LEAD POISONING LEGISLATION AND STATISTICS

HOFFMAN

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PART I

LEAD-POISONING LEGISLATION*

The type of legislation with which I have been chiefly concerned this summer during my European journey is the effort of the International Labor Office of the League of Nations in promoting the adoption of the International Convention concerning the use of white lead in painting. Thus far some eighteen countries have adopted the Convention, the first of these being Estonia, which entered the compact in 1922, and the last being Jugo-Slavia, which ratified the agreement in October, 1929. But, with the exception of France, all the countries which have thus far agreed to prohibit the use of white lead in painting are small and really unimportant, as the following list will show:

1922. Estonia
1923. Czecho-Slovakia, Sweden
1924. Austria, Latvia, Poland, Spain
1925. Bulgaria, Chile, Rumania
1926. Belgium, France, Greece
1928. Cuba, Luxemburg
1929. Finland, Norway, Jugo-Slavia

It will be observed that most of the countries that have adopted the International Convention are small and not particularly concerned either with the production or the industrial use of white lead, with the possible exception of France, where the Convention is in force but not rigorously applied. None of the great industrial nations, particularly Great Britain and her possessions, have thus far shown any decided leaning towards the theory of complete prohibition of white lead, but cover its hazards by adequate regulations.

A comprehensive summary of the present situation is contained in the report of the International Labor Conference, 16th Session, Geneva, 1932. This account, however, does not admit of being abbreviated to advantage and should be consulted in the original.

(1)

I am able to amplify this with documentary evidence of interviews on the present situation in England, Germany and Switzerland, all of which have the adoption of the Convention under serious consideration. A report may be forthcoming before long on the workings of the Convention, which

*Address delivered in Section of Industrial Hygiene of the American Public Health Association, Washington, D. C., October 24-27, 1932.

seems to have operated without much friction in most of the countries concerned. Each of the members of the Convention agreed to make annual reports to the International Labor Office on the measures it has taken to effect the provisions of the Convention, to which it is a party. The Convention had its origin in an agreement entered into on October 25, 1921, each member of the International Labor Organization ratifying the present Convention, agreeing to prohibit, with certain exceptions, the use of white lead and sulphate of lead and of all products containing these pigments, in the internal painting of buildings, except where the use of white lead or sulphate of lead or products containing these pigments is considered necessary, for railway stations or industrial establishments, by the competent authority after consultation with the employers' and workers' organizations concerned. Nevertheless, it is permissible to use white pigments containing a maximum of two per cent. of lead expressed in terms of metallic lead. The provisions of the agreement, however, shall not apply to artistic painting or fine lining. The employment of males under eighteen years of age and of all females is prohibited in any painting work of an industrial character involving the use of white lead or sulphate of lead or other products containing these pigments.

The agreement provides also that all cases of lead-poisoning and of suspected lead-poisoning shall be reported and subsequently verified by a medical man appointed by competent authority. Furthermore, instructions with regard to special hygienic precautions to be taken in the painting trades should be distributed to working painters. The provision regarding the collection of statistics of lead-poisoning among working painters seems to have been carried out in a very unsatisfactory manner, and in this respect no useful compilation of data for the countries concerned is yet available. Thus it can not be shown whether the prohibition involved has yet produced a material reduction in lead-absorption and lead-poisoning. In nearly all of the countries concerned, with the exception of France, this has never been of much importance. Minute regulations for the supervision and control of the painting trade have been adopted by a number of the countries concerned, but whether these operate satisfactorily is difficult to say. In any event, they must certainly impose very burdensome restrictions and be difficult of enforcement.

(2)

The best statistics on the subject are those of the Chief Inspector of Factories and Workshops, United Kingdom, which are available for the year 1931. England has not adopted the Convention, but in place thereof has passed adequate regulations. The report for 1931 shows 168 cases of lead-poisoning, with 21 deaths, at an average age at death of 51 years. By way of comparison, it may be stated that in this country, in 1930, there were 101 deaths from lead-poisoning, at an average age at death of 48.9 years, or, eliminating seven children, the average age at death was 53 years, corresponding closely to the British figure. The chief Inspector of Factories and Workshops reports that the British figure is the lowest that has ever

been recorded, and while the lower number exposed to risk has to be taken into account, it is also the result of the regulations adopted. He observes, "There can be little doubt of the increasing vigilance of manufacturers in taking steps to protect their workers."

The reduction in the incidence of lead-poisoning seems to have effected every branch of the industry but particularly that of painting. In this country, the number of deaths of painters from lead-poisoning in 1930 was also the lowest on record, having been in that year only 49, at an average age at death of 53.1 years. The youngest was 27 and the oldest 80. This information is derived from an examination of the original death certificates of deaths from lead-poisoning for the year 1930, furnished by the Census Office, Washington, D. C.

The actual number of cases of lead-poisoning in connection with the painting of buildings in England during 1931 was 64 with 6 deaths, against 66 cases and 13 deaths during 1930, 75 cases with 10 deaths during 1929, 87 cases with 20 deaths during 1928. Thus the situation in Great Britain has materially improved under adequate regulations, making the adoption of the International Convention unnecessary.

(3)

As an illustration of the small importance of the adoption of the Convention by certain countries, I mention Bulgaria, which entered the compact in 1925, and as regards to which it is stated, "In Bulgaria the use of white lead in painting is unknown." Probably the most important country for the present purpose is Switzerland, which has not yet adopted the Convention, but where the question of doing so is under serious consideration. A preliminary report on the subject was published in 1925 by the Labor Department of Switzerland, containing a considerable amount of extremely interesting information. It includes, for example, a table of deaths from lead-poisoning among painters for the period 1901-1921, summarized in the table following:

DEATHS OF PAINTERS FROM LEAD-POISONING—SWITZERLAND
1901-1921

1901.....10	1908..... 4	1915..... 4
1902.....13	1909.....11	1916.....13
1903..... 8	1910.....10	1917..... 7
1904..... 7	1911..... 8	1918..... 4
1905..... 6	1912..... 8	1919..... 2
1906.....15	1913..... 6	1920..... 5
1907.....13	1914..... 6	1921..... 8

During the period 1901-1921 there were 249 deaths from lead-poisoning in Switzerland, of which 168 were of painters, and of these 63 were master painters. The statistics show an almost continuous reduction in the rate of incidence, from an average of 8.8 during 1901-5 to 6.2 during 1916-20. A further report was made under date of March 2, 1928, giving statistics of cases of lead-poisoning among painters for the period 1920-1925. According to this report, there were 15 cases in 1920, 15 in 1921, 17 in

1922, 34 in 1923, 19 in 1924, and 19 in 1925. The number of deaths in this experience was as follows: 1920, none; 1921, 2; 1922, 1; 1923, 3; 1924, 2; 1925, 1. Thus the seriousness of the situation in Switzerland is negligible, but the subject, nevertheless, is receiving extended and qualified consideration. In fact, it may be questioned if anywhere the subject is being more thoroughly investigated at the present time than in Switzerland, and the outlook for a full report in the near future is most encouraging. The entire question is under consideration by the Swiss Accident Insurance Society, a government institution, in charge of Dr. Tzaut and Dr. D. Pometta, chief surgeon, Lucerne, who has published an interesting leaflet on the "Rational Treatment of Lead Poisoning," contributed to the *Swiss Medical Weekly* in 1932. The Swiss Accident Insurance Society has published some supplementary statistics on lead-poisoning among painters for the years 1926, 1927, 1928, according to which there were 23 cases, with 3 deaths, in 1926, 27 cases, with 2 deaths, in 1927, and 25 cases, with no deaths, in 1928. Summarizing the results for the three years, there were 75 cases, 48 of which were cured, 2 improved, 4 retired as invalids, and 5 died, while in the remaining 16 cases the results were unknown. The Swiss Accident Insurance Society has also published a very suggestive model regulation for the sanitary supervision and control of the painting trade, deserving of attention.

(4)

In Germany, the subject is receiving the attention of the Labor Department, as well as the Federal Health Department, which may be expected to publish a report on the subject in the near future. The matter is also receiving continuous attention on the part of the Union of Painters and Related Trades of Germany, an excellent report having been issued, reviewing fifty years of agitation against the use of white lead on the part of the organization, by Mr. Von O. Streine, Hamburg. Mr. Streine is probably the best informed representative of the Labor Party and his report is full of suggestive observations. It, however, can not be abbreviated to advantage for the present purpose.

But the outstanding authority in Germany on lead-poisoning is Professor Koelsch, of Munich, whose reports on lead-poisoning in Bavaria for a number of years have been the source of a considerable amount of data of great practical value. In Germany at the present time, the matter is subject to regulations adopted under date of May 27, 1930. All paints containing less than two per cent. of lead are considered innocuous. The use of lead-containing paints for inside painting is prohibited except in the case of railways and of large buildings for outdoor purposes. Regulations prohibit the rubbing-off of paints by hand, and provide means for the identification of lead-containing paints. Dry-rubbing is prohibited and the spraying of paints is subject to special regulation. The employment of males under eighteen years of age and of women is prohibited. Provision is made for washing, for nail-cleaning and for clean towels at the expense of the employer. Provision is also made for the education of the lead-

workers as to the symptoms of lead-poisoning, and a leaflet on the subject is furnished. Eating, drinking and smoking during the operation is prohibited. Finally, separate working-clothes are required, and provision is made for regular medical examinations in all the larger undertakings, particularly of new employees. Periodical examinations must be made semi-annually, and the results of these must be entered in a book furnished for the purpose.

According to Professor Koelsch the foregoing protective measures may be considered fully adequate, and the prohibition of white lead in painting appears to him at the present time impracticable and unnecessary. He is of the opinion, based on many technical studies, that the substitution of other paints for white lead is unsuitable. But he points out that the use of lead paints in Germany during the last twenty years has steadily gone down and to this he attributes, in part, the reduction in cases of lead-poisoning. At the present time, cases of lead-poisoning among painters are very rare. He is of the opinion that many cases are reported as lead-poisoning which, upon further inquiry and study, are revealed as other afflictions resembling lead-poisoning slightly, but not due to lead-intoxication. He points out that, in his experience, one of the chief sources of lead-poisoning in Bavaria is the occurrence of cases in the pottery industry, glass-making, enameling and plumbing. Among printers, he points out, cases are now very rare and that it is no longer necessary to speak of lead-danger in this occupation. These observations are based on twenty-five years of practical experience and they apply equally to the painting trade.

Professor Koelsch was good enough to furnish me with statistics of lead-poisoning cases in Bavaria for the period 1926-1931, and states that only about one-half were medically verified by further examination. I give the figures for Bavaria as follows, separating the sexes:

LEAD-POISONING CASES IN BAVARIA—1926-1931

	Males	Females	Total
1926	122	38	160
1927	147	67	214
1928	136	82	218
1929	147	38	286
1930	140	27	167
1931	78	20	98
	770	272	1042

Separating painters, the results are as follows:

LEAD-POISONING CASES IN BAVARIA—1926-1931

Years	Potters	Painters	Printers
1926	30	35	33
1927	34	36	25
1928	25	46	30
1929	29	60	22
1930	28	19	36
1931	21	16	29
1926-31	167	172*	175†

*Of which 162 were females (porcelain and glass painters).
†Of which 3 were females.

Through the kindness of Dr. Bauer, President of the Federal Statistical Department of Berlin, I have been furnished with the following statistics of lead-poisoning cases and deaths in Germany for the period 1926-1930.

LEAD-POISONING IN GERMANY—1926-1930

	Reported Cases	Compensated Cases	Compensated Deaths
1926	3,129	241	7
1927	3,329	256	12
1928	3,424	329	6
1929	3,456	421	20
1930	2,832	470	17
	16,170	1,717	62

(5)

The great difference between reported cases and compensated cases emphasizes the necessity of a careful reexamination of every case reported as lead-poisoning, often due to other closely resembling causes. Evidence of the insufficiency of the average diagnosis of lead-poisoning is furnished in an excellent and apparently unanswerable report on the "Case Against Prohibition as stated by the white-lead makers of Europe in answer to questionnaire and memorandum issued by the International Labour Office in 1921, and published by the International Labor Conference in Geneva, which document should be consulted carefully by all who wish to obtain a clear understanding of the present European situation. It brings out the startling fact that the propaganda employed by the manufacturers of zinc paints as substitutes for white lead, bears all the earmarks of bias and prejudice. In this connection, attention may be called to an article on "The Behaviour of Paints Under the Conditions of Practice, with Special Reference to the Aspersions Cast upon Lead Paints," by Henry E. Armstrong, Professor of Chemistry, City and Guilds Engineering College, South Kensington, and C. A. Klein, Chief Chemist to the Brimsdown Lead Co., published by the Society of Chemical Industry, London, 1913. At the same time, attention may be called to an address on "Paints, Painting and Painters, with Reference to Technical Problems, Public Interests and Health," by Professor Henry E. Armstrong and Mr. C. A. Klein, published in the *Journal of the Royal Society of Arts* for August, 1921. A further address on "Hygienic Methods of Painting: The Damp Rubbing-Down Process," by Mr. C. A. Klein, a discussion, was published in the *Journal of the Royal Society of Arts* for February, 1923.

(6)

During my visit to England I was given an opportunity to visit the plant of the Librex Lead Company, near Liverpool, than which I doubt that there is a more interesting plant anywhere, its first regard being the health of the employees, showing remarkable results in actual experience. At the Librex plant the Waring Vacuum-Filter is used.

Supplementary to my visits to the Librex plant and to conferences with the Chief Inspector of Factories and Workshops and officials of lead-pro-

ducing corporations, I had an interview with Mr. Will Meller, Secretary. The National Federation of Master Painters and Decorators of England and Wales, at his office in Manchester. He explained to me that the Federation had been fully consulted on the drafting of the regulations by the home office officials and that, consequently, they have been made as practicable as possible. When they came into operation, arrangements were made for the various district Factory and Workshop Inspectors under the home office to meet the members of the Federation at branch meetings, where full description and explanation of trade practices were given for the benefit of the Inspectors. The regulations seem to have met all reasonable expectations. He also informed me that the lead regulations in France and Belgium are largely a dead letter, and that the manufacture of lead paint is increasing in France, possibly due to the operation of import duties. In his judgment, the present regulations operate with entire satisfaction to both the Government and the trade and no drastic regulations, particularly of a prohibitive nature, are anticipated.

(7)

In Belgium, the number of cases of lead-poisoning reported has increased from 38 in 1928 to 55 in 1929 and to 124 in 1930. The number of compensated cases increased from 24 in 1928 to 38 in 1929 and to 95 in 1930. The deaths compensated increased from none in 1928 to 3 in 1929 and to 7 in 1930.

In France the number of cases of lead-poisoning during the period 1923-1929 has been as follows:

LEAD-POISONING CASES IN FRANCE—1923-1929

1923	1,025	1927	1,040
1924	1,249	1928	1,525
1925	1,343	1929	1,846
1926	1,505		

Thus an increase has taken place, regardless of the fact that France has prohibited the use of white lead in paint since 1926.

(8)

In concluding the foregoing observations, I wish to call attention to the preliminary statistics of deaths from lead-poisoning in nineteen American cities for which I have special returns. In this group of cities, including New York, Philadelphia, Boston, Cincinnati, Baltimore, Detroit, Cleveland, Chicago, Columbus, Salt Lake City, Pittsburgh, Kansas City, Mo., San Francisco, Providence, El Paso, Jersey City, Newark, N. J., Buffalo and Oakland, there occurred in 1930 twenty deaths from lead-poisoning, and in 1931 the number was twenty-five. But these deaths include non-industrial cases and must be interpreted with caution.

In the United States Registration Area, the number of deaths from lead-poisoning in 1929 was 134, against 101 in 1930. In 1931 the number of

deaths from lead-poisoning in the United States Registration Area was 111, at an average age of 49.9 years, or, excluding 8 children, 53.7 years. Of these deaths, 55 were those of painters, dying at an average age of 55.6 years. The United States lead-poisoning mortality rate in 1931 was 0.93 per million of population against 0.85 in 1930.

The quantity of lead in all forms consumed by American industry as estimated by the American Bureau of Metal Statistics and reported by the Bureau of Mines for the years 1927-1931 was as follows; 1927, 840,000 pounds, 1928, 930,000 pounds, 1929, 972,000 pounds, 1930, 768,000 pounds, 1931, 567,000 pounds. The quantity consumed in white lead was as follows; 1927, 126,000 pounds, 1928, 123,000 pounds, 1929, 119,000 pounds, 1930, 83,000 pounds, 1931, 77,000 pounds.

PART II

LEAD-POISONING STATISTICS—1930-1931

Complete statistics for the United States Registration Area for the year 1931 will not be available for some time to come. I have only recently been furnished with the 1930 death certificates, which will be dealt with in this report in full detail. The first table, by way of introduction, gives the deaths from chronic lead-poisoning in the experience of the Metropolitan Life Insurance Company for males only, 1927-1931.

DEATHS FROM CHRONIC LEAD-POISONING—MALE POLICYHOLDERS METROPOLITAN LIFE INSURANCE COMPANY—1927–1931

Year	Deaths	Rate per 1,000,000
1927	21	3.9
1928	22	2.7
1929	21	2.6
1930	12	1.5
1931	17	2.2

The table indicates an increase from a rate of 1.5 per million in 1930 to 2.2 in 1931. The number of deaths, however, is so small that the increase can not be considered significant. Compared with 1927, there has been a very marked reduction, which is much more impressive. Aside from the foregoing 17 deaths among males in 1931, there was one death of a female. Deaths from lead-poisoning among females since 1928 have been as follows: 3 in 1928, 1 in 1929, 2 in 1930 and 1 in 1931. How far the deaths of females and the preceding deaths of males are industrial can not be stated, but it is safe to assume that the deaths among females were not of an industrial character.

I give next a table of deaths from lead-poisoning in 19 American cities, 1930-1931. This also shows a slight increase from 20 to 25 deaths, conforming with the Metropolitan experience.*

DEATHS FROM LEAD-POISONING IN 19 AMERICAN CITIES—1930–1931

	1930	1931		1930	1931
New York City	3	2	Kansas City, Mo.	0	1
Philadelphia	4	5	San Francisco	1	0
Boston	2	4	Providence	0	1
Cincinnati	0	1	El Paso	0	0
Baltimore	1	2	Jersey City	0	0
Detroit	0	0	Newark, N. J.	0	2
Cleveland	4	3	Buffalo	1	0
Chicago	2	3	Oakland	1	0
Salt Lake City	0	0			
Columbus	1	1		20	25
Pittsburgh	0	0			

*In 1932 the number of deaths in these 19 cities was 20, of which 4 occurred in New York City, 3 in Philadelphia, 4 in Boston and 3 in Cincinnati.

I give next a table showing the population and the deaths from lead-poisoning in the United States Registration Area, 1920-1931 inclusive.

DEATHS FROM LEAD-POISONING IN U. S. REGISTRATION AREA—1920-1931
RATE PER 1,000,000

Year	Population	Deaths	Rate
1920	87,000,000	120	1.4
1921	89,000,000	142	1.6
1922	93,000,000	137	1.5
1923	97,000,000	141	1.5
1924	99,000,000	142	1.4
1920-24	465,000,000	682	1.5
1925	103,000,000	142	1.4
1926	105,000,000	144	1.4
1927	108,000,000	139	1.3
1928	112,000,000	129	1.2
1929	116,000,000	132	1.1
1925-29	544,000,000	686	1.3
1930	118,000,000	101	0.85
1931	120,000,000	111	0.93

The rate for 1930 shows a reduction, suggestive of improvement during that year, but due, possibly, to the depressed state of the lead-using industries, involving a lesser degree of lead-poisoning risk.

In a statistical appendix, I give the details of the 101 deaths from lead-poisoning in 1930, by single years of life, at an average age of 48.9 years, or if eight deaths of children are deducted, the average age as 53. In the British experience for 1931, there were 21 deaths from lead-poisoning, at an average age of 51 years.

Of the 101 deaths in 1930, 49 were the deaths of painters, who died at an average age of 53.1 years. The details are given in table two of the appendix.

In some detail, the analysis for 1930 show the following results. The classification adopted is the same as in the report for 1900-1930. It is the only classification of its kind that has ever been made and is based entirely upon original death certificates, copies of which were furnished by the Census Office.

LEAD-WORKERS.—There were three deaths of lead-workers in 1930 against five in 1929. These three occurred, respectively, in St. Louis, Passaic, N. J., and Nutley, N. J. The one in St. Louis was that of a furnace-timer in a lead factory, who died of lead-poisoning of one month's duration, complicated by chronic gastric ulcer. The second was that of a millwright in a lead company, who died from chronic lead-poisoning due to occupation complicated by intestinal obstruction, hypertension and cardiac hypertrophy. The third death was that of a male employee in a lead-battery factory in Nutley, who died from chronic lead-poisoning at the age of 17.

METAL-MINERS.—There were two deaths of metal-miners, one occurring in Lake City, Colo., and one in Oakland, Calif. One was that of a miner cook employed in quartz-mining, whose death was attributed to chronic lead-poisoning and quartz dust, complicated by valvular lesion, interstitial nephritis and dropsy. The death in Oakland was that of a mining engineer, age 67, who died from chronic lead-poisoning of two years' duration, complicated by edema of lungs, chronic myocarditis, chronic endocarditis and general asthenia. The number of metal-miners who died in 1929 was 4, against 2 in 1930.

PAINTERS.—The number of deaths of painters in this country in 1930 was 49, the ages running from 27 to 80, and the average age was 53.1 years. I have selected a few of the more suggestive cases by way of illustration. One was that of an enamel-sprayer in Kalamazoo, Mich., age 31, who died from lead-poisoning complicated by nephritis and uremia with convulsions. One was the death, in Youngstown, Ohio, of a painter, age 34, who had been employed for 17 years and who died from chronic lead-poisoning due to turpentine and paint poison. One was the death in Douglas County, Ore., of a painter and decorator and musician, whose death was attributed to "probably lead-poisoning," complicated by anuria. One was that of an interior decorator, age 46, in Kingston County, N. Y., who died from acute appendicitis and chronic lead-poisoning. One was that of a painter, age 47, of Emerson, Neb., who had been a painter for years and had had several attacks of lead colic. Complicating diseases were influenza, pleuro-pneumonia, heart exhaustion and double lobar-pneumonia, at different dates. One was that of a painter in Montgomery County, Pennsylvania, age 55, who died from chronic lead-poisoning complicated by uremic convulsions, chronic nephritis, arteriosolerosis and acute pulmonary edema. One was that of a painter and decorator in Chicago, Ill., age 56, death being classified as "probably chronic lead-poisoning." One was that of a duco-rubber for a motor-car company, in Pigrua County, Ohio, age 59, who died from painter's colic, lead-poisoning and angina pectoris. One was that of a painter in Clearwater County, Idaho, age 67, who died from lead-poisoning complicated by pneumonia, paralysis, heart-disease and alcoholism. One was that of a decorator in Baltimore, Md., age 77, who died from painter's colic, death being complicated by arteriosclerosis, cystitis, uremia, nephritis and myocarditis. The oldest painter in the group was 80 years of age, dying in Wheeling, W. Va., death being complicated by hemiplegia, hypostasis pneumonia and arteriosclerosis. He was reported to have had an attack of lead colic as far back as 1924. The number of deaths of painters in 1929 was 69, against 49 deaths in 1930.

PAINT-MIXERS.—There were no deaths of paint-mixers during the year 1930, against none during 1929 and one during 1928.

PLUMBERS.—There was one death of a plumber, age 64, in Manhattan, N. Y., death being complicated by chronic nephritis, endocarditis, myocarditis and exhaustion. The number of deaths of plumbers in 1929 was 2.

POTTERS.—There was one death of a potter in 1930, a dipper, age 68, of East Liverpool, Ohio. It is stated on the certificate that he had been a

glaze-dipper in pottery for fifty years. In 1929 there were no deaths of potters from lead-poisoning, nor were there any during the preceding two years.

RUBBER-WORKERS.—There were no deaths in this group in 1930, and there have been no deaths from lead-poisoning in this group during the preceding five years.

STORAGE-BATTERY WORKERS.—There were no deaths from lead-poisoning in this group, against none during the preceding two years and six during the period 1925-1929.*

PRINTERS.—There were five deaths of printers from lead-poisoning in 1930, against six during 1929 and four during 1928. One printer, age 51, died in National City, Calif., death being complicated by gangrenous cholecystitis. One, age 60, died in St. Louis, Mo. He was an instructor of printing in a public school, death being classified as "probably chronic lead-poisoning." The third was that of a printer, age 67, dying in El Paso County, Colo., death being complicated by cerebral hemorrhage. The fourth was that of a printer, age 74, of Philadelphia, Pa., death being complicated by myocardial degeneration and aplastic anemia. The fifth was that of a retired printer, age 80, who died in Manhattan, N. Y., death being complicated by chronic myocarditis, endocarditis and cirrhosis of the liver.

TIN AND COPPERSMITHS.—There were no deaths from lead-poisoning in this group during 1930, against one in 1929 and none during the preceding four years.

GLASS-WORKERS.—There were no deaths in this group during 1930 and none during the preceding three years.

METAL-WORKERS.—There were two deaths in this group, one occurring at Buffalo, N. Y. This was that of a brass-melter, age 48, death being classified as "probably lead-poisoning" complicated by diabetes. The other was a steel-worker, age 29, who died in Jackson County, Ill., death being complicated by edema of larynx and paralysis of epiglotis. The number of deaths of metal-workers in 1929 was 2, none having occurred during the preceding two years. There were 23 deaths from lead-poisoning in this group of occupations during the period 1914-1924, and 15 in 1925-29.

CARPENTERS.—There were no deaths in this group in 1930, against one in 1929 and 3 in 1928. There were 18 deaths in this occupation during the period 1914-1924, and 10 during 1925-1929.

LABORERS.—There were 9 deaths in this group of occupations, which includes a large variety of low-grade employments. One was that of a negro laborer, age 30, in Philadelphia, Pa. One was that of a night watchman, age 32, in Cleveland, Ohio, death being complicated by acute nephritis, apparently due to lead-poisoning of four years' duration. One was that of a negro laborer, age 34, employed by an East St. Louis junk-dealer. One was that of a laborer in a smelting-plant, age 43, in Richmond, Calif., death being attributed to acute lead-poisoning, encephalitis, anemia, and chronic alcoholism, also chronic pleuritis. One was that of a laborer,

*See in this connection *Baltimore Health News*, of the Baltimore Department of Health, October, 1932, on Lead Poisoning from Burning of Battery Casings, being a brief account of 36 cases.

age 45, of Chicago, Ill. One was that of a laborer, age 47, in Columbus, Neb. One was that of a laborer in a mining camp, age 48, dying in Spokane County, Wash., death being complicated by bronchopneumonia. One was that of a negro janitor, age 59, Highland County, Ohio, death being attributed to myocarditis and metallic-poisoning from paint. One was that of a laborer, age 61, of Hartford, Conn., death being due to chronic lead-poisoning complicated by bronchopneumonia and peripheral nephritis. The average age for this group was 44.4 years. The number of laborers dying from lead-poisoning in 1929 was 10. During the period 1914-1924, the number was 93 and during the five years ending with 1929 it was 60.

FARMERS.—There were four deaths from lead-poisoning among farmers in 1930, one dying in Raleigh, N. C., age 36, death being complicated by alcoholism dating back to 1929. One died in Norway, Me., age 45, death being due to chronic lead-poisoning from drinking water from lead pipes from house to well. One was that of a farmer, age 58, in Memphis, Tenn., death being complicated by chronic hepatic ulcer. One was that of a farmer, age 58, in Douglas County, Wash., death being complicated by aneurism and enlargement of the heart. The number of deaths of farmers in 1929 was 6.

PROFESSIONAL AND COMMERCIAL.—There were two deaths in this group in 1930, against 5 in 1929. One was that of a florist, age 64, of Worcester County, Mass., death being attributed to arteriosclerosis following lead-poisoning in drinking-water. The other was that of an artist, age 53 of Lackawanna County, Pa., who died from chronic lead-poisoning complicated by mitral regurgitation and dropsy.

MISCELLANEOUS.—There were 7 deaths from lead-poisoning in this group, against 8 in 1929. The first occurred in Leadville, Colo., and was that of a millman for a railway company, age 28. The second was that of an electrician, age 34, of San Francisco, Calif., death being complicated by chronic nephritis, edema of brain, acute bronchopneumonia, terminal results from complications due to lead-poisoning. The third was that of an auto mechanic, age 34, of Davidson County, N. C. The fourth was that of an employee of a stone company of Erie, Pa., age 50, who died from chronic lead-poisoning of one year's duration and pneumonia of three days' duration. The fifth was that of a mechanic, age 59, of Hartford, Conn., who died from chronic lead-poisoning of several years' duration, complicated by secondary anemia. The sixth was that of a machinist and loom-worker, age 60, of Milford, Mass., death being complicated by toxemia, hyperstatic pneumonia, arteriosclerosis and chronic nephritis. The seventh was that of a shoe-repairer of Wayne County, Ind., age 64, who died from chronic lead-poisoning of fifteen years' duration, complicated by anemia of three years' duration.

UNKNOWN AND RETIRED.—The number of deaths in this group was six, the first, age 38, being in Buffalo, N. Y., death being complicated by interstitial nephritis, hemorrhage of the brain and pleurisy. The second was that of a negro, age 52, of Hinds County, Miss., death being attributed

to lead-poisoning and painter's colic. The third, age 57, was in Louisville, Ky., death being complicated by traumatic pleurisy. The fourth, age 70, was in Philadelphia, Pa., death being due to valvular heart disease and chronic plumbism of six months' duration. The fifth, age 56, was that of a retired railway engineer of Los Angeles, Calif., who died from chronic lead-poisoning, complicated by chronic colitis and empyema. The sixth was that of a retired smelterman, age 71, who died in Pueblo, Colo., death being due to apoplexy and chronic lead-poisoning.

WOMEN.—There were two deaths of women, against 3 in 1929; one aged 77, who died in Ruston, La., from lead-poisoning complicated by myocardial insufficiency and chronic interstitial nephritis. The second, age 71, was that of a woman employed in sewing window blinds in Cleveland, Ohio, death being attributed to lead-poisoning from fabric in window blinds, complicated by secondary anemia with edema.

BOYS UNDER 18.—There were four deaths in this group during 1930, against two in 1929. One was that of a boy in Philadelphia, Pa., age 1, death being attributed to toxic myocarditis and plumbism, caused by eating paint off wood. The second, age 2, died in Bridgeport, Conn., death being due to lead-poisoning and lead encephalopathy, caused by the child licking paint from freshly-painted furniture. The third, age 3, died in Chicago, Ill., death being due to acute meningo encephalitis and lead-encephalitis, caused by the child chewing lead paint from porch. Death was complicated by cerebreal edema. The fourth age 3, died in Philadelphia, Pa., death being due to lead-poisoning of two months' duration, complicated by toxic myocarditis, caused by the child chewing the paint from his crib. It is significant, in this connection, that all these children were of foreign parentage, two having been born in Russia and two in Italy, no doubt suggestive of the ignorance of the parents in watching the children's habits.

GIRLS UNDER 18.—There were four deaths in this group also, against none in 1929 and two in 1928. The first, age 7 months, died in Boston, Mass., from lead-poisoning of six months' duration, cause unknown, but not due to gnawing paint. The second, age 1 year, died in Boston, Mass., poisoning caused by the gnawing of painted wood. The third, age 1 year, died in Baltimore, Md., with a history of eating paint. The fourth, age 2 years, died in Montgomery County, Pa., lead-poisoning having been due to the habitual eating of paint from furniture and pencils. The parents were born in Ireland.

I include, as a matter of convenient record and reference, the following observations and data, communicated to me by the Lead Industries Association under date of September 4, 1931, being replies to questionnaires regarding the practice of furniture manufacturers in painting children's cribs, beds or furniture, which are highly illuminating.

LEAD INDUSTRIES ASSOCIATION QUESTIONNAIRE

Forwarded to Manufacturers of Children's Cribs, Beds and Furniture

RE: *Painting*

ORIGINAL LETTER TO FOLLOWING COMPANIES

Dated November, 1930

We are conducting an investigation to ascertain if any lead paint is being used to paint or decorate cribs, children's beds or furniture. Will you therefore, kindly let us know if it is your practice to use any white lead in painting this type of furniture.

A return envelope is enclosed, and a simple notation at the bottom of this letter will suffice.

Thanking you for your cooperation, I am,

COMPANY No. 1

We do not use any lead paint on our product.

COMPANY No. 2

We wish to advise that we manufacture children's cribs and we use enamel of various colors, which are manufactured for us in Chicago.

COMPANY No. 3

We use lacquer only.

COMPANY No. 4

Do not use any white lead in painting beds or furniture.

COMPANY No. 5

We do not use any white lead in any of our furniture finishes.

COMPANY No. 6

No. Must be enamel.

COMPANY No. 7

We purchase our *enamels* and undercoats that we use on children's furniture and cribs from the Glidden Co., Boston, and we refer you to them with reference to above-desired information.

COMPANY No. 8

We do not use white lead.

COMPANY No. 9

We would not be interested in lead paint, for the reason that we only use enamel in finishing our beds and springs.

COMPANY No. 10

We wish to advise that we do not use lead paint in our production here.

COMPANY No. 11

Wish to advise you that very little of this lead paint is used in painting our material.

COMPANY No. 12

No.

It is thus shown that, of the 101 deaths, quite a number were non-industrial, while it is also safe to assume that an additional number of diagnoses were superficial and possibly erroneously arrived at. The large number of complications reveal the involved nature of causation, easily arrived at as a mere matter of conjecture as being due to lead-poisoning in view of occupational connections.

(9)

In continuation of my report on 27 cases of lead-poisoning treated at the Buffalo City Hospital for a period of years, I am now able to give 3 more cases, as follows:*

Clinical Notes on Cases of Lead-Poisoning, Buffalo City Hospital 1930-1931

Case 28—L. K., White, Male, Age 44

Admitted December 22, 1929; discharged November 10, 1930.

Occupation: Employed in a brass foundry, renewing old brass by adding lead-zinc.

Chief Complaints: Severe epistaxis for 2 days prior to admission. Colicky abdominal pains for 2-3 months prior to admission.

History of Present Illness: Three months prior to admission, patient developed pain in his abdomen. Pain at first seemed to be located in the lower part of his chest, later radiating to the abdomen. About one week prior to admission, the pain became so severe that he became addicted to the use of alcohol to alleviate the pain. Two days prior to admission, on December 20, 1929, patient began to bleed spontaneously from his nose. Bleeding became so severe that a physician was called and the nose was packed. Bleeding again occurred on the day of admission, December 22, 1929, and physician advised hospitalization.

Physical Examination: Fairly well developed, well nourished, anemic white male of 44 years of age.

Face: Quite pale.

Eyes: Pupils are slightly unequal, the left being greater than the right. Right pupil is irregular, but both react well to light.

Nose: Clots in the right nostril. Left nostril is bleeding profusely.

Mouth: Teeth are in fairly good repair. There is a definite blue line about the gingival margin. Some pyorrhea present. Mucous membranes are pale.

Heart: Regular, pounding, tone only fair. Apex beat in the 6th interspace, not enlarged. There is a systolic impurity at the mitral area.

Abdomen: Soft, quite tender in the left upper quadrant, and to the left epigastrium. Mild tenderness throughout the lower abdomen.

Genito-urinary examination: Normal.

Extremities: Normal size, shape and contour.

Knee-jerks present and active.

Laboratory Findings: Blood-count on admissions: 30% Hb., 1,540,000 reds, 17,000 whites, 78% polys., 3 monos., 10% lymph., 9% S. L. Reds showed many stippled cells. On June 14, 1930: Hb. 65%, 3,190,000 reds, 7,800 whites, 64% polys, 2% L. M., 21% L. L. and 20% S. L., and only an occasional polychromatophilic cell was seen in the smear. Urines and the stools showed no lead. Blood Wassermann test was negative.

*See Deaths from Lead Poisoning, Bulletin 488, U. S. Department of Labor Statistics, Washington, D. C., 1929.

PROGRESS NOTES: Patient was so anemic shortly after admission that a transfusion was done. Patient improved considerably following its administration. Within two weeks patient developed bilateral wrist-drops, and the knee-jerks were practically absent bilaterally.

On January 14, 1930, patient became mentally disturbed, completely disoriented, and was constantly delirious, which was interpreted as a lead-encephalopathy.

During the first two weeks of patient's stay in the hospital, patient was given the usual high calcium diet with calcium lactate, and general condition seemed better, except for the development of the lead-polyneuritis and encephalopathy. After the administration of high calcium diet for one month, patient was then put on a low calcium diet and a saturated solution of potassium iodide was used. Following this administration, the patient showed much improvement in every respect, except for the peripheral neuritis. This was treated with physiotherapy for the following six months and showed gradual improvement.

On discharge, patient had fairly good strength in both wrists and hands, but was far from normal.

DISCHARGE DIAGNOSIS:

Acute Plumbism—Improved.
Epistaxis—Improved.
Secondary Anemia—Improved.
Gingivitis—Improved.
Neuritis of the Radial and Ulnar Nerves—Slightly improved.

CASE 29—H. W., White, Male, Age 38

Admitted April 20, 1931; discharged May 20, 1931.
OCCUPATION: Employed in the manufacture of arsenate of lead for the past 8 years.

CHIEF COMPLAINTS:

Nausea and vomiting since April 16, 1931.
Diarrhea since January, 1931.
Loss of 40 pounds in weight in the past year.

HISTORY OF PRESENT ILLNESS: Patient states he was in pretty good health until 1 year ago. At this time he noticed considerable nausea after meals. Rarely had much pain associated with it. Frequently would vomit 15 to 20 minutes to two hours after meals. Occasionally before meals. Never noticed any particular relationship to food, but the pain and nausea were frequently relieved by soda. In January, 1931, patient developed a severe diarrhea, which continued for 3 or 4 days. Then stopped for a day and recurred again. Has been like this for the past 3 or 4 months prior to admission to hospital.

PHYSICAL EXAMINATION:

Well developed, poorly nourished male of 38 years.
Eyes: Pupils are regular, equal and responsive.
Nose: Negative.
Mouth: Edentulous.
Neck: Negative.
Chest: Breath sounds are somewhat diminished throughout.
Heart: Regular, tones rather poor, no definite murmurs. Radial arteries are slightly thickened.
Abdomen: Soft, scaphoid in type and tender in the epigastrium.
G. U.: Normal.
Extremities: Normal.
Knee-jerks are hyperactive.

LABORATORY FINDINGS:

Blood smear showed 75% poly., 14% lymph., 5% monos. and 2 eos.
Many of the red cells show stippling and polychromatophilia.
Gastric analysis showed 26% free hcl., 44% total acid.
Wassermann test was negative.
X-Ray of the gastro-intestinal tract revealed a duodenal ulcer.

PROGRESS NOTES: Patient improved markedly on Sippy diet and Sippy powders. He became symptomless within 4 days, and during his stay in the hospital gained about 7 pounds in weight.

DISCHARGE DIAGNOSIS:

Duodenal Ulcer—Improved.
Chronic Plumbism—Improved.

CASE 30—J. G., Colored, Male, Age 52

Admitted May 11, 1931; discharged June 10, 1931.

OCCUPATION: Removing paint from Pullman cars for 8 years. Claims he wore a mask while employed.

CHIEF COMPLAINTS: Pain in the left side of epigastrium, intermittently for five years, quite severe past 3 weeks, vomiting at the onset, severe constipation past year.

PHYSICAL EXAMINATION: A well-developed, rather poorly-nourished colored male of 52 years.
Eyes show arcus senilis, the left lens is opaque.
Ears and nose: Negative.
Mouth: Teeth are repaired, gingivitis present, suggestive blue line in the upper gingival margin.
Neck: Negative.
Chest: Rather harsh breath-sounds in the bases.
Heart is regular, weak tone, precordial systolic bruit present.
Heart is enlarged to the left. Blood pressure, 102/65.
Abdomen: Soft, some tenderness in the epigastrium.
Genito-urinary: Normal.
Extremities: Normal.
Knee-jerk is hyperactive.

LABORATORY FINDINGS:

Urinalysis was essentially negative.
Blood urea was 48.2 on admission and 18.9 on discharge. Blood-sugar was 112.
Blood-count Hb. 67%, RBC 3,800,000, WBC 14,650. The smear showed 75% polys., 22% lymphocytes, 3% monocytes. Red cells showed many stippled cells and one nucleated stippled cell.

PROGRESS NOTES: Patient improved under therapy consisting of a high calcium diet and calcium lactate, and within one month showed no symptoms except some neuritic pains in the arms.

DISCHARGE DIAGNOSIS:

Chronic Plumbism—Improved.
Secondary Anemia—Improved.
Gingivitis—Unimproved.
Alveolar Abscesses—Unimproved.
Myocardial Insufficiency—Slightly improved.

(10)

In continuation of my tabulation of reported cases and deaths from lead-poisoning in England and Wales, I now give a table for the different industries, showing the cases and deaths for the period 1925-1931.

CASES AND DEATHS FROM LEAD-POISONING, ENGLAND AND WALES, 1925–31

	1925	1926	1927	1928	1929	1930	1931
Cases							
Smelting of metals	32	26	21	36	20	37	15
Plumbing and soldering	7	7	11	11	8	6	3
Shipbreaking	31	8	32	32	18	24	2
Printing	8	8	10	3	8	7	1
Tinning of metals	4	2	3	1	3	2	—
Other contact with molten lead	17	16	17	9	12	19	10
White and red lead	19	13	21	9	8	3	1
Pottery	47	41	14	23	14	23	9
Vitreous enameling	9	8	12	23	9	2	7
Electric accumulators	73	52	58	33	23	36	21
Paint and color works	8	10	6	12	8	6	10
India-rubber works	2	2	2	1	1	3	—
Coach and car-painting	23	14	14	18	9	10	8
Shipbuilding	13	8	10	7	3	5	2
Paint used in other industries	14	16	7	11	11	5	8
Other industries	29	11	11	10	14	11	7
Painting of buildings	—	90	98	87	75	66	64
	326	332	347	326	244	265	168
Deaths							
Smelting of metals	—	1	1	2	0	1	1
Plumbing and soldering	0	3	1	1	1	1	0
Shipbreaking	0	0	0	0	0	0	0
Printing	0	0	0	0	1	0	0
Tinning of metals	0	0	0	1	0	0	0
Other contact with molten lead	1	4	0	1	2	2	0
White and red lead	1	1	1	1	1	1	1
Pottery	5	14	6	10	11	10	7
Vitreous enameling	2	0	0	0	0	0	1
Electric accumulators	1	0	0	1	2	0	1
Paint and color works	0	0	0	1	1	1	1
India-rubber works	0	0	0	0	0	1	0
Coach and car-painting	1	2	3	3	2	0	2
Shipbuilding	0	0	1	2	0	1	0
Paint used in other industries	1	3	0	0	0	0	1
Other industries	1	0	1	0	0	0	0
Painting of buildings	—	18	21	20	10	13	6
	13	46	35	43	31	32	21

These are the returns of the Chief Inspector of Factories and Workshops and do not, therefore, include non-industrial cases as returned by the Registrar-General, subsequently to be referred to. I quote the following interesting comment from the Chief Inspector's report for 1931, published June, 1932, amplified by a personal visit to the Factory Inspector's office in London during the current summer. The number of cases reported was 168, with 21 deaths, at an average age at death of 51 years. This is said to be the lowest figure ever recorded, and while it is pointed out that the smaller number of men exposed to risk must be taken into account, the

Chief Factory Inspector is convinced that the result is due largely to "better protection from the risk attendant upon the use of lead. It would be difficult to think otherwise, as improved mechanical methods in manufacture must have lessened the risk, and with greater knowledge of these risks, better methods of prevention have been devised. There can be little doubt of the increasing vigilance of manufacturers in taking steps to protect their workers." This, of course, applies equally well to this country, which must be looked upon as the chief cause of the reduction in both cases and deaths in this country as well as abroad.

The report further contains the highly suggestive observation that, "The possibility of confusion between lead-poisoning and certain types of acute appendicitis is brought to mind by three cases of lead-poisoning which were operated on, which came to my notice. The possibility of such confusion is very present in a first attack, where no inquiry is made as to the man's occupation, and especially where the lead risk is, as it were, 'concealed,' in that the man's occupation is not a common source of lead-poisoning, or when he is unaware that he is exposed to lead at all."

With regard to particular industries, I quote, in part, observations regarding the smelting of metals and respecting pottery.

> Six of the fifteen cases occurred at a blast furnace following the use of an ore containing 0.28 per cent. of lead. The source of these cases was fume from the molten lead as it leaves the furnace and lead-oxide dust in the neighborhood of the furnace and molding-bed. No further cases have been reported since the introduction of preventive measures, which include pneumatic-drilling of the tapping-plug, rendering it unnecessary for men to stand over the tapping-hole during drilling; instruction of the men to stand to windward during the tapping of the furnace, as far as possible; provision of a receptacle, with lid, for reception of the lead shovelled from the gutter near the tapping-hole; removal of the contaminated sand and replacement with fresh from time to time; and the provision of washing accommodation. Similar cases of lead-poisoning amongst blast-furnace workers were noted in 1927, where high lead-containing ores were in use.

With regard to the pottery trade it is said,

> Fatal cases as compared with non-fatal cases of poisoning are high, but it must not be assumed that those, whose deaths were certified as due to lead-poisoning, contracted the poisoning during the year. Two cases will suffice to illustrate this point. The first died at the age of sixty-nine; was notified as lead-poisoning in 1924, and had never worked since that year. Death was due to chronic nephritis and cerebral hemorrhage. The second had never been notified as a case of lead-poisoning, and thus is included now in the number of cases notified. The cause of death, at the age of forty-nine, was chronic nephritis. So far as enquiry showed, there had been no contact with lead for thirty-four years. There are, it should be noted, other causes of chronic nephritis.

The foregoing observations regarding lead-poisoning in potters is highly suggestive of the urgency of greater care in death-classification.

The reduction in the number of cases of lead-poisoning in electric storage-battery operations "cannot be attributed altogether to a reduction in the number of persons exposed to risk, for, so far as can be judged, this branch of the industry has been fairly well occupied. Here, again, it is said that,

> The cooperation of the manufacturers and, in particular, the appointment of a medical officer to supervise a group of works has, I am convinced, contributed in no

small measure to this reduction. The medical supervision of workers and of working conditions is of the utmost importance in this industry.

I add some observations on vitreous enameling.

Seven cases, with one death, were reported. In the fatal case, the man had been employed for 33 years as an enameler. Two cases, though included in this industry, were not strictly employed in an enameling process. They had been engaged for comparatively short periods in removing enamel from baths by means of shot-blasting. The firm in question handle expensive castings and find it of economic advantage to re-use those with faulty enameling. For this purpose, the old enamel has to be removed and various methods for its removal have been tried. None has been found so satisfactory as the use of shot-blasting, carried out in a chamber. The dust produced in this process is a mixture of fine powder and large metallic particles, and while helmets were supplied and worn by the men employed in the cabinet, within a short time the men were affected. A sample of the dust was found to contain 17.1 per cent. of soluble lead, calculated as lead monoxide, while the fine dust contained a much higher percentage. Such a process is undoubtedly associated with grave risk to health, and although a powerful system of exhaust-ventilation has now been installed, it is extremely difficult to control the dust.

With regard to the important question of lead-poisoning in painting, in view of the working of the new regulations, there is only a very brief reference to the effect that,

Reports show that the regulations are being more widely observed, though the practice of dry rubbing-down still continues, and would appear to be the cause of the poisoning, even though a supply of waterproof sandpaper is supplied and available.

Finally, there is a brief reference to the cases of lead-poisoning in plumbers, of particular interest as illustrating the superficial nature of many of the diagnostic statements on current death-certificates.

A case of reported lead-poisoning in an apprentice plumber, aged 19, was, after the fatal issue, found to be an almost classic case of aplastic anemia. The verdict of "death from natural causes" was arrived at by a coroner's jury after expert evidence, based on a minute examination of the tissues. This went to show that the focal sepsis originated in the mouth, which was grossly neglected, and that such exposure to lead as had occurred had played no part in the cause of issue of ill-health.

Deaths from occupational lead-poisoning, as reported by the Registrar-General, numbered 41 in 1929 and 40 in 1930, giving a somewhat reduced rate per million of population, as shown by the following table:

DEATHS FROM OCCUPATIONAL LEAD-POISONING, ENGLAND AND WALES
1923-1931

Year	Males	Females	Total	Population	Rate per 1,000,000
1923	51	4	55	38,403,000	1.4
1924	47	2	49	38,746,000	1.3
1925	28	3	31	38,890,000	0.8
1926	44	3	47	39,067,000	1.2
1927	44	—	44	39,290,000	1.1
1928	53	6	59	39,482,000	1.5
1929	40	1	41	39,607,000	1.0
1930	39	1	40	39,806,000	1.0
1923-1930	346	20	366	313,391,000	1.2
1931	30	3	33	40,000,000	0.83

(11)

I also give statistics of lead poisoning for the Commonwealth of Australia for recent years, ending with 1931.

DEATHS FROM LEAD-POISONING, AUSTRALIA—1918-1931

Rate per 1,000,000

Year	Males	Females	Total	Population	Rate
1918-1927	176	29	205	56,338,400	3.6
1928	17	3	20	6,300,000	3.2
1929	16	1	17	6,400,000	2.7
1930	11	3	14	6,442,000	2.2
1931	14	6	20	6,500,000	3.1

(12)

Through the courtesy of the New York State Department of Labor, Division of Industrial Hygiene, I have been furnished with a return of occupational disease statistics for 1931, differentiating cases reported from up-state New York and New York City, showing allowed and disallowed cases.

OCCUPATIONAL DISEASE STATISTICS, NEW YORK STATE, 1931

Section of Compensation Law	Cause	UP-STATE	NEW YORK CITY		
			Allowed	Disallowed	Total
27	Acetic acid	1	—	—	1
—	Acetylene	—	—	1	1
27	Acid-unsp.	2	1	3	6
27	Alkali-unsp.	1	4	2	7
27	Ammonia	1	—	1	2
8	Aniline dye	2	14	1	17
1	Anthrax	3	—	—	3
6	Arsenic	1	—	5	6
24-27	Benzine	4	—	—	4
8	Benzol	—	2	4	6
—3	Brass	1	—	—	1
26	Bursitis	—	—	1	1
17	Caisson	—	1	26	27
—	Calcium carbonate	1	—	—	1
27	Calcium oxide	2	—	2	4
—	Carbon	—	—	2	2
—	Carbon dioxide	—	—	1	1
22	Carbon monoxide	12	2	9	23
—	Carbon tetrach.	3	—	1	4
27	Cement	5	2	3	10
—	Chemical-unsp.	8	—	—	8
—	Gold	3	—	—	3
14	Chrome	12	3	4	19
—	Copper	—	—	1	1
—	Copper-sulfate	1	—	—	1
—	Cyanide	1	—	—	1
27	Derm-unsp.	12	1	20	33
—	Drugs	2	—	—	2
—	Dust-unsp.	1	—	—	1
2-3-4-6	Dust-metal	1	—	2	3
—	Dust-vegetable	3	—	3	6
—8	Dye-fur-unsp.	—	1	7	8
—8	Dye-unsp.	8	—	7	15
27	Flour-dust	2	—	3	5
—	Fluoride	—	—	1	1
—	Fruits	—	2	5	7
—	Furs-unsp.	—	—	—	—

OCCUPATIONAL DISEASE STATISTICS, NEW YORK STATE, 1931—*Continued*

Section of Compensation Law	Cause	UP-STATE	NEW YORK CITY Allowed	NEW YORK CITY Disallowed	Total
—	Gas-unsp.	1	—	—	1
15-24-27	Gasoline	1	5	3	9
—	Glue	2	—	1	3
—	Hair tonic	—	1	—	1
23	Hydrochloric acid	1	2	1	4
23	Hydrofluoric acid	1	—	1	2
9	Hydrogen sulfide	3	—	—	3
—	Infection	6	1	2	9
8	Ink	2	1	—	3
12	Lacquer	5	—	4	9
2-6	Lead-arsenate	10	—	—	10
2	Lead-babbit metal	1	—	—	1
2	Lead-battery	18	6	2	26
2	Lead-color	3	—	2	5
2	Lead-foundry	3	—	1	4
2	Lead-oxide	—	4	—	4
2	Lead-paint	9	16	6	31
2	Lead-smelting	3	—	—	3
2	Lead-solder	—	—	1	1
2	Lead-sulphate	1	—	—	1
2	Lead-metallic	1	2	2	5
2	Lead-unsp.	2	2	4	8
—	Leather	1	—	—	1
4	Mercury	2	—	—	2
7	Methanol	—	4	2	6
—	Methyl bromide	—	1	—	1
9	Metol	—	4	2	6
24-27-15	Mineral Oil	2	1	1	4
15-24-27	Naphtha	2	—	—	2
—	Neurosis-writer's cramp	1	—	—	1
—	Nickel	—	—	1	1
27-10	Nitric acid	1	2	—	3
10	Nitrous oxide	1	—	—	1
—	Novocain	—	—	1	1
24-15-27	Oil-unsp.	4	3	3	10
27	Oxalic acid	1	—	—	1
24-15	Paraffin	—	3	4	7
—	Parasites	3	—	—	3
—	Parasite-ringworm	3	—	10	13
8	Phenol	3	1	1	5
5	Phosphorus	1	—	—	1
—	Plants	5	—	—	5
27	Poisoning	11	—	3	14
27	Poison Oak	2	—	—	2
27	Poison Sumac	1	—	—	1
27	Potassium Hydrox	1	—	—	1
27	Primrose	2	—	—	2
—	Rheumatism	—	—	1	1
9-8	Rubber	5	—	—	5
27	Soap	6	7	13	26
—27	Sodium carb.	2	—	—	2
—	Sodium chlor.	—	—	1	1
7	Shellac	1	—	—	1
8	Shoe-dressing	1	—	—	1
—	Silica	3	—	2	5
—	Spices	—	—	2	2
2-8-12	Spray paint	1	4	—	5
—	Strain	—	—	1	1
—	Sugar	1	—	—	1
9	Sulfides	—	—	1	1
—	Sulfur diox.	1	—	1	2

OCCUPATIONAL DISEASE STATISTICS, NEW YORK STATE, 1931—*Continued*

Section of Compensation Law	Cause	UP-STATE	NEW YORK CITY Allowed	NEW YORK CITY Disallowed	Total
23	Sulfuric acid	5	2	—	7
—	Tuberculosis	—	1	4	5
27	Turpentine	2	3	2	7
—	Typhoid fever	—	—	1	1
—	Ultra Violet Rays	1	—	—	1
—	Unknown	1	—	—	1
27	Varnish	1	—	—	1
—	Vegetables	1	—	3	4
27	Washing solution	3	1	6	10
—	Water	—	—	2	2
	Total	248	110	217	575

	No.	Per cent.
Allowed	110	34
Disallowed	217	66
Up-State	248	43
City	327	57

NOTE: Up-State—reported cases.
New York City—final disposition.

In explanation of the foregoing return for New York, I quote a letter from Mr. J. D. Hackett, Director, Division of Industrial Hygiene, dated June 2, 1932:

It gives me pleasure to send you the report of occupational disease in New York State, 1931. Your attention is called to the fact that this is a composite tabulation. The first column indicates the paragraph in the Schedule to which the poison refers. The third column tabulates *reported* cases; whereas, columns four and five tabulate cases disposed of.

Owing to the fact that we have no representatives in the up-State offices, it has been found impossible to get the end-results in these cases. We do not obtain the end-results in the cases which have been compensated throughout the State and these are found, as you know, in Bulletin 164 of the Division of Statistics and Information of this State.

According to a letter from Dr. E. B. Patton, Director, Division of Statistics and Information, New York State Department of Labor, dated December 5, 1932:

For the year ended June 30, 1930, the compensated lead-poisoning cases in New York State numbered 269, involving compensation awards for 8,110 weeks and $115,146. Five of the cases were death cases and 264 were temporary disability cases. Of the 269 cases, 249 occurred in manufacturing, 13 in construction, 2 in transportation, 4 in service, and 1 occurred in an industry for which we do not have information.

(13)

The following is a brief statement of the cases of deaths from lead-poisoning in the U. S. Navy, 1927-1931, differentiating acute and chronic cases.

LEAD POISONING CASES AND DEATHS—U. S. NAVY, 1927-1931

Year	Average Strength	Acute Cases	Acute Deaths	Chronic Cases	Chronic Deaths
1927	115,316	27	0	7	0
1928	116,047	12	0	3	0
1929	117,388	20	0	3	0
1930	117,453	3	0	4	0
1931	112,767	6	0	0	0

The question is also dealt with in a report on Instructions for Painting and Cementing Vessels of the United States Navy, issued by the Navy Department, July, 1931, which should be consulted for further details.

In further explanation of statistics of the United States Navy, I quote the following from a circular of the Navy Department, dated July 14, 1925, as a matter of record:

> The attention of all navy yards and naval stations is invited to the necessity of using straight air-line hose-masks or hose-hoods where employees are engaged in cutting painted metal by means of oxy-acetylene torches. The particles of vaporized-lead fumes encountered in such work average about one-fifty thousands of an inch in size, and the ordinary respirator affords little or no protection, but may result in an increased risk to the wearer because of the false sense of security. It is also recommended that the paint be scraped or scaled from each side of the plate along the entire length of the cut before the oxy-acetylene operators are started on the job. Goggles with proper absorption must also be used while cutting metal, in order to protect the eyes of the operator from the harmful light-rays of the oxy-acetylene torch, unless proper absorption-lenses for this purpose are provided in the face of the hose-mask.
>
> Enclosure (A) is forwarded as a matter of information and guidance in oxy-acetylene work, where there is danger from lead-poisoning because of vaporized-lead fumes.
>
> It is requested the above be brought to the attention of all concerned as a warning that necessary protection must be provided and used where there is danger from lead-poisoning by vaporized-lead fumes.

I, furthermore, quote as follows with reference to the dangers of lead-poisoning in shipbreaking yards, from circular issued under date of May 7, 1925:

> The attention of the home office has been called to the increasing number of cases of lead-poisoning in shipbreaking yards during the last few years. The industry is carried on in about 70 yards, some of them temporary in character, and varying very much in size. The cases occur among burners or their assistants, employed in cutting lead-painted and red-leaded plates by means of an oxy-acetylene flame, and are caused by the inhalation of lead-fume. The figures for the reported cses of lead-poisoning are as follows: 1 in 1919, 3 in 1920, 7 in 1921, 17 in 1922, 38 in 1923, and 131 in 1924. The number of burners is relatively small in relation to the total number of persons employed in the industry, but at the present time more cases of lead-poisoning are being reported among them than in any other industry, and in view of the grave danger to health, all possible steps should be taken to reduce the risk.
>
> The evidence goes to show that a large number of comparatively young men are exposed to the poisonous effect of lead on the system. Out of the total of 197 cases above mentioned, 118 were under 30 years of age and 53 were under 25. Nearly all the cases are reported as first attacks and suffering from lead colic, and very few from the symptoms of chronic lead-poisoning (wrist-drop and chronic kidney disease). There can be no doubt, however, that with repeated exposure, these disabling symptoms, which do not appear before at least five years' exposure to the cumulative action of lead, would develop in time.
>
> Workers in the cutting of galvanized plates, besides running the risk of lead-poisoning, are subject to the unpleasant symptoms of brass-founders' ague. This form of poisoning, which is due to the presence of zinc, does not—like lead—undermine the constitution, but causes the worker great discomfort and distress, which continues for some hours after he has ceased work, and is an additional reason for taking all possible steps to prevent the inhalation of the fumes.

THE DANGEROUS FUMES

Under high magnification (600 diameters), the fumes from cutting—which experiments by the Government Chemist show is so fine as to be completely held back only by a layer of cotton wool 6 in. thick—is seen to consist of an enormous number of

translucent, colorless particles, chiefly 0.5 of a micron (1/50,000 of an inch), and less in size, discrete, but so dense as almost to be touching, irregular in form, and apparently more flaky than globular. Such microscopical examination indicates that the fumes (1) are particulate in character; (2) may be present and may reach considerable density, though not obvious even in bright sunlight; (3) are much more dense in confined or sheltered places.

There is no doubt that the whole of the symptoms are due to the inhalation of fume which is liberated at the high temperature of the oxy-acetylene flame as it comes into contact with lead-painted surfaces or with red lead. Experiments carried out in the Government Laboratory abundantly prove this and show that the amount of lead breathed daily by an oxy-acetylene burner is about 25 times as great as the minimum dose of lead which, if inhaled daily, will in time cause chronic lead-poisoning. This report is printed as an appendix to the memorandum.

The lead is inhaled in the form of fume through the nostrils or mouth into the lungs, from whence it passes directly into the blood. No support can be given to the view that the poisoning is due to the swallowing of lead particles, by contamination of food or cigarettes with fingers dirty by lead. The manner of absorption (coupled with the amount of lead inhaled) accounts for the rapidity with which the symptoms of lead-poisoning show themselves. Of the 197 cases mentioned, no less than 83 occurred within a year of commencing employment in lead-burning, and 24 of these occurred within the first three months. The fact that in 23 cases during the last four years, second or subsequent attacks have been reported, show the persistence of the poisoning in the system and the tendency to relapse if work is resumed before perfect recovery. Scientific investigation would seem to show that after an attack of acute lead-colic, several months are necessary before all trace of the effects of the lead has disappeared from the red blood-cells.

As stated before, the risk arises chiefly in confined or sheltered places, and on this account the general method of procedure is to "open up," that is, to commence burning on the deck and work downwards, in order to avoid such places. It has not so far been found possible to apply to this process the remedy usually adopted to remove poisonous dust or fumes, namely localized exhaust-ventilation. Nor can the wearing of respirators of the ordinary type be recommended. Owing to the nature of the fume, the ordinary respirator affords little or no protection and, by reason of the false sense of security it gives, may even result in increased risk to the worker. For oxy-acetylene cutting in confined or sheltered places, the only suitable type of respirator is a breathing-apparatus with tube attachment several feet in length, so arranged that the operator breathes fresh air through the free end.

SUGGESTED PRECAUTIONS

The most important single measure that can be adopted to minimize the risk is periodic medical examination at monthly intervals, with power to the surgeon to suspend workmen from employment in or in connection with lead-burning, and this has not been adopted voluntarily in the industry. The following points should be observed:

(1) In order to prevent the employment of persons who may have contracted lead-poisoning elsewhere, there should be a preliminary medical examination of all persons to be taken on as burners.

(2) The visits by the surgeon appointed to carry out the examination should be regular and systematic.

(3) All persons employed on lead-burning, including the helpers assisting the burners by chipping off or otherwise removing the paint along the lines of burning, should be included in the periodic examination.

(4) The surgeon should be authorized, where he considers it necessary, to reexamine any workman in the interval between the periodic examinations.

(5) There should be cooperation between the works managers and the surgeon, with a view to giving effect to the latter's recommendations.

Alternation of employment for all workers engaged in a dangerous process (say a fortnight on and a fortnight off the dangerous process) has been found a very useful means of minimizing the risk of poisoning by dangerous substances, which are cumulative in the action, as in the case of T. N. T. in shell-filling, and should be adopted so far as practicable. It is better for a burner suffering from lead-absorption to be transferred to other work than to be idle.

In some yards, cutters, propelled either mechanically or by hand, have been introduced. From the point of view of preventing lead-poisoning, mechanically-propelled cutters are much to be preferred, as they obviate the necessity of the burner working in such close proximity to the flame. When propelled by hand, the cutter has little advantage, in this respect, over the older method of hand-burning.

EMPLOYMENT OF YOUNG PERSONS

The employment of young persons as lead-burners or as assistants, says the memorandum, is much to be deprecated. The consequences of lead-poisoning to growing lads are likely to be more serious than to adults, and they are more liable to contract the disease since they are less likely to appreciate the risk and the necessity for care.

More general precautions which might be taken include the provision of arrangements for first aid, provision in exposed yards for the men to shelter when not at work, means for drying the clothes when wet, a suitable messroom and washing accommodation.

Finally, constant diligence should be exercised by foremen and managers to see that the men work on the windward side, and in every possible way to minimize the inhalation of fume.

Finally I quote from a circular of the Navy Department, of March 30, 1932, the following interesting observations regarding the prevention of lead-poisoning incident to cutting metal that has been painted.

1. The monthly accident reports for January and February show nine cases of lead-poisoning of gas-cutters and welders.

2. Eight of these cases occurred at one Navy Yard. The other case was due to the employment of a man who already had lead-poisoning, and the acceptance of this man for employment was evidently due to the fact that the medical examination given him did not disclose the fact that he was suffering from lead-poisoning.

3. It is believed that the freedom from lead-poisoning of all but one Navy Yard is due to the fact that these yards see to it that men engaged in cutting or welding metal that has been painted wear air-line hose-masks.

4. It is desired that rules (1), (2) and (3) following be strictly enforced.

(1) All gas-cutters, welders, and helpers when cutting or welding metal that has been painted or galvanized shall wear air-line hose-masks. The particles in the fumes given off by the paint or galvanizing are so small that a filter or canister type of respirator does not afford protection.

(2) Gas-cutters, welders and their helpers shall wear gloves when cutting or welding metal that has been painted, as shall also the men engaged in chipping or scraping paint in advance of the cutters.

(3) These men shall thoroughly wash their hands and faces with soap and warm water before meals.

(4) Cutting of metal that has been painted shall be done in the open air whenever practicable, and work should be started from the windward side.

(5) Paint should be scaled or scraped from a plate on both sides, when practicable, for a width of about 6 inches for the entire length of the cut before cutting of this plate is begun.

(6) As a further precaution, it is recommended that all men doing work of this kind, involving possibility of lead-poisoning, be given a monthly examination by the yard medical department and that all men found to have symptoms of lead-poisoning be transferred to other work, if practicable.

5. A filter, developed and successfully used at Norfolk and Mare Island, to remove oil and water vapor from the yard compressed air, is described as follows:

Body.—The body is a 10" length of 4" pipe or boiler tube.

Base.—The base is a plate welded to one end of the body.

Inlet.—The inlet is a horizontal pipe extending into and nearly across the body as near the base as practicable. The inner end is plugged, and that part of the pipe inside the body is perforated.

Drain.—A drain is fitted near the base.

Cover.—A cover is screwed onto the top of the body. Leads to from one to four masks can be led from suitable fittings on the cover.

Filtering Material.—This consists of a bottom layer of cotton felt, a quantity of charcoal such as that used in gasmasks, and an upper layer of cotton felt.

6. It is desired that careful study be made of the use of the Navy type half-mask, fitted with a filter of the type described, in all work when protection against poisonous or noxious fumes or gases is required, to the end that improvements in the mask or its fittings may be developed.

(14)

I give below copy of a letter dated Cincinnati, Ohio, October 20, 1932, being a communication from Dr. Carey P. McCord, Chairman, Committee on Lead-Poisoning of The American Public Health Association, to members of the Committee. I give this letter as a matter of record.

Under separate cover, I am sending to you, as a member of the Committee on Lead-Poisoning of the American Public Health Association, copy of this year's compilation of bibliographic material. This work has been done at the headquarters of the association, by Miss Clareiss T. Rayne.

Attached hereto is a brief memorandum Committee Report, prepared for your suggestions, alteration, or approval, prior to submission during the Washington Sessions. The manuscripts, representing special items of endeavor in this year's work, making up, in part, the symposium on lead during one session in Washington, may be sent to you as committee members prior to their presentation. Requests have been made for such copies, in order that these may be placed in your hands.

It is the writer's understanding that this committee was appointed for a lifetime of five years. This completes our fifth year of service. Even though automatically we might be discharged, the suggestion is made that this committee's work be terminated.

As the Chairman of this committee will probably not be in attendance at sessions in Washington, owing to a catastrophe in his home, Dr. Hayhurst, a member of the committee, will act as Chairman, as may be required.

Accompanying the letter is the following report, which also is included for future reference. It will be noted that this report includes a recommendation to the effect that, having completed five years of activities, the Committee be terminated.

The members of the Committee on Lead-Poisoning as at present constituted are:

Emery R. Hayhurst, M.D.
Joseph Aub, M.D.
Frederick L. Hoffman, LL.D.
May R. Mayers, M.D.
Adelaide Ross Smith, M.D.
Carey P. McCord, M.D., Chairman.

1. The items of the current year's committee work are the preparation of bibliographic material and abstracts for the year 1931. This work has been done at the headquarters of the association by Miss Clareiss T. Rayne. This bibliographic compilation has been mimeographed, for distribution to those in attendance at the Industrial Hygiene Sessions of A. P. H. A., and a number have been reserved for requests sent in to the Section Secretary and to A. P. H. A. H. headquarters.

2. A report is to be made on deaths in this country from lead-poisoning during 1930 by Dr. Frederick L. Hoffman.

3. A second report is to be made by Dr. Hoffman, dealing with his experience in Germany, England, and possibly Switzerland and Italy, with reference to recent lead-poisoning legislation, and the compensation status thereof as an occupational disease.

4. The program of the committee's work called for compilation of materials on autopsy-findings after lead-poisoning. Responsibility for this compilation was accepted by Dr. Adelaide Ross Smith, but this phase of the report will not be ready for presentation during the coming session.

At the time of the appointment of the Committee on Lead-Poisoning, it was tacitly agreed that the life of the committee should be for five years. During this period it was hoped that every outstanding phase of lead-poisoning might be investigated to the extent of compiling and evaluating all possible publications bearing on these several angles of plumbism. This has been done, which fact is largely to the credit of Dr. Emery R. Hayhurst, Chairman of this Committee for three years, during which time outstanding reports were made. Reports of this committee have been made at the time of A. P. H. A. sessions in Chicago, Minneapolis, Fort Worth, Montreal and Washington. Having completed five years of activity, this committee, in keeping with the intent of those responsible for its creation, suggests its termination.

DEATHS FROM LEAD-POISONING, U. S. REGISTRATION AREA—1930

By Single Years of Life

Age	Number	Total Years	Age	Number	Total Years
Under 1	1	7 mos.	54	2	108
1	3	3 yrs.	55	1	55
2	2	4	56	2	112
3	2	6	57	1	57
17	1	17	58	3	174
27	1	27	59	3	177
28	1	28	60	4	240
29	2	58	61	3	183
30	1	30	62	1	62
31	1	31	63	1	63
32	1	32	64	4	256
34	5	170	67	4	268
36	2	72	68	2	136
38	1	38	69	1	69
42	2	84	70	2	140
43	4	172	71	3	213
44	1	44	74	3	222
45	3	135	77	2	154
46	6	276	78	1	78
47	4	188	80	2	160
48	3	144		99	4840
49	2	98			
50	2	100			
51	2	102	Average age, 48.9 years		
53	1	53	Average age (less 8 children), 53.0 years		

DEATHS FROM LEAD-POISONING, U. S. REGISTRATION AREA—1930

PAINTERS

Age	Number	Total Years	Age	Number	Total Years
27	1	27	56	1	56
29	1	29	58	1	58
31	1	31	59	1	59
34	2	68	60	2	120
36	1	36	61	2	122
42	2	84	63	1	63
43	3	129	64	1	64
44	1	44	67	2	134
45	1	45	69	1	69
46	6	276	70	1	70
47	2	94	71	1	71
48	1	48	74	2	148
49	2	98	77	1	77
50	1	50	78	1	78
51	1	51	80	1	80
53	1	53			
54	1	54		48	2541
55	1	55	Average age, 52.9 years.		

DEATHS FROM LEAD-POISONING—U. S. REGISTRATION AREA—1925-1930

	1925-29	1930		1925-29	1930
Lead-workers	25	3	Carpenters	10	—
Metal-miners	14	2	Laborers	60	9
Painters	349	49	Farmers	22	4
Paint-mixers	8	—	Profession and commercial	29	2
Plumbers	11	1	Misc.	37	7
Potters	1	1	Unknown and retired	34	6
Rubber-workers	—	—	Women	19	2
Electric Stge. Bat.	6	—	Boys under 18	11	4
Printers, etc.	20	5	Girls under 18	7	4
Tin and Coppersmiths	1	—			
Glass-workers	3	—		682	101
Metal-workers	15	2			

PRINCIPAL COMPLICATIONS IN LEAD-POISONING, 1925-1930

	1925-29 Compli-cations	1930 Compli-cations		1925-29 Compli-cations	1930 Compli-cations
Anemia	21	9	Cirrhosis of the liver	15	2
Diabetes	1	1	Peritonitis	4	1
Encephalitis	12	5	Chronic nephritis	72	18
Meningitis	5	2	Acute nephritis	26	3
Spinal diseases	4	1	Other kidney diseases	11	1
Cerebral hemorrhage	37	6	Tumor of the pancreas	1	—
Paralysis	26	3	Uremia	—	3
Brain tumor	1	—	Dropsy	—	5
Endocarditys and Myocarditis	52	15	Alcoholism	—	3
Angina pectoris	5	1	Pleurisy	—	3
Heart diseases	50	24	Rheumatic fever	—	1
Diseases of the arteries	32	1	Neuritis	—	1
Bronchitis	6	—	Gastro-Intestinal	—	1
Pneumonia	37	9			
Congestion of the lung	1	—		420	120
Appendicitis	1	1			

LEAD-POISONING CASES IN GREAT BRITAIN AND NORTHERN IRELAND—1932

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Smelting of Metals	—	1	—	—	—	—	—	1	—	4	3	7	16
Plumbing	—	1	1	1	—	1	—	1	—	—	—	—	5
Shipbreaking	3	—	—	6	7	3	3	3	3	2	—	4	34
Printing	—	1	1	—	—	—	2	—	—	—	—	1	5
Tinning of Metals	—	—	—	—	—	—	1	—	—	—	—	—	1
Other Contact with Molten Lead	—	1	—	—	—	—	4	1	—	2	—	1	9
White- and Red-Lead Works	—	1	—	—	1	—	—	—	1	—	—	1	4
Pottery	—	3*	—	3*	—	—	—	—	—	1*	—	1	8
Vitreous Enameling	—	—	—	—	1	2	—	2	1	—	—	1	7
Electric Accumulator Works	1	2	—	—	2	—	1	2	1	—	2	3	14
Paint and Color Works	1	—	—	—	—	—	—	2	1	1	2	2	9
India-rubber Works	1	—	—	—	—	—	—	1	—	—	—	—	2
Coach and Car-Painting	—	1	—	—	—	—	1	—	—	1	—	2	5
Shipbuilding	—	3	—	—	1	—	—	—	—	—	—	—	4
Paint used in Other Industries	1	—	2	—	—	—	1	—	1	—	—	1	6
Other Industries	—	—	—	1	—	—	4	—	2	2	1	—	10
Painting of Buildings	2	2	1	2	8	4	2	6	7	2	3	4	43
	9	16	5	13	20	10	19	19	17	15	11	28	182
Deaths	1	1	2	1	3	3	1	2	1	1	2	5	23

*1 Female.

LEAD-POISONING, UNION OF SOUTH AFRICA—1912-1930
EUROPEANS ONLY

Year	Population	Deaths from all Causes	Deaths from Chronic Poisoning—Mineral Substances
1912	1,305,200	13,442	2
1913	1,330,100	13,664	6
1914	1,354,900	12,897	1
1915	1,379,700	14,211	—
1916	1,404,600	14,385	—
1917	1,429,400	14,665	1
1918	1,454,100	24,972	—
1919	1,476,400	17,534	—
1920	1,499,900	16,634	1
1921	1,522,600	15,855	1
1922	1,556,200	14,753	—
1923	1,579,700	15,438	—
1924	1,610,800	15,503	1
1925	1,637,500	15,371	—
1926	1,677,500	16,080	1
1927	1,709,000	16,627	1
1928	1,738,900	17,642	—
1929	1,767,700	16,803	2
1930	1,798,600	17,415	1

LEAD-POISONING IN CANADA—1929-1931

Year	Population	Total Deaths	Male	Female
1929	10,016,000	4	4	—
1930	10,195,000	6	5	1
1931	10,363,000	11	9	2

LEAD-POISONING CASES—MASSACHUSETTS GENERAL HOSPITAL—1928-1931

Year	Acute	Chronic	Chronic Industrial
1928	1	1	6
1929	0	0	2
1930	1	0	0
1931	0	2	0

LEAD-POISONING IN NEW JERSEY—1929-1931

	Total Number of Cases	Number of Cases Kind of Disability		
		Death or Permanent Total	Permanent Partial	Temporary
1929	(2) 124	(2) 6	40	78
1930	(1) 169	(1) 3	61	105
1931	(1) 227	(1) 4	152	71

*Figures in parentheses show the number of permanent total disability cases included.

Days Lost (Weighted)

	Total	Death or Permanent Total	Permanent Partial	Temporary
1929	72,312	—	—	—
1930	60,657	18,000	34,802	7,855
1931	128,666	24,000	99,504	5,162

Compensation

	Total	Death or Permanent Total	Permanent Partial	Temporary
1929	$91,490	—	—	—
1930	105,593	$11,829	$74,963	$18,801
1931	217,814	16,946	188,900	11,968

MEDICAL COST

	Total Number Cases Reporting*	Total Medical Cost	Death or Permanent Total	Permanent Partial	Temporary
1929	43	$2,860	—	—	—
1930	(1) 49	15,981	$9,650	$2,562	$3,769
1931	(1) 48	5,882	437	2,862	2,583

*Figures in parentheses show the number of permanent total disability cases included.

DEATHS FROM LEAD-POISONING IN NEW YORK STATE—1921-1932

	Deaths		Deaths		Deaths
1921	18	1925	10	1929	10
1922	8	1926	17	1930	11
1923	25	1927	20	1931	15
1924	13	1928	14	1932	7

NOTE: For additional statistics and observations, see Deaths from Lead-Poisoning, Bulletin U. S. Department of Labor Statistics (No. 426, Washington, D. C., 1927), Deaths from Lead-Poisoning, 1925-1927, U. S. Department of Labor Statistics (No. 488, Washington, D. C., 1929), The Decline in Lead-Poisoning, an address read before the Royal Institute of Public Health, Ghent, Belgium, 1927 (Prudential Press).

PART III

TRANSLATION OF REPORT OF DIRECTOR TZAUT, SWISS ACCIDENT INSURANCE SOCIETY LUCERNE, SWITZERLAND

(Made to the Federal Commission on Lead-Poisoning, May 7, 1929)

The situation regarding lead-poisoning in Switzerland remains much the same as when last reported upon. The statistics for the Institution have been published for the years 1926, 1927 and 1928 and show that the number of cases of this affection is very small. Hence, the conclusion that it is no longer advisable to speak of lead-poisoning as of particular industrial interest. Our investigations show, as a matter of fact, that the cases in which lead-poisoning is erroneously attributed as the cause of disease are still relatively common. It may seem remarkable that during the three years ending with 1928 the number of cases in which lead-poisoning was doubtfully established had diminished and that the number of cases in which such poisoning actually occurred as well as the number in which lead-poisoning was positively denied has increased. This arises out of the fact that the Institution has become much more cautious in its investigations of cases of lead-poisoning, being satisfied that many such reports are erroneous. The diagnosis of lead-poisoning in the meantime has made considerable progress and a more definite conclusion is possible. But even when the presence of lead in the system is established it does not by any means follow that the affections from which the patients suffer are due exclusively or chiefly to this cause. For it is now known that lead may be in the system without pathologic results.

In considering the results of our statistics for 1928, the 16 cases of lead-poisoning justify the view that the situation is no longer seriously disconcerting. This also applies to the small number of serious affections, of which there were only three in three years, and two deaths. The report therefore speaks of the specter of lead-poisoning as an admissible imaginary condition.

Of course, it is said, the fact that lead-poisoning cases and deaths are relatively rare in Switzerland would not justify laxity on the part of the supervising authorities, since the risk is an ever-present one presenting preventive measures of admitted precautions. Such precautions have now been worked out in considerable detail. But the Institution in its efforts in this direction has made no recommendations or issued no orders which could not be practically carried into effect or which were not absolutely necessary. Nothing, it is said, does more harm than to deal with a problem on too theoretical grounds. The Institution has for its chief effort the development of precautionary measures which are both necessary and practicable.

One of the chief problems which has not yet been solved is the question of wet-grinding to prevent the development of dust containing lead. This

will require further study before a working method can be developed which can serve as a model. But supervisory methods must be strictly practicable, in view of the wide distribution of the risk in numerous employments, making such supervision in individual cases extremely difficult.

Another problem is the spraying of paints by compressed air. This method exposes the workman to much greater risks than formerly was the case in the use of paint-brushes. This problem really extends beyond the risk of lead-poisoning, for it includes the risk of other modes of poisoning produced by the spraying process, and possibly even more injurious than the lead-hazard itself. The report quotes the judgment of Professor Dr. Zangger with regard to other risks than paint-spraying, as to which further information is urgently required. Too much emphasis being placed upon lead, it is said, other dangers are obscured.

The question as to whether lead-containing paints are in use in the ordinary painting process is replied to in the affimative by most of the master painters who were reached by means of a questionnaire. As a rule, it is said, most of the lead paint sold in Switzerland is in a moist condition, while paint in powder form is less common and of course considerably much more dangerous. The use of spray methods was admitted by 29 master painters, while two replied that they had not made use of the method, due to the inherent and greater hazards to lead-workers.

The question as regards the prohibition of lead paint for interior painting being feasible and practicable was replied to in the affimative by 181 master painters, but denied by 113 others. In addition thereto 127 industries considered it feasible to use a mixture of lead-containing and lead-free paint, while 121 denied this to be possible.

It is said that other aspects of prophylaxis as regards the lead-poisoning hazard had not been neglected. The medical service of the Institution observes with thoroughness and care the attention which the insured give to early symptoms of lead-intoxication. All such individuals discovered as likely to be suffering from lead-poisoning are medically examined and medically supervised. New methods of treatment have been studied, and every case of lead-poisoning is thoroughly investigated by the chief medical director of the Institution or his assistant.

As regards the important question of substituting lead-free paints for such as contain lead, it is said that thus far the Institution has only concerned itself with zinc-white paint, and so is not prepared to render a final judgment. The opinion of technical experts on these questions is widely divided and requires in all cases more experience. Whatever the ultimate judgment may be, it goes without saying that the final agreement on prohibition should be absolute, unconditional, or nothing of the kind should be attempted. It is apparently held that it would be difficult to make a majority of paint-using industries conform to complete prohibition. The question of a partial adherence to prohibition has involved considerable criticism. It is felt that any partial prohibition would lead to neglect of precautions, on the assumption that the risk has practically been done away with. In other words, the Institution believes that prohibition should be

unconditional, to justify the complete elimination of the lead-danger and not give rise to false apprehensions. The Institution is opposed to any precautionary measures which are not unquestionably completely effective in the case of their adoption. The Institution, therefore, believes that a partial prohibition would probably do more harm than good. It further believes that in the majority of instances it would not be possible to avoid a mixture for interior painting of lead-free paint, with lead-containing paint used for exterior painting. This would lead to paint employees in indoor painting to assume that the paint was lead-free and that must not be the case. The Institution therefore studied the possibility of substitution for lead-containing paints such as are free from lead not with respect to partial prohibition but with respect to total prohibition. They have reports from the leading industries to the effect that for all practical purposes lead-free paint can be used as a satisfactory substitute for lead-containing paint. But the discussion on this question is treated partially and one has to be extremely careful to arrive at a conclusion. Technical studies of the value of lead-free paint as to durability, etc., would require several years for their effective solution.

A large paint industry in Paris has communicated to the Institution the information that it has not used lead-containing paint for many years, either for interior or exterior painting, and that, therefore, it is fully convinced of the practical usefulness of lead-free paint for such purposes. This industry uses zinc paint exclusively. It is the intention of the reporter to investigate this matter personally in Paris and report thereon will be forthcoming in due course.

Attention is called to the fact that in France the use of lead-containing paint has been prohibited since January, 1926, but it is very difficult to ascertain how far this prohibition is actually carried out in practise. Inquiries upon this question have resulted in very conflicting evidence.

The Institution is of the unconditional opinion that the question should be thoroughly and impartially investigated and that whatever recommendations are made and adopted should be thoroughly effective in their end results. It plans to make a number of technical studies of the durability of lead-free paint. Summarizing the report it is said that the Swiss Accident Insurance Society will not enter into any agreement as to partial prohibition, while it will employ all possible methods to control the existing situation by means of effective regulations.

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