayers	101.0	Policemen	71.3
Railway track and yard workers	100.1	Coal miners (underground)	65.4
All occupations (excluding retired)	100.0	Bakers	52.1
Compositors, printers, and pressmen	97.6	Longshoremen and stevedores	45.5

Other Diseases of the Heart

THIS GROUP of heart diseases is responsible for more deaths than any other cause. There were 16,217 deaths from these diseases of the heart among our white male industrial policyholders 15 years of age and older during the years 1922-1924. The average age at death was 55.7. In 1911-1913 the average age at death was 55.6 years. Table 67 presents death rates per 100,000 for the year 1923 together with the per cent of change in the death rate since 1912, by age periods.

TABLE 67.—*Death rates in 1923 and per cent of increase or decrease in death rate from other diseases of the heart between 1912 and 1923*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Death rate per 100,000 in 1923.....	188.7	26.0	39.6	86.6	253.3	681.3	1854.1
Per cent of increase or decrease in death rate, 1912 to 1923.....	-7.5	-7.1	-26.4	-33.5	-3.3	+1.7	+3.7

The death rate among white male wage earners, ages 15 years and older, in 1923 was 188.7 per 100,000. In the age period 15 to 24 years the rate was 26.0. The rate increased in each successive 10-year period, reaching the high levels of 253.3 and 681.3 at the ages 45 to 54 and 55 to 64, respectively. Between the years 1912 and 1923 the death rate from heart disease decreased by 7.5 per cent. The decline is, however, understated due to the fact that there was a change in the classification of causes of death in the interim. The effect of this change was to increase the number of deaths assigned to this cause in the age period 45 to 54 years by about 17 per cent and in the period 55 to 64 years by about 5 per cent and averaging about 4 per cent for all ages 15 years and over. The greatest decline (33.5 per cent) was recorded in the age period 35 to 44 years. If the same classification code had been used in 1923 as in 1912, the rate for the age period 45 to 54 years would have shown a decline of about 20 per cent instead of 3.3 per cent and the rate for the period 55 to 64 years would have shown a decline of over 3 per cent instead of an increase of 1.7 per cent.

The importance of other diseases of the heart in relation to the other causes of death is shown in Table 68, which gives the per cent of deaths from heart disease in the years 1922-1924 and 1911-1913 by age periods.

TABLE 68.—*Per cent of deaths from other diseases of the heart, 1922-1924 and 1911-1913*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Per cent of total deaths, 1922 to 1924.....	15.4	7.6	7.0	9.2	15.2	19.7	23.8
Per cent of total deaths, 1911 to 1913.....	12.0	5.8	5.4	7.7	11.1	15.9	20.4

Other diseases of the heart were responsible for 15.4 per cent of all the deaths in the period 1922-1924. In the years 1911-1913, 12.0 per cent of all the deaths were due to heart disease. The disease has therefore become relatively more important in spite of the decrease in the actual death rate because the decline in the death rate for heart disease has not been as great as that for all causes between the two periods. The decline in the death rate from tuberculosis has been so much more rapid than that for heart disease that the latter is now the first cause of death, supplanting the former, which held that position in 1911-1913.

TABLE 69.—Occupations in order of standardized relative indexes for other diseases of the heart, 1922 to 1924

Occupation	Standardized relative index, ages 15 to 64	Occupation	Standardized relative index, ages 15 to 64
Sailors (Navy).....	180.1	Railway track and yard workers.....	92.2
Boiler makers.....	128.6	Coal miners (underground).....	92.2
Merchants and storekeepers.....	128.2	Teamsters and drivers.....	91.8
Rooters.....	123.6	Farmers and farm laborers.....	90.7
Cooks (hotel and restaurant).....	123.5	Painters, paper hangers, and varnishers.....	90.5
Tailors and other clothing workers.....	122.9	Electricians.....	89.7
Textile (dyeing, bleaching, and finishing) mill workers.....	117.5	Carpenters.....	88.0
Waiters and hotel servants.....	117.0	Furniture and other wood workers.....	87.5
Clerks, bookkeepers, and office assistants.....	115.5	Iron and steel mill workers.....	85.5
Barbers and hairdressers.....	112.1	Slaughter and packing house workers.....	85.3
Shoemakers (cobblers).....	111.4	Saloon keepers and bartenders.....	84.3
Hostlers and stablemen.....	111.3	Fishermen, oystermen, sailors, and marine workers.....	84.1
Brick, tile, and terra-cotta workers.....	110.5	Hotel and restaurant keepers.....	83.8
Hucksters and peddlers.....	110.4	Textile (except cordage, hemp, dyeing, and finishing) mill workers.....	82.1
Plasterers.....	110.1	Blacksmiths.....	82.1
Janitors and building employees.....	109.5	Iron-foundry workers.....	82.0
Store clerks and salesmen.....	109.2	Policemen.....	81.9
Agents and canvassers.....	107.1	Glassworkers.....	80.9
Timners (shop) and tinware workers.....	106.8	Cement and lime workers.....	80.8
Longshoremen and stevedores.....	106.4	Saw and planing mill workers.....	80.8
Watchmen and guards.....	106.1	Cigar makers and tobacco workers.....	80.3
Street-railway workers.....	104.6	Railway enginemen and trainmen.....	75.3
Bakers.....	104.0	Plumbers, gas fitters, and steam fitters.....	74.8
Compositors, printers, and pressmen.....	103.9	Chemical and explosives factory workers.....	73.1
Machinists.....	103.0	Stonecutters.....	73.0
Street and sewer cleaners.....	102.4	Paper and pulp mill workers.....	71.4
Chauffeurs.....	101.6	Electric linemen.....	71.0
Laundry workers.....	101.0	Firemen (city department).....	69.1
Shoe-factory workers.....	100.7	Polishers (iron and steel products).....	65.0
Rubber-factory workers.....	100.6	Oil-refinery workers.....	64.7
Letter carriers.....	100.2	Cordage and hemp mill workers.....	64.4
Brass-foundry workers.....	100.1	Hat workers (wool and felt hats).....	62.3
All occupations (excluding retired).....	100.0	Structural-iron workers.....	57.3
Pottery workers.....	97.2	Miners (underground) excluding coal miners.....	37.9
Stationary engineers and firemen.....	97.2	Soldiers.....	37.4
Masons and bricklayers.....	96.6		
Cutlers and grinders.....	95.9		
Laborers.....	94.4		

The listing of occupations according to their standardized relative indexes shows no tendency for the occupations to group according to common hazards. However, the presence of so many sedentary and inactive occupations high up in the list (for example, merchants and storekeepers, with a ratio of 128; tailors, 123; clerks, 116; barbers, 112; and shoemakers, 111) suggests that men with impaired hearts naturally selected those occupations. It is interesting to observe that with the exception of sailors in the Navy (where the total number of deaths was very small) the very highest ratio, that

for boilermakers, was only 29 per cent above the average. This in itself would indicate that industrial conditions play a less important rôle in the causation of heart disease than in other diseases. The Registrar General of England and Wales also found the range of mortality for the several occupations to be less than that for other important diseases. The Registrar General considers it highly suggestive, however, that 15 out of the 16 textile occupations suffer higher than average death rates from circulatory diseases. On the other hand, textile workers in our study show an index of only 82. Dyers and bleachers of textiles, however, show a ratio of 118. The Registrar General's figure also suggests a relationship between silica dust and heart diseases, but virtually all of the occupations offering exposure to silica dust in our study show a lower than average ratio. Here again, we must point out that the proportion of deaths for pottery workers, cutlers, grinders, iron-foundry workers, as well as coal miners and other miners, are affected by the very high death rates from other causes, notably tuberculosis, pneumonia, and accidents, and that for this reason the proportion of deaths from heart disease is low.

Nephritis (Acute and Chronic)

THERE WERE 9,414 deaths from acute and chronic nephritis among our white male industrial policyholders 15 years of age and older during the years 1922-1924. The average age at death was 55.7 years. Table 70 presents death rates per 100,000 for the year 1923, together with the percentage of decline in the death rate since 1912, by age periods.

TABLE 70.—Death rates in 1923 and per cent of decline in death rate from nephritis (acute and chronic) between 1912 and 1923

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Death rate per 100,000 in 1923.....	110.5	8.2	25.0	67.5	175.1	363.0	1056.0
Per cent of decline in death rate, 1912 to 1923.....	33.0	47.1	50.8	55.7	38.2	39.4	18.7

Nephritis was the fourth largest cause of death among white male wage earners in 1923, the death rate for ages 15 years and older being 110.5 per 100,000. In the age period 15 to 24 years the rate was 8.2 per 100,000. It increased with age to 363 in the age period 55 to 64 years. A decline of 38 per cent was recorded in the death rate for all ages since 1912. The greatest decline (55.7 per cent) was registered in the age period 35 to 44 years.

The importance of nephritis in relation to other causes of death is shown in Table 71, which gives the per cent of deaths from acute and chronic nephritis in the years 1922-1924. Comparable figures for 1911-1913 are not available.

TABLE 71.—Per cent of deaths from nephritis (acute and chronic), 1922-1924

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Per cent of total deaths, 1922 to 1924.....	8.9	2.7	4.4	6.7	9.7	11.0	13.3

Acute and chronic nephritis combined were responsible for 8.9 per cent of all the deaths in 1922-1924. Nephritis is of greatest relative importance in the older ages and in the last significant age grouping, 55 to 64 years, it is responsible for 11 per cent of the deaths.

The occupations with the highest relative indexes are soldiers (199), saloon keepers and bartenders (175), firemen (city department) (158), hotel and restaurant keepers (152), and roofers (144). Alcoholism is suggested as the possible cause of the high ratios for saloon keepers and hotel and restaurant keepers. Lead is possibly a factor in the high ratio of roofers. We note in this connection that several other trades in which there is exposure to lead poisoning have high relative indexes, notably plumbers, gas fitters, and steam fitters, painters, paper hangers, and varnishers, and perhaps also compositors, printers, and pressmen. On the other hand, the ratio for pottery workers (36) is the lowest in the list. The very high ratios for city firemen and city policemen are worthy of notice and suggest the possibility of some common occupational influence.

Death rates by occupations are in part influenced by the shifting of those impaired with the nephritides from strenuous to lighter occupations and, as in the case of heart disease, we find most of the sedentary and inactive occupations among those with high indexes.

Occupations showing the lowest ratios are pottery workers (36), cement and lime workers (48), miners (underground) excluding coal miners (54), electric linemen (58), and coal miners (underground) (68).

The complete list of occupations with their standardized relative indexes for nephritis (acute and chronic) is shown in Table 72.

TABLE 72.—Occupations in order of standardized relative indexes for nephritis (acute and chronic), 1922 to 1924

Occupation	Standardized relative index, ages 15 to 64	Occupation	Standardized relative index, ages 15 to 64
Soldiers	199.2	Cigar makers and tobacco workers	97.7
Saloon keepers and bartenders	174.8	Blacksmiths	96.2
Firemen (city department)	157.8	Polishers (iron and steel products)	96.0
Hotel and restaurant keepers	151.6	Street and sewer cleaners	95.1
Roofers	144.1	Structural-iron workers	94.1
Policemen	140.8	Iron and steel mill workers	92.8
Plumbers, gas fitters, and steam fitters	131.4	Bakers	92.5
Merchants and storekeepers	130.6	Teamsters and drivers	91.8
Barbers and hairdressers	122.4	Furniture and other wood workers	90.8
Store clerks and salesmen	121.3	Stonecutters	89.8
Janitors and building employees	120.7	Cooks (hotel and restaurant)	89.4
Compositors, printers, and pressmen	116.1	Masons and bricklayers	88.9
Stationary engineers and firemen	116.1	Chemical and explosives factory workers	88.0
Tailors and other clothing workers	115.2	Iron-foundry workers	87.8
Fishermen, oystermen, sailors, and marine workers	114.9	Railway track and yard workers	85.9
Cutlery and grinders	114.3	Carpenters	85.1
Longshoremen and stevedores	114.1	Laborers	83.0
Railway engineers and trainmen	114.0	Textile (dyeing, bleaching, and finishing) mill workers	82.7
Agents and canvassers	112.4	Cordage and hemp mill workers	80.2
Saw and planing mill workers	111.8	Laundry workers	79.6
Textile (except cordage, hemp, dyeing, and finishing) mill workers	111.8	Paper and pulp mill workers	79.2
Shoemakers (cobblers)	111.5	Electricians	78.8
Painters, paper hangers, and varnishers	111.3	Slaughter and packing house workers	77.4
Shoe-factory workers	110.9	Farmers and farm laborers	77.0
Brass-foundry workers	110.1	Rubber-factory workers	74.6
Letter carriers	109.0	Chauffeurs	73.4
Watchmen and guards	108.8	Glassworkers	73.0
Street-railway workers	108.6	Sailors (Navy)	72.9
Oil-refinery workers	106.9	Plasterers	71.7
Machinists	104.3	Waiters and hotel servants	71.2
Brick, tile, and terra-cotta workers	102.0	Hat workers (wool and felt hats)	69.5
Clerks, bookkeepers, and office assistants	102.0	Coal miners (underground)	67.8
Hucksters and peddlers	101.4	Electric linemen	58.1
Tinners (shop) and tinware workers	100.7	Miners (underground), excluding coal miners	54.0
All occupations (excluding retired)	100.0	Cement and lime workers	47.9
Hostlers and stablemen	98.5	Pottery workers	36.1
Boiler makers	98.1		

Accidental or Undefined Violence

ACCIDENTAL deaths directly attributable to industrial hazards play an important part in the total mortality of American wage earners. Various estimates place the annual number of such fatal industrial accidents among the 43,000,000 gainfully occupied persons in the United States at from 20,000 to 35,000. In 1927 almost 1,700 railroad employees were killed in occupational accidents. In the same year more than 2,200 men lost their lives in coal-mine accidents. The railroads and the mines are the heaviest contributors to the total, but all trades and professions are represented. Among white male industrial policyholders 15 years of age and older during the years 1922 to 1924 there were 10,916 deaths from accidental or undefined violence, of which about one-third were certified as of occupational origin. The average age at death from accidents of all types combined was 38.8 years, compared with 39.3 years in the period 1911-1913. Table 73 presents death rates per 100,000 for the year 1923 together with the percentage of decline in the death rate since 1912, classified by age periods.

TABLE 73.—*Death rates in 1923 and per cent of decline in death rate from accidental or undefined violence between the years 1912 and 1923*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Death rate per 100,000 in 1923.....	121.2	89.0	95.9	118.3	148.1	213.1	310.7
Per cent of decline in death rate, 1912 to 1923.....	13.8	.2	18.0	21.2	24.6	6.3	15.9

The death rate among white male wage earners, ages 15 years and over, from accidents of all types was 121.2 per 100,000. The rate rises steadily with age from 89 in the age period 15 to 24 to 310.7 in the age period 65 and over. Referring to Table 6 it is seen that automobile accidents caused the greatest number of accidental deaths, the death rate from this cause being 26 per 100,000 for all ages combined. Following in order were falls, with a rate of 16 per 100,000; drowning, with a rate of 14.4 per 100,000; and railroad accidents, with a rate of 14.1 per 100,000. Automobiles were also responsible for the greatest number of accidental deaths in every age period except the youngest and the oldest. In the age period 15 to 24 accidental drowning was of greatest importance, while in the age period 65 and over the greatest number of deaths was ascribed to falls. In these two age periods automobiles caused the second largest number of deaths. Railroad accidents were second in importance between the ages of 25 and 44 and falls were second at ages 45 to 64.

As might have been expected, the greatest proportion of deaths of occupational origin is found for accidental traumatism in mines and quarries, virtually all deaths from this cause being so classified. Other causes of death showing a high proportion of deaths of occupational origin are, in order: Machinery accidents, over 90 per cent occupational; accidental electric shock, about 80 per cent occupational; railroad accidents and burns (conflagration excepted), each about 50 per cent occupational; and deaths from falls and from conflagration, each about 40 per cent occupational.

There was a decline of 13.8 per cent in the death rate from accidents between the years 1912 and 1923. Appreciable decreases were recorded in every age period except 15 to 24 years, where the rate remained practically stationary. The greatest decline (24.6 per cent) occurred in the age period 45 to 54 years. Substantial declines in the death rate were recorded for acute poisonings, accidental drownings, accidental falls, railroad accidents, and street car accidents. On the other hand, the death rate for automobile accidents increased 465 per cent and there were likewise heavy increases in deaths from burns, machinery accidents, and the accidental absorption of deleterious gases.

The importance of accidental deaths in relation to the other causes of death is shown in Table 74, which gives the per cent of deaths from accidents or undefined violence in the years 1922-1924 and 1911-1913, classified by age periods.

TABLE 74.—*Per cent of deaths from accidental or undefined violence, 1922-1924 and 1911-1913*

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Per cent of total deaths, 1922 to 1924.....	10.4	24.8	16.6	12.2	8.6	6.2	4.0
Per cent of total deaths, 1911 to 1913.....	9.3	19.2	12.5	9.9	8.5	6.5	4.4

Accidents were responsible for 10.4 per cent of all deaths in the years 1922-1924 and 9.3 per cent in the years 1911-1913. The proportion of deaths was higher in the later period at every age from 15 to 54 years. Accidents have, therefore, become of relatively greater importance in spite of the decline in the death rate, because the death rate from this cause has not declined as fast as that for all causes combined. Accidents attain their greatest relative importance in the age period 15 to 24 years, when they account for 24.8 per cent of all the deaths and constitute the leading cause of death. In our earlier study tuberculosis was the chief cause of death in this age period, but the death rate from this cause declined markedly while the accident rate remained about the same as it had been. Between the ages of 25 and 44 years accidents are the second largest cause of death. They are of least importance at the older ages.

When the occupations are listed according to their standardized relative indexes for accidents, electric linemen are found to have the highest index (281). Over 60 per cent of the accidental deaths among these workers were caused by electric shock, while accidental falls accounted for an additional 19 per cent. The only other occupation showing a high percentage of deaths from electric shock is electricians, the seventeenth occupation on the list. Deaths from electric shock accounted for 34 per cent of the accidental deaths among these men, while falls accounted for 11 per cent. Both railroad occupations and the two mining occupations included in this study are found among the 10 highest. Railway engineers and trainmen are second on the list, with a standardized relative index of 241, while railroad track and yard workers, with an index of 177, are ninth. Railroad accidents accounted for 76 per cent of the accidental deaths among the former and 59 per cent among the latter. The third occupation on the list, coal miners (underground), has an index of 228. Other miners are eighth, with an index of 185. Traumatism in mines caused 71 per cent of the accidents among coal miners (underground) and 62 per cent of the accidental deaths among other underground miners.

The building trades are represented by a number of occupations well up on the list. Structural-iron workers, with an index of 219, are fourth, and roofers are sixth, with an index of 188. Further down the list are carpenters (129) and masons and bricklayers (123). The characteristic hazard of the building trades, accidental falls, accounts for 60 per cent of the accidental deaths among roofers, 32 per cent of the accidental deaths among masons, 31 per cent among structural-iron workers, and 24 per cent among carpenters.

City firemen are fifth on the list, with an index of 197. Approximately 37 per cent of their accidental deaths are due to conflagration. Almost as many deaths (34 per cent) were caused by vehicular accidents. The relative index for policemen (120), it is interesting to observe, is much lower than that for firemen. However, the figure for policemen excludes occupational homicides, which accounted for about 4 per cent of all deaths.

Fishermen, oystermen, sailors, etc., appear seventh on the list, with an index of 186. Of the total accidental deaths, 61 per cent were due to drowning and 10 per cent to falls. Longshoremen and stevedores, the nineteenth occupation, also showed large percentages of deaths from drowning and falls, the former accounting for 23 per cent and the latter for 22 per cent of all accidental deaths.

Chemical and explosives factory workers showed the highest index (174) of any of the manufacturing groups. Burns accounted for 14 per cent of the accidental deaths among these workers. It would be interesting to give the figure for deaths due to explosions but no provision is made in the international list for such a separation. Other manufacturing industries with high ratios are cement and lime (170), oil refineries (161), brick, tile, and terra cotta (160), saw and planing mills (144), paper and pulp mills (141). The high proportion of machinery accidents and of drownings among sawmill workers are worthy of note. The former accounted for 27 per cent of all accidents and the latter for 8 per cent. About 20 per cent of the accidental deaths among paper and pulp-mill workers were caused by machinery.

The relative index for chauffeurs is quite high (146) and may be compared with 124, the figure for teamsters and drivers. Forty-four per cent of the accidental deaths among chauffeurs were caused by automobile accidents, while only 21 per cent of the accidental deaths among teamsters were so classified. Among teamsters, accidents from other vehicles were of more importance than automobile accidents, accounting for 31 per cent of all accidental deaths.

At the other end of the list we find that among cordage and hemp mill workers no fatal accidents occurred, although a total of 77 deaths from all causes was recorded. The sedentary occupations, as one might expect, are among those with the lowest ratios. Clerks have a standardized relative index of 50 and merchants 65. The light manufacturing occupations, clothing workers and bakers, show relative indexes of 56 and 62, respectively.

The order of occupations shown in Table 75 is in very close agreement with what we should anticipate from a knowledge of the hazards in the different occupations and from the known fatal accident rate in those industries for which such figures are available. In all probability if we had the true occupational accidental death rates for each of the occupations listed some changes in the order of the occupations would occur, but there is every reason to believe that the number of such changes in position would be few.

TABLE 75.—Occupations in order of standardized relative indexes for accidental or undefined violence, 1922 to 1924

Occupation	Standardized relative index, ages 15 to 64	Occupation	Standardized relative index, ages 15 to 64
Electric linemen	281.4	Street and sewer cleaners	99.0
Railway enginemen and trainmen	240.7	Rubber-factory workers	98.9
Coal miners (underground)	228.3	Blacksmiths	95.5
Structural-iron workers	218.5	Hat workers (wool and felt hats)	94.5
Firemen (city department)	197.3	Plasterers	93.5
Roofers	188.4	Cooks (hotel and restaurant)	90.6
Fishermen, oystermen, sailors, and marine workers	185.5	Cutlery and grinders	89.7
Miners (underground), excluding coal miners	184.8	Machinists	88.7
Railway track and yard workers	177.3	Hucksters and peddlers	88.3
Chemical and explosives factory workers	173.9	Sailors (Navy)	87.7
Cement and lime workers	170.1	Iron-foundry workers	87.5
Oil-refinery workers	160.7	Street-railway workers	84.5
Brick, tile, and terra-cotta workers	159.9	Textile (except cordage, hemp, dyeing, and finishing) mill workers	81.1
Chauffeurs	145.8	Letter carriers	80.6
Watchmen and guards	145.2	Slaughter and packing house workers	80.6
Sawmill and planing mill workers	143.9	Textile (dyeing, bleaching, and finishing) mill workers	79.9
Electricians	143.4	Shoemakers (cobblers)	77.8
Paper and pulp mill workers	141.2	Furniture and other wood workers	76.7
Longshoremen and stevedores	137.3	Hotel and restaurant keepers	75.7
Carpenters	128.7	Laundry workers	75.1
Teamsters and drivers	124.2	Cigar makers and tobacco workers	72.9
Masons and bricklayers	123.3	Shoe-factory workers	72.7
Janitors and building employees	119.8	Agents and canvassers	70.2
Policemen	119.5	Waiters and hotel servants	69.8
Iron and steel mill workers	119.4	Store clerks and salesmen	66.9
Boiler makers	119.4	Compositors, printers, and pressmen	66.5
Painters, paper hangers, and varnishers	118.0	Merchants and storekeepers	65.4
Laborers	115.4	Bakers	61.6
Stationary engineers and firemen	114.4	Glassworkers	56.3
Tinners (shop) and tinware workers	114.3	Tailors and other clothing workers	55.5
Stonecutters	113.0	Brass-foundry workers	51.1
Polishers (iron and steel products)	112.6	Clerks, bookkeepers, and office assistants	50.0
Plumbers, gas fitters, and steam fitters	110.5	Barbers and hairdressers	46.6
Hostlers and stablemen	110.4	Pottery workers	40.6
Soldiers	102.9	Saloon keepers and bartenders	33.5
Farmers and farm laborers	101.8	Cordage and hemp mill workers	(¹)
All occupations (excluding retired)	100.0		

¹ No deaths recorded.

Homicide (All Forms)

THERE WERE 865 homicidal deaths among our white male industrial policyholders 15 years of age and older during the years 1922-1924. The average age at death was 34.2 years. Table 76 presents death rates per 100,000 for the year 1923 together with the percentage of change in the death rate since 1912, classified by age periods.

TABLE 76.—Death rates in 1923 and per cent of increase or decrease in death rate from homicide (all forms) between 1912 and 1923

Item	Ages 15 and over	Age period (years)					65 and over
		15-24	25-34	35-44	45-54	55-64	
Death rate per 100,000 in 1923	9.7	7.0	14.3	12.7	9.0	5.6	4.2
Per cent of increase or decrease in death rate, 1912 to 1923	+18.3	+34.6	+14.4	+39.6	-15.9	-30.0	+16.7

The death rate among white male wage earners 15 years of age and older from homicide in 1923 was 9.7 per 100,000. In the age period 15 to 24 years the rate was 7. In the next age period the maximum rate, 14.3 per 100,000, was recorded. It then declined gradually to 5.6 in the age period 55 to 64 years. The homicide rate for all ages combined in 1923 was 18.3 per cent higher than that in 1912, increases being recorded for all ages under 45 and also after age 64. The largest increase, 39.6 per cent, was registered in the age period 35 to 44 years. Between the ages 45 and 64 years, however, the rates have decreased considerably, the decline amounting to 15.9 per cent in the age period 45 to 54 and to 30 per cent in the period 55 to 64 years.

The importance of homicide in relation to other causes of death is shown in Table 77, which gives the per cent of deaths from homicide in the years 1922-1924. Comparable figures for 1911-1913 are not available.

TABLE 77.—Per cent of deaths from homicide (all forms), 1922 to 1924

Item	Ages 15 and over	Age period (years)					
		15-24	25-34	35-44	45-54	55-64	65 and over
Per cent of total deaths, 1922 to 1924.....	0.8	1.8	2.4	1.2	0.6	0.2	0.1

Homicide accounted for 0.8 per cent of all the deaths in 1922-1924. In the age period 25 to 34 years, homicidal deaths were of greatest relative importance, constituting 2.4 per cent of all the deaths at those ages.

Policemen, as might be expected, show the highest percentage of deaths due to homicide. The occupational factor in this result is self-evident. Saloon keepers and bartenders also exhibit very high ratios. Here, too, occupation is responsible, since these men are frequently exposed to brawls which often lead to homicidal assaults. Death by homicide is also relatively common among watchmen and guards, longshoremen and stevedores, merchants and storekeepers, and chauffeurs. Watchmen and guards, like policemen, are directly exposed to this hazard through actions of criminals. Merchants and storekeepers are perhaps the innocent victims of bandits who raid the retail stores. It was thought that perhaps chauffeurs were also frequently attacked by bandits but a check-up of those original records for which full information was available failed to substantiate this assumption, and showed moreover that in a majority of cases the chauffeur himself was culpably concerned. The lowest ratios are credited to composers, printers, and pressmen; shoe-factory workers; furniture and other wood workers; cigar and tobacco workers; and bookkeepers and office assistants.

Occupational Diseases

THE Metropolitan Life Insurance Co. makes a special effort to have physicians recognize the influence of occupation in assigning causes of death. The physician is asked to state in his report on the cause

of death whether the previous occupation of the deceased was in any way contributory to the death of the policyholder. Where it appears probable that the physician signing the death certificate has overlooked the question, a follow-up is made to determine this point. Our mortality statistics are intended to reveal, therefore, every death of occupational origin which the facilities of the physician enable him to recognize. And yet a careful study of the experience leaves no doubt that in spite of the special precautions to discover these diseases, by far the larger number of them remain undetected. A simple comparison will display this fact. Dr. Wade Wright (26), in *A Clinical Study of Fur Cutters and Felt Hat Workers*, reports that 43 per cent of the group were considered to be in some degree poisoned by mercury. In our own statistics of 156 deaths among felt and wool hat makers not one occupational disease had been registered. Our figures are of little value then as a measure of the extent of fatal occupational diseases in the United States. They merely serve to emphasize the fact that many wage earners die of industrial diseases which have not been recognized by the general practitioner. The figures are of some interest, however, in showing which diseases are recognized and which are most frequently reported.

In the present study 321 deaths, or 0.3 per cent of all the deaths for all ages combined, were classified as due to specific occupational diseases. In the age period 15 to 24 years the proportionate representation of occupational diseases is only 0.1 per cent. The ratio increases with age up to the period 45 to 54, where it is 0.5 per cent. In the following 10-year period it drops to 0.4 per cent. The gradually increasing incidence at the older ages may reflect the generally cumulative and chronic nature of the occupational diseases.

In Table 78 the deaths due to occupational diseases are classified:

TABLE 78.—Occupational diseases reported on death certificates as contributory or terminal causes of death, 1922 to 1924

Cause of death	Number of deaths	Cause of death	Number of deaths
Miners' asthma.....	116	Heart disease due to strain.....	12
Lead poisoning.....	72	Pneumoconiosis.....	44
Anthrax.....	3	Traumatic tuberculosis.....	4
Organic poisoning.....	4	Miscellaneous.....	13
Mineral poisoning (except lead).....	10		
Infections:		Total.....	321
Septicæmia.....	19		
Tetanus.....	18		
Others.....	6		

The great majority of these deaths were caused by pneumoconiosis (including miners' asthma) and lead poisoning. Together these two diseases were responsible for 232 of the 321 deaths. The greater number of cases of pneumoconiosis were found to have occurred among coal miners. Painters accounted for the vast majority of the deaths from lead poisoning. It is interesting to observe in this connection that the death rate from chronic lead poisoning has declined 50 per cent among male industrial policyholders 15 years

and older between 1912 and 1923. The rate in the latter year was 0.8 per 100,000. Other mineral poisons caused 10 deaths. Infections following injury caused 43 of the 321 deaths and anthrax took the lives of three workers. Twelve deaths were ascribed to sudden heart failure from overstrain. It is evident from these figures how difficult it is at the present time to estimate the incidence of occupational diseases. We can safely conclude, however, that the pneumoconioses and lead poisoning are the occupational diseases producing the greatest number of fatalities directly.

CHAPTER 4

Concluding Statement

THE conclusions to be drawn from our analysis of the mortality of white male wage earners insured in the industrial department of the Metropolitan Life Insurance Co. may be stated very briefly. In the first place, we find that within the same social class the death rates of male wage earners are uniformly higher than those of females. Their death rates also exceed those prevailing among males in the general population and among males insured under ordinary policies in the same company. Differential death rates of various age groups show that this disparity increases year by year up to about age 54. We believe this indicates that exposure to industrial hazards is cumulative in its deleterious effect. Compared with workers in nonhazardous employments, wage earners are at a disadvantage in respect to every important cause of death. The death rate from tuberculosis, age for age considered, is especially high in the industrial group and ranges from two and a half to nearly four times that of the nonindustrial population. Deaths from pneumonia and accidents are over twice as frequent; while death rates from the degenerative diseases are from two to three times as great.

Gratifying, indeed, has been the decline in the mortality of all classes during the past two decades. Improvement in vitality has characterized all the main working ages of life, and death rates have been cut down more rapidly in the group of industrial wage earners than in other classes. Individuals and organizations working to promote industrial health and safety may take pride in their efforts, which undoubtedly have served well in bringing about this improvement. But, at the same time, much intensive work remains to be done if advances are to continue.

Employing, as we have, the proportionate mortality method of analysis, we have been able to bring out sharply the wide variation that exists in the percentage distribution of the deaths from violence and the principal diseases in various occupations within the several age periods. It is reasonably clear that industrial environment tends to favor certain diseases. When occupations with high percentages for a selected cause of death are brought together, a common industrial hazard is frequently found, thus suggesting that a definite cause and effect relationship exists between a given industrial hazard and a particular cause of death. Conversely, low percentages presumably denote the absence of any specific disadvantage in the occupation. A positive association is most clearly marked in the case of accidental violence, tuberculosis, the nontuberculous respiratory diseases, alcoholism, and such a strictly occupational disease, for example, as lead poisoning. Typhoid fever is generally prevalent among workers where the water supply is questionable. In regard to cancer, heart

disease, and other degenerative diseases, however, the results do not ordinarily reveal a connection with any industrial hazard. Differences in the percentage distribution of each of these causes among the several occupations do exist; but the groupings of occupations do not lend themselves to ready interpretation.

We realize only too well the limitations of our method of analysis and the pitfalls which must be avoided in interpreting our results. We have probably fallen into many ourselves in spite of all precautions. The lack of information regarding the number of living policyholders in the different age groups is a serious handicap which precludes the possibility of computing occupational death rates. Undoubtedly such death rates would be a much more accurate measure of the hazards to life in the various occupations than we now have. Consequently, it would be highly desirable to obtain death rates classified according to age and cause of death for a much larger number of occupations than our study covered. The absence of trustworthy occupational mortality statistics in the United States hinders the work of industrial hygienists, and an investigation such as ours can only partially overcome the lack of reliable data that now exists. We can not too strongly urge, therefore, that the Federal Bureau of the Census compile and tabulate data showing the mortality of workers engaged in different occupations. The reports of the Registrar General of England and Wales give much more complete information on occupational mortality than is available in this country. Death rates are classified according to age and cause of death in five different social classes of the population. The reports, moreover, give information for each occupation within the different economic classes and denote as well the particular occupations exposed to specific hazards. They have, therefore, been invaluable in aiding the British Medical Research Council to determine the weak spots in industrial management and to inaugurate additional studies.

We should have similar studies here modeled on the same plan. If this has proved feasible in England, it should also be a possible undertaking in America. Certain inherent difficulties in securing trustworthy data make the procedure a little more complicated in the United States than in England, such as the greater mobility of labor and the shifting of men from one occupation to another. The mixture of nationalities also hinders the task of obtaining clear statements of occupational status from large groups of foreign workmen. But these obstacles can be overcome or their effect minimized. The results obtained will amply justify the time and money expended in investigating hazards of occupation. The Director of the Census is fully aware of the importance of better occupational statistics and has already taken steps to secure them. Every industrial hygiene worker, every physician, and every employer, as well as organized groups of doctors, employers, workers, and the general public should assist Census Bureau officials to gain helpful information and cooperate with them to the end that our knowledge of industrial hazards may be broadened; that the measures needed to eliminate them should be determined; and that the best program for conserving the health of workers should be put into effect.

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A complete list of the reports and bulletins issued prior to July, 1912, as well as the bulletins published since that date, will be furnished on application. Bulletins marked thus () are out of print.*

Conciliation and Arbitration (including strikes and lockouts).

- *No. 124. Conciliation and arbitration in the building trades of Greater New York. [1913.]
- *No. 133. Report of the industrial council of the British Board of Trade on its inquiry into industrial agreements. [1913.]
- No. 139. Michigan copper district strike. [1914.]
- No. 144. Industrial court of the cloak, suit, and skirt industry of New York City. [1914.]
- No. 145. Conciliation, arbitration, and sanitation in the dress and waist industry of New York City. [1914.]
- *No. 191. Collective bargaining in the anthracite-coal industry. [1916.]
- *No. 198. Collective agreements in the men's clothing industry. [1916.]
- No. 233. Operation of the industrial disputes investigation act of Canada. [1918.]
- No. 255. Joint industrial councils in Great Britain. [1919.]
- No. 283. History of the Shipbuilding Labor Adjustment Board, 1917 to 1919.
- No. 287. National War Labor Board: History of its formation, activities, etc. [1921.]
- No. 303. Use of Federal power in settlement of railway labor disputes. [1922.]
- No. 341. Trade agreement in the silk-ribbon industry of New York City. [1923.]
- No. 402. Collective bargaining by actors. [1926.]
- No. 468. Trade agreements, 1927.
- No. 481. Joint industrial control in the book and job printing industry. [1928.]

Cooperation.

- No. 313. Consumers' cooperative societies in the United States in 1920.
- No. 314. Cooperative credit societies in America and in foreign countries. [1922.]
- No. 437. Cooperative movement in the United States in 1925 (other than agriculture).

Employment and Unemployment.

- *No. 109. Statistics of unemployment and the work of employment offices in the United States. [1913.]
- No. 172. Unemployment in New York City, N. Y. [1915.]
- *No. 183. Regularity of employment in the women's ready-to-wear garment industries. [1915.]
- *No. 195. Unemployment in the United States. [1916.]
- No. 196. Proceedings of the Employment Managers' Conference held at Minneapolis Minn., January 19 and 20, 1916.
- *No. 202. Proceedings of the conference of Employment Managers' Association of Boston, Mass., held May 10, 1916.
- No. 206. The British system of labor exchanges. [1916.]
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- No. 310. Industrial unemployment: A statistical study of its extent and causes. [1922.]
- No. 409. Unemployment in Columbus, Ohio, 1921 to 1925.

Foreign Labor Laws.

- *No. 142. Administration of labor laws and factory inspection in certain European countries. [1914.]
- No. 494. Labor legislation of Uruguay. [1929.]

Housing.

- *No. 158. Government aid to home owning and housing of working people in foreign countries. [1914.]
- No. 263. Housing by employers in the United States. [1920.]
- No. 295. Building operations in representative cities in 1920.
- No. 500. Building permits in the principal cities of the United States in [1921 to] 1928.

Industrial Accidents and Hygiene.

- *No. 104. Lead poisoning in potteries, tile works, and porcelain enameled sanitary ware factories. [1912.]
- No. 120. Hygiene of the painters' trade. [1913.]
- *No. 127. Dangers to workers from dusts and fumes, and methods of protection. [1913.]
- *No. 141. Lead poisoning in the smelting and refining of lead. [1914.]
- *No. 165. Lead poisoning in the manufacture of storage batteries. [1914.]
- *No. 179. Industrial poisons used in the rubber industry. [1915.]
- No. 188. Report of British departmental committee on the danger in the use of lead in the painting of buildings. [1916.]
- *No. 201. Report of committee on statistics and compensation insurance cost of the International Association of Industrial Accident Boards and Commissions. [1916.]
- *No. 207. Causes of death, by occupation. [1917.]
- *No. 219. Industrial poisons used or produced in the manufacture of explosives. [1917.]
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- No. 488. Deaths from lead poisoning, 1925-1927.
- No. 490. Statistics of industrial accidents in the United States to the end of 1927.

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- No. 340. Chinese migrations, with special reference to labor conditions. [1923.]
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- No. 444. Decisions of courts and opinions affecting labor, 1926.
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- No. 432. Thirteenth, Hartford, Conn., September 14-17, 1926.
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- No. 192. First, Chicago, December 19 and 20, 1913; second, Indianapolis, September 24 and 25, 1914; third, Detroit, July 1 and 2, 1915.
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Productivity of Labor.

- No. 356. Productivity costs in the common-brick industry. [1924.]
- No. 360. Time and labor costs in manufacturing 100 pairs of shoes, 1923.
- No. 407. Labor costs of production and wages and hours of labor in the paper box-board industry. [1926.]
- No. 412. Wages, hours, and productivity in the pottery industry, 1925.
- No. 441. Productivity of labor in the glass industry. [1927.]
- No. 474. Productivity of labor in merchant blast furnaces. [1928.]
- No. 475. Productivity of labor in newspaper printing. [1929.]

Retail Prices and Cost of Living.

- *No. 121. Sugar prices, from refiner to consumer. [1913.]
- *No. 130. Wheat and flour prices, from farmer to consumer. [1913.]
- No. 164. Butter prices, from producer to consumer. [1914.]
- No. 170. Foreign food prices as affected by the war. [1915.]
- No. 357. Cost of living in the United States. [1924.]
- No. 369. The use of cost-of-living figures in wage adjustments. [1925.]
- No. 495. Retail prices, 1890 to 1928.

Safety Codes.

- *No. 331. Code of lighting: Factories, mills, and other work places.
- No. 336. Safety code for the protection of industrial workers in foundries.
- No. 350. Specifications of laboratory tests for approval of electric headlighting devices for motor vehicles.
- No. 351. Safety code for the construction, care, and use of ladders.
- No. 375. Safety code for laundry machinery and operations.
- No. 378. Safety code for woodworking plants.
- No. 382. Code of lighting school buildings.
- No. 410. Safety code for paper and pulp mills.
- No. 430. Safety code for power presses and foot and hand presses.
- No. 433. Safety codes for the prevention of dust explosions.
- No. 436. Safety code for the use, care, and protection of abrasive wheels.
- No. 447. Safety code for rubber mills and calenders.
- No. 451. Safety code for forging and hot-metal stamping.
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- *No. 159. Short-unit courses for wage earners, and a factory school experiment. [1915.]
- *No. 162. Vocational education survey of Richmond, Va. [1915.]
- No. 199. Vocational education survey of Minneapolis, Minn. [1917.]
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- No. 459. Apprenticeship in building construction. [1928.]

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- *No. 146. Wages and regularity of employment and standardization of piece rates in the dress and waist industry of New York City. [1914.]
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- No. 204. Street-railway employment in the United States. [1917.]
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- No. 265. Industrial survey in selected industries in the United States, 1919.
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- No. 435. Wages and hours of labor in the men's clothing industry, 1911 to 1926.
- No. 438. Wages and hours of labor in the motor-vehicle industry, 1925.
- No. 442. Wages and hours of labor in the iron and steel industry, 1907 to 1926.
- No. 452. Wages and hours of labor in the hosiery and underwear industries, 1907 to 1926.

Wages and Hours of Labor—Continued.

- No. 454. Hours and earnings in bituminous-coal mining, 1922, 1924, and 1926.
- No. 471. Wages and hours of labor in foundries and machine shops, 1927.
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