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WOMEN'S BUREAU
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THE OCCURRENCE AND PREVENTION OF OCCUPATIONAL DISEASES AMONG WOMEN

1935 TO 1938

UNITED STATES DEPARTMENT OF LABOR
FRANCES PERKINS, Secretary
WOMEN'S BUREAU
MARY ANDERSON, Director

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The Occurrence and Prevention of Occupational Diseases Among Women

1935 TO 1938

By

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UNITED STATES DEPARTMENT OF LABOR,
WOMEN'S BUREAU,
Washington, February 8, 1941.

MADAM: I have the honor to transmit to you a report on the Occurrence and Prevention of Occupational Diseases Among Women, 1935 to 1938. The situation it shows indicates the continuing need for watchfulness and constant study of materials and substances used in industry. Such study is of particular importance at a time when new processes are developing and new substances being used.

The bulletin follows Nos.114 and 147 of the Bureau as one of a regular series of reports summarizing State records and special studies in this field. It is hoped that its publication will further stimulate the State collection and reporting by sex of data on industrial diseases.

I greatly appreciate the courtesy of the various States in making available material which in a number of instances was prepared from unpublished data especially for this use.

The research was done and the report written by Margaret T. Mettert of the Research Division of the Women's Bureau.

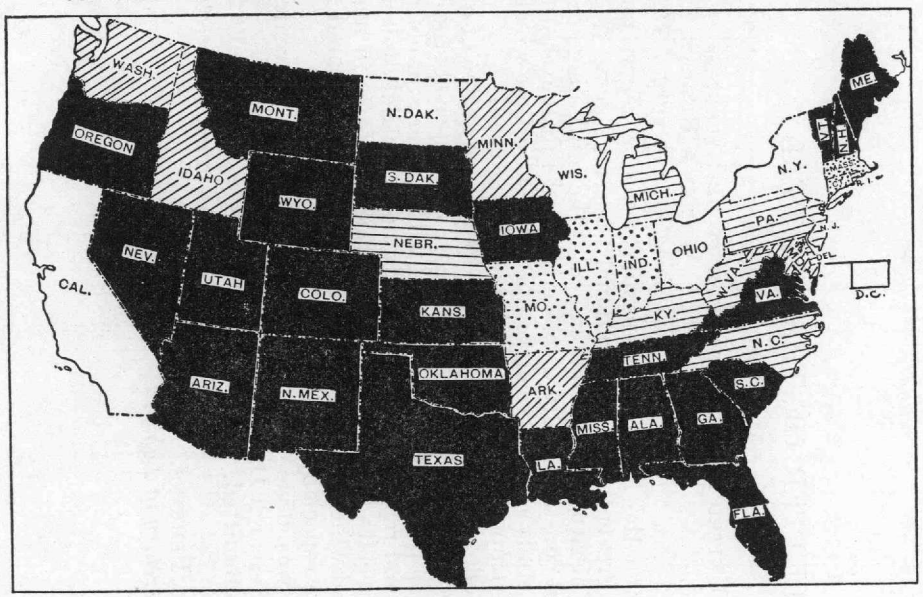
Respectfully submitted.

MARY ANDERSON, *Director.*

Hon. FRANCES PERKINS,
Secretary of Labor.

Workmen's Compensation for Industrial Diseases

Compulsory and Elective Coverage in Private Employment, January 1940



Complete coverage with compulsory compensation law.

Complete coverage with elective compensation law.

Limited coverage with compulsory compensation law.

Limited coverage with elective compensation law.

No industrial disease coverage.

THE OCCURRENCE AND PREVENTION OF OCCUPATIONAL DISEASES AMONG WOMEN, 1935 TO 1938

Part I.—INTRODUCTION

Occupational diseases are giving serious concern to all who are interested in the health of women in industry and in the industrial-injury problem in general. Practically all industries present some dangers of health impairment. Where protective and preventive measures have been neglected, industrial diseases have proved extremely costly. On the other hand, inclusion under the compensation laws of injury by disease, combined with adequate programs for investigating reported cases, has made possible reductions in the numbers affected and reductions in the resulting costs.

There is evidence that women need special protection from certain substances in use in industry, in some cases because of the susceptibility of women to the resulting disease, in others because of the effect of the substance on the health of children. Such common industrial poisons include among others lead and various lead compounds, benzol and its derivatives, and carbon tetrachloride. There is some indication also that women are constitutionally more susceptible to illness than men are. The National Health Survey found that for both workers and nonworkers women experienced an illness rate higher than that for men.[1]

SUMMARY

Scope.

Nine State agencies furnished information for this report, the third of a series, as to the numbers of women injured by occupational diseases. The period covered is the 4 years 1935 to 1938 or some part of that period. In three States reports were from State health departments, in four they were from compensation authorities, in two from divisions of the State labor department. The States are these:

Connecticut.	Michigan.	New York.
Illinois.	Minnesota.	Ohio.
Massachusetts.	Missouri.	Wisconsin.

The reporting of these nine States represents a considerable increase over the five furnishing data for 1932 to 1934,[2] but considering the great importance of the subject they constitute far too small a proportion of all the States.

A number of State health departments have engaged in surveying the potential disease hazards of industry, and three—Pennsylvania, Illinois, and Iowa—have given special consideration to the hazards to which women are exposed. Material from these States and from a

[1] U. S. National Institute of Health. Preliminary reports, National Health Survey, Sickness and Medical Care Series, Bull. 7, Illness Among Employed and Unemployed Workers. 1938. p. 3.

[2] Women's Bureau Bull. No. 147, Summary of State Reports of Occupational Diseases With a Survey of Preventive Legislation, 1932 to 1934. 1936.

number of special studies of industries has been summarized in order to show the disease hazards to which women are exposed and the need for an integrated disease-prevention program in every State.

Number of women affected.

In the most recent year reported, women's proportion was greater among the occupational-disease cases than among all manufacturing employees in four of the seven States for which such information is available, as is clear from the following summary. In every State, however, women's proportion was less among disease cases than among workers in all occupations taken together. (See p. 8 for further analysis.)

	Percent women comprised in—		
	Disease cases	*Manufacturing occupations*	*All occupations*
Connecticut	15	18	26
Illinois	16	12	22
Massachusetts	21	21	29
Michigan	3	7	19
New York	21	16	26
Ohio	20	10	21
Wisconsin	16	11	19

The numbers reported reflect State differences in compensation laws and in the recognition of various diseases as occupational, as well as employment differences.

The cost of compensation.

Compensation may be large in individual cases of occupational disease, but the total in every State collecting comparative data is a very small part of compensation for all injuries. In each of three States with compensation laws covering all occupational diseases, the cost of their compensation was less than 5 percent of the compensation for all industrial injury.

Average compensation for women injured by diseases was less than that for men in both temporary- and permanent-injury cases, reflecting the lower wages of women as well as the fact that ordinarily they were less seriously disabled.

Extent of disability.

Disabilities of women usually were of a temporary nature. However, in one of the four States giving this type of information 12 of the 63 women reported in 1938 suffered injuries of a permanent character and in two States fatal cases were reported.

Age distribution.

Large proportions of the women injured by disease—from just over one-half to seven-tenths in the various States—were less than 30 years old; in fact, from 7 and 8 percent in two States to 25 and 36 percent in two others were less than 20 years of age.

	Percent of women—	
	Under 30 years	*Under 20 years*
Connecticut	70	25
Illinois	52	8
Massachusetts	63	36
Minnesota	57	17
New York	58	13
Ohio	56	7
Wisconsin	54	13

Industrial distribution.

The largest proportions both of men and of women affected were in manufacturing occupations, but this proportion generally was smaller for women than for men. Large proportions in the case of women are found in almost all States in service, followed in importance by the trade occupations.

Distribution by disease.

Skin infections (dermatoses) were the most common type of disease reported to men and women in each State, and, as the following summary indicates, they comprised an especially large part of the women's total.

	Percent dermatoses were of all disease cases	
	Men	*Women*
Connecticut	56. 6	74. 6
Illinois	37. 2	74. 6
Massachusetts	69. 0	95. 0
Michigan	27. 4	(1)
Minnesota	(2)	72. 8
New York	47. 2	57. 1
Ohio	60. 0	66. 2
Wisconsin	40. 7	65. 1

[1] Not computed; base less than 50.
[2] Not available.

Reports from Wisconsin show that the working time lost by the women compensated for dermatoses resulting from their work averaged 19 days.

Cases from New York and Ohio records show that serious and even permanent disability may result from skin infections.

Analysis of the agents resulting in the 734 Ohio cases shows that cleaning agents rank first in number of cases, followed by chemicals not specified, then dyes, then vegetables, fruits, and plants. In every State a great variety of substances were listed, cleaning agents being the most common except in the canning centers of Wisconsin and Minnesota, where vegetables and fruits ranked first.

The importance of continued investigation of new processes and substances has been demonstrated in recent years with the occurrence of serious skin infections resulting from the use of chlorinated naphthalene in the manufacture of electrical condensers and wire and cable insulation. A New York report found 6 serious cases, 4 of them women, in two plants employing 31 workers.

Repetitive motion over an extended period of time may result in various abnormal conditions, including tenosynovitis, ganglions, felons, neuritis, and bursitis. Cases of women were reported in six States, amounting to from one-tenth to one-third of all women's occupational diseases. Repetitive action required by numerous manufacturing and clerical occupations was the most common source of tenosynovitis in Ohio reports. Kneeling required by scrubbing and cleaning was the usual cause of bursitis.

Lead-poisoning cases among women workers were reported in five States, and considerable numbers of men were injured through work with lead in each of the seven States reporting. Occupations in which women's cases occurred included glass decorating, printing, assembling electrical apparatus, and the manufacture of clocks and watches, batteries, toys, metal goods, and rubber.

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Volatile-solvent poisoning cases among women were reported in a few cases in these States. Reports from a special study of 89 individuals exposed to benzol in Massachusetts included 19 women. Two of these women died as a result of the exposure to benzol and 14 others showed abnormal blood conditions. The study brought out the fact that such poisoning is likely to cause a different type of disease among women from that among men, and that disease may appear long after exposure has ceased.

Other systemic poisoning cases among women resulted from contact with radium, hydrofluoric acid, corn, dyes, and gas fumes.

Chrome ulcerations were reported as occurring to women in the metal-stamping industry of Ohio.

Respiratory diseases, including silicosis, tuberculosis, pneumoconiosis, and asbestosis were attributed to industrial sources in the case of several women.

Contagious diseases resulting from the nature of the occupation are especially common among nurses, though cases are reported among waitresses, teachers, household employees, and hospital attendants. Such diseases are likely to be compensated only in States having compensation laws covering all diseases of industry. They made up a seventh of all women's cases in Wisconsin in 1938.

Evaluation of potential hazards.

Three States, Pennsylvania, Illinois, and Iowa, have made special studies of the exposures of women in the industries of the State. Evidence is that even in the least industrialized States there are occupational-disease potentialities for women as well as men that require constant watchfulness. In many industries organic dusts constitute the most common hazard to which women are exposed. Abnormalities of temperature and humidity and repetitive motion also are among the common hazards to women. Women are exposed to a great variety of harmful materials, and the indications from these studies are that in many plants the health of workers is inadequately safeguarded against such hazards.

Industry studies made by Federal and State agencies in recent years include a number of important woman-employing industries and show the extent and effect of exposure of women. These studies include the manufacture of pottery, asbestos, shoes, and wood heels; dry cleaning; and the nursing profession.

Progress in prevention.

Compensation laws covering occupational disease doubled in number in the period 1935 to 1939. In 24 States, the District of Columbia, three territories, and two groups compensated by the Federal Government were occupational diseases compensable at the close of 1939:

Arkansas.
California.
Connecticut.
Delaware.
Idaho.
Illinois.
Indiana.
Kentucky.
Maryland.
Massachusetts.
Michigan.
Minnesota.
Missouri.
Nebraska.
New Jersey.
New York.
North Carolina.
North Dakota.
Ohio.
Pennsylvania.
Rhode Island.
West Virginia.
Washington.
Wisconsin.
District of Columbia.
Federal employees.
Longshoremen.
Hawaii.
Philippine Islands.
Puerto Rico.

Three States—Illinois, New York, and Ohio—changed from listing the diseases covered to an all-inclusive coverage of occupational diseases.

Industrial-hygiene divisions have been established in more than half the States and consideration has been given to the need for such an agency in a number of the others.

Independent agencies, including organizations of employers, organizations of employees, and private foundations, have played an important part in the research and prevention program of recent years.

Part II.—THE OCCURRENCE OF OCCUPATIONAL DISEASES AMONG WOMEN, 1935 TO 1938

Comparability of data.

For the convenience of agencies interested in the prevention of occupational diseases among women, this report brings together information from the States that report separately by sex the occurrence of such diseases. While the statistical data are not comparable from State to State, they indicate the exposure of women to harmful materials and conditions, and they bring out certain pertinent facts about the age and industrial distribution of the women affected. To add to the value of the discussion, special studies of the occurrence of certain diseases have been considered, together with cases tabulated in State reports.

Chart I is included here for the purpose of emphasizing the lack of comparability among the States. Not only do some tabulations cover all reported cases and others only those compensated or compensable, but some States base their reports on a limited list of diseases and others receive and tabulate reports of all diseases of industry. The chart shows, too, that the tabulation was issued in four States by the authority handling workmen's compensation cases and in three by the State department of health, while the remaining reports are the result of investigations by State departments of labor, the division of industrial safety in one case and the division concerned with women and children in the other. In one State the health department tabulated not only the cases reported to that agency but the compensated cases not so reported.

CHART I.—*Type and source of statistics tabulated, by period covered and by State*

State	Years included [1]	Cases tabulated	Source
Connecticut	1935, 1936, 1937, 1938.	Cases reported to Bureau of Occupational Diseases by physicians and cases compensated under blanket compensation law but not reported.	Connecticut Department of Health. Unpublished data from Bureau of Occupational Diseases.
Illinois	1935, 1936, 1937, 1938.	Cases closed during year (all compensation due has been paid). Blanket law since Oct. 1, 1936. Brief schedule of diseases prior to that date. (More than 7 days' disability.)	Illinois Department of Labor. Division of Statistics and Research. Cost of Industrial Accidents for the years 1935, 1936, 1937, 1938.
Massachusetts	Years ending Nov. 30, 1935, 1936, 1937, 1938.	Cases investigated by the Division of Industrial Safety.[2]	Annual reports of the Department of Labor and Industries, Division of Industrial Safety, for the years ending November 30, 1935, 1936, 1937, 1938.
Michigan	Year ending Nov. 1, 1938.	Cases reported. All occupational disease, whether compensable or not, to be reported. (Scheduled list of diseases compensable.)	Michigan Department of Health. One year of occupational-disease reporting in Michigan.

[1] Calendar years unless otherwise indicated.
[2] Not all tabulable cases occurring are separated by sex. The cases investigated by the Division of Industrial Safety are about one-third of the total tabulable cases.

CHART I.—*Type and source of statistics tabulated, by period covered and by State*—Continued

State	Years included	Cases tabulated	Source
Minnesota [3]	1935 to 1938, inclusive, combined.	Cases reported. (Scheduled list of diseases compensable.)	Unpublished data from Minnesota Industrial Commission, Division of Women and Children.
Missouri [4]	1935, 1936, 1937, 1938.	Cases involving medical expense reported by employers who make written election to come under compensation law with regard to occupational diseases.	Annual reports of the Missouri Workmen's Compensation Commission for the statistical years 1935, 1936, 1937, 1938.
New York	1936, 1937	Closed cases (cases decided to be compensable). Blanket law since 1935. (More than 7 days' disability.)	Unpublished data from New York Department of Labor, Disivion of Statistics and Information.
Ohio	1935, 1936, 1937, 1938.	Cases reported by physicians. All diseases reportable, though schedule of compensable diseases in effect 1935 to 1938. Amendment of 1939 made all occupational diseases compensable after 7-day waiting period.	Ohio Health News. Also unpublished reports from Ohio Department of Heath, Division of Hygiene.
Wisconsin	1938	Compensable cases settled. (More than 3 days' disability.)	Industrial Commission of Wisconsin, Statistical Department. (Mimeog.)

[3] Information for women only.
[4] Missouri data have not been included in the following analyses because of the small number of employers electing to be covered by the compensation act with reference to diseases of industry.

Effective occupational-disease prevention, like accident prevention, requires increasing standardization of statistics so that the extent of progress may be measured.[1]

OCCUPATIONAL DISEASES TABULATED BY SEX

Extent of data.

The nine States tabulating occupational-disease data by sex during the period covered by this report comprise almost twice the number of States (five) that have made such analysis in the past.[2] All the reports are from States having in effect compensation laws that cover occupational diseases, though many other States require reporting of such diseases to some State agency. This demonstrates again the way in which compensation laws may underline the need for prevention. Only when these injuries are paid for by industry does it become possible to collect data as to their occurrence and to put into effect methods for preventing recurrence.

Several of the States regularly making a tabulation by sex of the numbers injured by disease have increased the data available. Chart II summarizes the types of information tabulated by the nine reporting States. The increased information reported is indicated by the following:

	Number of States reporting in the period—	
	1935–38	*1932–34*
Age of injured	7	4
Industry	6	3
Type of disease	8	4
Extent of disability	5	1

[1] U. S. Bureau of Labor Statistics, Bull. No. 276, Standardization of Industrial Accident Statistics, 1920. and Bull. No. 667, Manual on Industrial-Injury Statistics, 1940.
[2] See Women's Bureau Bulls. No. 114, p. 6, and No. 147, p. 2.

CHART II.—*Years for which data of various types are reported, by State* [1]

State	Years for which data are reported							
	Number of cases	Type of disease	Age	Industry	Occupation	Race	Extent of disability	Cost of compensation
Connecticut	1935 1936 1937 1938	1935 1936 1937 1938	1935 1936 1937 1938	1935 1936 1937 1938	1935 1936 1937 1938			
Illinois	1935 1936 1937 1938						1935 1936 1937 1938	 1938
Massachusetts	1935 1936 1937 1938	1935 1936 1937 1938	1935 1936 1937	1935 1936 1937	1935 1936 1937		1935 1936 1937	
Michigan	[2] 1938	1938				1938		
Minnesota [3]	1935–38	1935–38	1935–38	1935–38	1935–38		1935–38	1935–38
Missouri [4]	1935 1936 1937 1938						1935 1936 1937 1938	1935 1936 1937 1938
New York	1936 1937	1936 1937	1936 1937	1936 1937	1936 1937			
Ohio	1935 1936 1937 1938	1935 1936 1937 1938	 1937 1938	1935 1936 1937 1938	1935 1936 1937 1938	 1937 1938		
Wisconsin	1938	1938	1938	1938	1938		1938	1938

[1] For source and cases tabulated see chart I.
[2] First year compensation law effective.
[3] Information for women only.
[4] Only for employers electing to be covered by the act. Not included in analyses following, because of small number.

Number of cases by sex.

Table 1 gives the number of cases of occupational disease reported by sex and the percentage women form of the total, by State and year.

Lack of data on the hours of exposure makes it difficult to analyze with any degree of accuracy the statistics showing number of persons injured by occupational disease. Nevertheless, it is possible to give a general background for the changes apparent from year to year in each State. The increase in 1937 in Illinois and New York reflects the broadened scope of the compensation laws.[3]

Occupational disease varies less directly than other injuries with employment changes, due to the fact that diseases frequently continue to develop after the exposure has ended. In Ohio the marked increase from 1936 to 1937 was due not so much to the addition of silicosis to the list of compensable diseases as to an unusual number of dermatitis claims and to outbreaks of lead poisoning in three plants. The year 1938 brought a drop from 1937 in total number of cases in each State giving comparable statistics for earlier years.

The number of women affected is by no means negligible. In Ohio the proportion of women is practically equal to their proportion in the

[3] See p. 44. See also Women's Bureau Bull. No. 147, p. 8.

working population, and in New York and Wisconsin it is not appreciably less. In all cases the percentage women form of those injured by the diseases of industry is much greater than the percentage they form of the total injured by other causes.

In Michigan, where the proportion of women among these cases is the lowest in any State, women comprise about one-fifth of the gainfully employed. There is no accounting for the very small number and proportion of women affected by occupational disease unless, in this first year of the law's application, women's cases are not so completely reported as men's. The Michigan bulletin states that reporting is far from complete and that physicians are unduly guided in their reporting by the schedule of compensable diseases. Only 3 of the 1,008 acceptable reports did not correspond to this schedule.

TABLE 1.—*Number of occupational-disease cases in States that tabulate data by sex, 1935 to 1938* [1]

State [2]	Year [3]	Occupational-disease cases			
		Total	Men	Women	
				Number	Percent of total
Connecticut	1935	344	305	39	11.3
	1936	401	349	52	13.0
	1937	423	377	46	10.9
	1938	357	305	52	14.6
Illinois	1935	371	338	33	8.9
	1936	309	291	18	5.8
	1937	539	466	73	13.5
	1938	402	339	63	15.7
Massachusetts	1935	290	242	48	16.6
	1936	229	180	49	21.4
	1937	300	230	70	23.3
	1938	161	128	33	20.5
Michigan	1938	1,008	965	34	3.4
Minnesota [4]	1935–38	----------	----------	114	----------
New York	1936	984	805	179	18.2
	1937	1,414	1,122	292	20.7
Ohio	1935	1,416	1,128	288	20.3
	1936	1,501	1,253	248	16.5
	1937	1,730	1,427	303	17.5
	1938	1,382	1,112	270	19.5
Wisconsin	1938	652	546	106	16.3

[1] Refer to chart I (p. 6) for type of case tabulated and source of statistics.
[2] Exclusive of Missouri; see footnote 4, chart I.
[3] Calendar year, except in Massachusetts and Michigan. See chart I.
[4] For women only, and over the 4-year period.

The cost of compensation.

Information about the cost of compensating the occupational diseases of women is available from Illinois and Wisconsin, where only compensated cases are tabulated. Such data are published by New York for all occupational-disease cases, with no breakdown of costs by sex. This information is discussed in connection with the various diseases affecting women in the sections following, but the main facts about the costs of these disabilities may be briefly summarized here.

The cost of occupational-disease compensation is a very small fraction of the total cost of injury compensation, as the following shows:

	Percent cost of compensation for occupational disease was of cost of all industrial injuries
Illinois (1938)	1. 5
New York (1937)	1. 3
Wisconsin (1938)	4. 4

Each of these three States has an all-inclusive disease-compensation law. Every disease for which industry is responsible is covered by the act, yet cost of coverage is a very minor part of total compensation costs. Those States that fear passage of complete coverage on the basis of costs should consider the experience of these States.

The total cost of compensating the 106 women to whom awards were made in Wisconsin in 1938 amounted to $9,510, or less than 6 percent of all occupational-disease-compensation costs. The average compensation paid women was $90, as compared to an average of $293 for male cases. Cost ranged in the 106 women's cases from $2 in a chemical-poisoning case and a case of neurasthenia to $3,940 in a benzol-poisoning case.

Twenty-one of these 106 cases were caused by diseases to which the general public is exposed and which would not be compensated under a schedule law, that is, a law in which specific diseases only are covered. Borne by the individual, the cost frequently might be unbearable; borne by industry, it is a minor item in the total. These 21 cases and their costs are as follows:

Disease	*Number of cases*	*Compensation paid*
Total	21	$2,947
Neurasthenia	1	2
Neuritis	1	18
Sciatica	1	5
Chickenpox	1	51
Measles	3	67
Mumps	3	112
Scarlet fever	4	325
Trench mouth	1	144
Tuberculosis	1	983
Undulant fever	1	994
Sore throat	1	114
Systemic infection	1	31
Heat prostration	2	101

In Illinois a correlation of extent of disability with cost of compensation shows that in 1938 the average cost of compensating diseases resulting in only temporary disability was about $92 for men, $55 for women. In permanent partial cases, compensation for men averaged $487, for women $213. Women whose injuries were temporary were disabled an average of 12 weeks as compared with 8 weeks for men's temporary cases; cases having permanent effects disabled women 21 weeks as compared to 38 weeks in male cases.

These data may be summarized as follows:

	Men			Women		
	Fatal and permanent total	Permanent partial	Temporary	Fatal and permanent total	Permanent partial	Temporary
Number of cases	17	147	175		12	51
Average compensation	$1,682.8	$487.1	$91.9		$212.8	$55.1
Average weeks' disability		37.5	7.7		20.5	11.5

The cost of certain occupational diseases has provided the stimulant necessary to prevention. Wisconsin found that the high cost of silicosis in iron mines, foundries, and granite works provided a tremendous urge toward prevention. The possibility of complete elimination of the disease even in these most hazardous industries is apparent. Industry is investing large sums to bring the dust count below the point of dangerous concentration, and Wisconsin statistics show a steadily declining number of silicosis cases as a result.[4]

Extent of disability resulting from occupational diseases.

There are few data on the final results of cases occurring. The summary following (table 2) indicates the reporting of extent of disability resulting from these diseases in the 4 years.

No fatality was reported for women in either Illinois or Wisconsin in 1938. Massachusetts reported one fatality among women in that year—a girl who had been working with a benzol cement for about 6 months in a plant making crepe soles for shoes and who died as a result of the benzol exposure.[5] In Minnesota a woman employed in canning died of corn poisoning. Illinois closed 12 cases involving permanent disability to women, about a fifth of all women's cases closed in 1938. Wisconsin reported 2 cases of permanent disability among the 106 women affected by diseases in the year.

TABLE 2.—*Extent of disability of men and women injured by occupational disease, 1935 to 1938* [1]

State and sex	1935			1936			1937			1938			
	Total	Fatal	All other	Total	Fatal	All other	Total	Fatal	All other	Total	Fatal	Permanent	Temporary
Illinois:													
Men	338	26	312	291	12	279	466	8	458	339	[2] 17	147	175
Women	33	0	33	18	3	15	73	0	73	63	[2] 0	12	51
Massachusetts:													
Men	242	5	237	180	9	171	230	14	216	128	9	119	
Women	48	0	48	49	1	48	70	0	70	33	1	32	
Minnesota: [3]													
Women										[3] 114	1	0	113
Wisconsin:													
Men										546	[2] 13	16	517
Women										106	[2] 0	2	104

[1] For source of data see chart I.
[2] Includes permanent total.
[3] Reported in 1938 for 4 years combined but only for women.

[4] Safety Engineering, August 1936, pp. 82 and 83.
[5] Massachusetts Department of Labor and Industries, Annual Report for the Year Ending November 30, 1938, pp. 13 and 126.

Age distribution by sex.

Cases of women are reported in every age group from less than 20 up to 60 years, and in three States there were cases reported of women past the age of 60. Nevertheless, the outstanding fact about the ages of women having industrial diseases is their concentration in the age groups under 30, due primarily to the fact that larger proportions of employed women than of employed men are so young. In the various reporting States from 52 to 70 percent of the women with industrial diseases were less than 30 years old, though roughly half the employed women in each State were in such age group. The comparable proportions of men having industrial illnesses ranged from 32 to 42 percent. However, the degree to which women are remaining in industry is to some extent reflected in the numbers of older women who suffer from occupational diseases.

A marked difference exists between men and women in the proportion of cases less than 20 years old, again attributable largely to the fact that youth characterizes employed females more generally than employed males. In the four States reporting for both men and women, the percentages under 20 were as follows: [6]

	Men	*Women*
Connecticut	2	25
Illinois	2	8
Massachusetts	9	36
Ohio	5	7

The evidence points to the need of special efforts toward the prevention of disease among young employees.

Table 3 details the State figures by age group.

TABLE 3.—*Occupational-disease cases of men and of women according to age group, various periods of 1935–38, by State* [1]

Age group	Connecticut (4 years ended Dec. 31, 1938)		Illinois (1938)		Massachusetts [2] (3 years ended Nov. 30, 1937)		Minnesota [3] (4 years ended Dec. 31, 1938)	New York [3] (2 years ended Dec. 31, 1937)	Ohio (2 years ended Dec. 31, 1938)		Wisconsin [3] (1938)
	Men	Women	Men	Women	Men	Women	Women	Women	Men	Women	Women
Total	1,336	189	339	63	531	165	113	471	2,539	573	106
Not reporting age	966	132	42	1	-----	-----	17	35	121	30	3
Total reporting age	[4] 370	[4] 57	297	62	531	165	96	436	2,418	543	103
Under 20 years	2.1	24.6	2.0	8.1	9.4	35.8	16.7	12.8	5.2	7.0	12.6
20 to 29 years	31.1	45.6	30.0	43.5	31.8	27.3	40.6	45.2	37.1	49.0	41.8
30 to 39 years	[5] 23.8	[5] 21.1	27.9	22.6	22.6	23.0	23.9	21.3	22.5	22.1	21.4
40 to 49 years	[6] 43.0	[6] 8.8	19.9	19.4	20.5	11.5	14.6	15.6	18.7	16.0	16.5
50 to 59 years	-----	-----	15.5	6.5	9.2	2.4	[7] 4.2	4.4	11.7	4.6	6.8
60 years and over	-----	-----	4.7	-----	6.4	-----	-----	.7	4.9	1.3	1.0

[1] For source of statistics see chart I.
[2] Age groups: Under 21; 21 to 30; 31 to 40; 41 to 50; 51 to 60; 61 and over.
[3] Comparable data for men not available.
[4] Age data available only for cases reported by physicians.
[5] Age group is 30 to 40.
[6] Age group is 41 and over.
[7] Age group is 50 and over.

[6] In Massachusetts, includes 20 years.

Industrial distribution of disease cases.

Manufacturing is the source of an appreciably larger proportion of the industrial-disease cases of men than of those of women. The service industries and trade ordinarily are more important among women than among men.

Within the manufacturing group the marked differences among States follow to some extent the differences in mechanical development. It is not surprising to find that in Massachusetts two in every five women reporting disability caused by disease were engaged in the manufacture of shoes and other leather products, nor to find New York textile and clothing industries reporting more cases of women than any other manufacturing group. A third of all women reported in Minnesota worked in the processing of foods, chiefly in canneries. This industry accounted, too, for the largest group of Wisconsin women who suffered from diseases of industry. Metals, machinery and vehicle manufacture, ranked first in number of cases of both men and women in Connecticut and Ohio.

In the period before 1935 chemical manufacture, particularly the making of ammunition, accounted for over a fifth of the women's cases in Connecticut.[7] In the years since 1934 this industry has not had a single case among its women workers, an example of the results that may be expected to follow complete reporting and a preventive program. Similarly, over a period of 20 years the application of high standards of reporting and prevention has made itself felt in a reduction of diseases occurring in the Ohio rubber industry.[8]

Of the service industries, hotels and restaurants account for most cases in four States; beauty parlors report a larger number of women's cases in Connecticut.

The later discussion of the types of disease affecting working women as a result of their occupations will show more detail as to the industries in which these diseases occur.

[7] Women's Bureau Bull. No. 147. Summary of State Reports of Occupational Diseases, 1932 to 1934, p. 11.
[8] Women's Bureau Bull. No. 114. State Reporting of Occupational Disease, pp. 58 and 59.

TABLE 4.—*Occupational-disease cases of men and of women according to industry, 6 States, 1935 to 1938* [1]

Industry	Connecticut (1935–38, 4 years)				Massachusetts (1935–37, 3 years)				Minnesota [2] (1935–38, 4 years)		New York [2] (1936–37, 2 years)		Ohio (1935–38, 4 years)				Wisconsin (1938 only)			
	Men		Women		Men		Women		Women		Women		Men		Women		Men		Women	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total reporting	1,237	100.0	176	100.0	595	100.0	157	100.0	114	100.0	471	100.0	4,880	100.0	1,106	100.0	546	100.0	106	100.0
Manufacturing and mechanical	1,146	92.6	137	77.8	580	97.5	153	97.5	63	55.3	227	48.2	4,224	86.6	790	71.4	340	62.3	54	50.9
Asbestos	22	1.8			6	1.0	2	1.3												
Chemicals	52	4.2	6	3.4	25	4.2	3	1.9	1	.9	11	2.3	247	5.1	14	1.3	12	2.2		
Clay, glass, and stone	10	.8			1	.2					4	.8	269	5.5	50	4.5	18	3.3		
Construction	196	15.8	4	2.3	20	3.4							222	4.5			98	17.9		
Electrical apparatus and supplies	80	6.5	18	10.2	18	3.0	18	11.5	1	.9	16	3.4	250	5.1	37	3.3	2	.4	3	2.8
Food, beverages, and tobacco	35	2.8	15	8.5	21	3.5	13	8.3	37	32.5	45	9.6	300	6.1	88	8.0	52	9.5	30	28.3
Metals, machinery and vehicles	435	35.2	39	22.2	113	19.0	13	8.3	3	2.6	19	4.0	1,877	38.5	202	18.3	77	14.1	4	3.8
Paper, printing, and publishing	18	1.5	1	.6	23	3.9	1	.6	3	2.6	17	3.6	172	3.5	78	7.1	14	2.6	2	1.9
Plastics													80	1.6	32	2.9				
Rubber goods	23	1.9	15	8.5	26	4.4	5	3.2			2	.4	390	8.0	122	11.0	1	.2	1	.9
Shoes and other leather	4	.3	1	.6	164	27.6	60	38.2			39	8.3	53	1.1	44	4.0	24	4.4	4	3.8
Textiles and clothing	239	19.3	21	11.9	127	21.3	28	17.8	16	14.0	58	12.3	96	2.0	66	6.0	7	1.3	6	5.7
Miscellaneous manufacturing	32	2.6	17	9.7	36	6.1	10	6.4	2	1.8	16	3.4	268	5.5	57	5.2	35	6.4	4	3.8
Service industries	45	3.6	27	15.3	2	.3	3	1.9	28	24.6	170	36.1	192	3.9	179	16.2	27	4.9	22	20.8
Beauty parlors	1	.1	11	6.2					9	7.9	39	8.3	4	.1	23	2.1			5	4.7
Hospitals			1	.6							16	3.4	10	.2	11	1.0	1	.2		
Hotels and restaurants	28	2.3	7	4.0					15	13.2	63	13.4	79	1.6	84	7.6	10	1.8	11	10.4
Laundries and dry cleaners	14	1.1	4	2.3	2	.3	3	1.9	1	.9	11	2.3	44	.9	20	1.8	1	.2	3	2.8
Care and custody of buildings											36	7.6								
Other domestic and personal service	2	.2	4	2.3					3	2.6	5	1.1	55	1.1	41	3.7	15	2.7	3	2.8
Agriculture	10	.8	1	.6							2	.4	55	1.1	11	1.0	19	3.5	2	1.9
Clerical	1	.1							5	4.4	17	3.6	15	.3	22	2.0	1	.2	4	3.8
Mining and quarrying					2	.3							43	.9			1	.2		
Professional and semiprofessional									2	1.8	29	6.2	45	.9	9	.8	5	.9	14	13.2
Public employment																	101	18.5		
Trade	35	2.8	11	6.2	8	1.3	1	.6	16	14.0	19	4.0	196	4.0	90	8.1	35	6.4	10	9.4
Transportation					3	.5					7	1.5	25	.5			17	3.1		
Miscellaneous													85	1.7	5	.5				

[1] For sources of information see chart I.

[2] Corresponding data for men not available.

Type of disease.

Some analysis of industrial diseases affecting women has been made by each of the 8 States under discussion. Such information for women in Illinois was published first in 1938, and that for women in New York was made more complete in the period of this study.

Dermatitis.—As a class, skin infections exceed in every State any other group of diseases, though differences both in reporting and in industry cause great variation among the States in the incidence of particular diseases. Some skin infections cause serious discomfort and a few result in permanent injury, though many are mild. As table 5 shows, skin infections caused nearly three-fifths of the women's occupational-disease cases in New York, two-thirds in Wisconsin and Ohio, practically three-fourths in Minnesota, Illinois, and Connecticut, and almost all (95 percent) of the women's cases investigated in Massachusetts.[9] The proportion of men's cases that were classed as dermatitis was much less, varying from little over a fourth in Michigan to about seven-tenths in Massachusetts. The difference between men and women in percentage affected was least in Ohio.

TABLE 5.—*Cases of dermatitis among men and women, 1935 to 1938, by State* [1]

State	Men's cases		Women's cases		
	Number	Percent of men's occupational-disease cases	Number	Percent of women's occupational-disease cases	Percent of all dermatitis cases
Connecticut	756	56.6	141	74.6	15.7
Illinois	126	37.2	47	74.6	27.2
Massachusetts	538	69.0	190	95.0	26.1
Michigan	264	27.4	29	(2)	9.9
Minnesota			83	72.8	
New York	910	47.2	269	57.1	22.8
Ohio	2,952	60.0	734	66.2	19.9
Wisconsin	222	40.7	69	65.1	23.7

[1] For source and years covered see chart I. Illinois covers only 1938. [2] Not computed; base less than 50.

Cases reported in Wisconsin are those that resulted in more than 3 days of disability. The data show that in 1938 the average cost of compensation for women with industrial dermatitis was $33, with an additional $26 for medical care. Women lost from work, on the average, slightly over 3 weeks. Altogether the 69 women who were compensated for skin infections in this State lost 1,309 working days and cost in compensation and medical care $4,073. The average time lost and the average cost of medical aid were respectively one-third more and almost one-half more in the case of men than of women, but the cost of men's compensation was more than twice that of women's compensation, due to men's higher weekly earnings. These Wisconsin data may be summarized as follows:

	Men	*Women*
Number of cases	222	69
Number of working days' time loss [1]	5,586	1,309
Average	25	19
Cost of compensation	$15,114	$2,273
Average	$68	$33
Cost of medical aid	$8,448	$1,800
Average	$38	$26

[1] 6 days' loss per week of disability.

[9] Dermatitis cases were 56 percent of all occupational-disease cases tabulated by the Department of Industrial Accidents, for which the data were not tabulated separately for women. (Cases tabulated were all occurring cases with disability lasting 1 day or shift.)

Cases reported in New York are only those that resulted in more than 7 days of disability. Skin diseases were costly in New York, and in 1937 the average compensation cost, not tabulated by sex, was $170; a total of $129,248 was spent in compensation for these diseases during that year.[10]

While many industrial diseases are the result of a specific hazard found only in certain processes and occupations, dermatitis occurs in most industries and may result from a great variety of contacts. An analysis of the 734 women's dermatitis cases reported in Ohio in the 4-year period shows the variety of hazards resulting in such infections. The largest number of cases resulted from the use of cleaning agents, followed by miscellaneous chemicals. The women affected were from every industry reported and no occupational group could claim to be entirely free from such hazards;[11] the occupations of those affected ranged from the operatives and laborers in manufacturing and service industries to skilled workers, saleswomen, and clerical and professional workers. The following are the causes reported in the 734 dermatitis cases occurring to Ohio women in the 4 years covered:

Cleaning agents	92	Metals not specified	12
Chemicals not specified	73	Leather	11
Dyes	58	Chrome	10
Vegetables, fruits, and plants	53	Cement	6
Oils and greases	48	Enamel	6
Rubber	35	Money	6
Bakelite and formica	31	Turpentine	6
Dusts not specified	22	Sulphur	5
Textiles, clothing, and furs	22	Lacquers and thinners	5
Formaldehyde	14	Various (infections)	6
Volatile petroleum products	13	Irritants not specified	42
Glue	13	All other [1]	132
Ink	13		

[1] Less than 5 cases resulting from any one specified hazard.

Reports from New York show that there, too, cleaning preparations caused the largest number of dermatoses, three-tenths of the total. The preparation of foods or their handling ranked second, and work involving the use of gasoline, kerosene, oils, and grease was third. The most costly of New York's occupational skin diseases compensated in 1937 were those caused by contact with dyed furs or other materials containing benzol, anilin, or derivatives of benzene. These averaged $521 a case and included one permanent partial disability to a fur worker who became unable to handle dyed furs, and one permanent partial case in which dermatitis finally resulted in amputation of the end of a finger. The first of these cases would not have been compensable under the New York schedule of diseases in effect before the all-inclusive act of 1935 was passed.[12]

To illustrate the way in which cleaning agents may result in such disability, cases may be cited from recent Ohio and New York experience:

A woman employee of an Ohio drug company was granted compensation for disability due to her employment as soda-fountain attendant. She was required to wash dishes and glasses in water containing a softener and a chemical required for sterilization. She burned her right hand on a coffee urn and, after receiving first aid, continued to work. She developed a skin condition diagnosed as a

[10] New York Industrial Bulletin, February 1939, p. 70.
[11] See Women's Bureau Bull. No. 147, Summary of State Reports of Occupational Diseases, 1932 to 1934, for an occupational classification of women reported as having industrial dermatitis,.
[12] New York Industrial Bulletin, February 1939, p. 70.

chronic dermatitis and was compelled to quit her work on account of recurrent attacks.[13]

A kitchen maid in a New York City hospital became disabled by dermatitis of both hands due to using cleansing agents and an antiseptic. Compensation covering periods of total and partial disability amounted to $492.31. A susceptibility to recurrence prohibited her employment in any type of work that involved contact with soaps, alkalies, and so forth. As she was unable to earn her full wages in another occupation, the board made further award on the basis of her inability to perform her usual work.[14]

As in Ohio and New York, contact with cleaning agents caused the largest number of skin infections classed as occupational diseases of women in Connecticut. Oil followed, and other agents, in order of their importance, included solvents, organic dusts, rubber, and acids.

The group of materials causing the largest number of dermatitis cases to women in Wisconsin was food, principally vegetables. The chief group of women were reported as factory laborers; next in point of numbers were the fruit and vegetable sorters and trimmers.

In Minnesota, cannery employees were important among the women reporting skin diseases. In practically every case liability for resulting disability was denied because of the limited schedule of compensable diseases. Workers handling the raw products in fruit and vegetable canneries have so commonly been affected by skin infections that a number of dermatitis studies have centered on this important woman-employing industry. The City Health Department of Baltimore, Md., has investigated the occurrence of dermatitis among women packing spinach, peas, and tomatoes in canning plants in the city. In the season following the reporting of a number of cases in a vegetable cannery, a policy was put into effect to prevent recurrence. In spite of the preemployment examinations and supervised regular washing of hands and faces, almost a fifth of the packers were affected by dermatitis. On the theory that a type of fungus might be the causative factor, as it had been determined to be among fruit packers of the Northwest, the health authorities requested managers of all Baltimore plants to require their employees to use a solution of thymol and oil of cinnamon after washing. The results indicated this to be effective. Of the 1,812 workers trimming and packing spinach in 10 plants, 20 cases (19 of them women) were reported, 14 from one plant. Investigation of this plant showed laxity in carrying out the preventive measures. Time lost in these 20 cases varied from a few days to several weeks.[15]

Conditions of heat and moisture and the skin abrasions caused by sharp-edged cans add to the hazard of contact with the sensitizing agent. Provision of rubber gloves for employees handling the raw product has been a solution to the problem in many canneries.[16]

The use of chlorinated naphthalenes in the manufacture of wire insulation and electrical condensers has been found in recent years to result in serious skin conditions as well as systemic disease. Reports of dermatitis from this source come from Connecticut, New York, and from a special study in Pennsylvania. In this 4-year period Connecticut reported 27 cases of dermatitis and 1 of systemic poisoning from the use of chlorinated naphthalene in cable and wire-insulation manufacture. Following the death in 1936 of three workmen

[13] Ohio Industrial Commission Monitor, October 1939, p. 153.
[14] New York Industrial Bulletin, October 1938, p. 481.
[15] Journal of Industrial Hygiene and Toxicology, May 1935, pp. 111–113.
[16] National Youth Administration of Indiana. The Vegetable Canning Industry. July 1938. p. 37.

employed in the insulation of wire in Pennsylvania, the State Department of Labor and Industry made a study of 101 persons exposed to the compounds in wire-insulating companies. Of this number, 78 percent were found to be affected with the dermatitis. This investigation showed that it is possible for a worker with this type of dermatitis to transfer it to members of his family. In one case a worker, his wife, and two children all were affected.[17]

The occurrence of similar tragedies in New York State, including the death of a 17-year-old girl employed in the manufacture of electrical condensers,[18] caused the department of labor in that State to make a survey of the 22 plants using these materials. Three manufactured insulated wire, the others made electrical condensers. A careful examination of 31 workers in two electrical-condenser plants found 6 workers, 4 of whom were women, with very serious cases. An investigation in one plant of the case of a girl, not included among these 31, who contracted a severe skin eruption revealed the fact that at the site of the eruption on the cheek a furunculosis of the inner cheek had developed, which due to secondary infection from scratching went on to septicemia and resulted in her death.

In another such case in New York, a young girl employed in the manufacture of electrical condensers and using chlorinated naphthalene suffered a permanent facial disfigurement as a result of scar-tissue formation. The deeper layers of the skin were involved. Serious results also are found to follow secondary infections of an existing dermatitis.[19]

The finishing departments of these plants are responsible for most cases of skin eruptions. In the dipping, pouring, and soldering operations fumes are given off in small amounts from many different points in the workroom. The New York Department of Labor has detailed general principles for ventilation to be applied to the various processes, and makes recommendations with regard to personal hygiene including provision by the employer of highly starched uniforms, underwear, caps, and gloves, laundered daily; provision of two lockers, one for street clothes, the other for uniforms; sanitary eating facilities removed from workrooms; regular wash periods on company time; provision of abundant hot water, cold cream, soap, individual towels, and protective lotion.[19]

Synovitis and other diseases resulting from repetitive activity.—Repeated motion is among the hazards affecting women in the reports of Connecticut, Illinois, Michigan, New York, Ohio, and Wisconsin.

It is evident that these cases may result from a great variety of occupational activity where continuous repetitive movement, pressure, or vibration is present. The continuous use of hand tools is a common cause of synovitis and neuritis of hand, wrist, or arm. So also is constant operation of machinery, or operations requiring continuous gripping or pulling of work and repetitive hand operations such as are required in packing, wrapping packages, folding, typing, and so forth. Continuous tightening of bolts in one case and continuous striking of a rod of a screw machine with the hand in another case

[17] Pennsylvania. Department of Labor and Industry. Bull. No. 43, A Preliminary Report of the Dermatological and Systemic Effects of Exposure to Hexachloro-Naphthalene and Chloro-Diphenyl. March 16, 1936.
[18] Journal of Industrial Hygiene and Toxicology, February 1939, pp. 32–35.
[19] New York Industrial Bulletin, August and September 1938, pp. 358, 360, 361, 425, 426, and 427.

caused two costly permanent-disability cases in New York State in 1937. In general, however, these disease cases were not so serious as those resulting from exposure to injurious substances.[20]

Many cases resulting from repetitive action or friction compensable as occupational disease in these States are tabulated and compensated as accidental injury in other States. There is difficulty even in these States in drawing a line between accidental injury and disease. In New York in 1937, for example, there were compensated as accidents over 100 cases of blisters and abrasions from continuous handling and 379 injuries due to the position in which employees had to work.

In the most recent year reported, the proportion of all women's cases that resulted from repeated motion was as follows:

	Number of cases	*Percent of all women's occupational-disease cases*
Connecticut (1938)	9	17. 3
Illinois (1938)	7	11. 1
Michigan (1938)	4	11. 8
New York (1937)	98	33. 6
Ohio (1938)	46	17. 0
Wisconsin (1938)	11	10. 4

Illinois reports in 1938 two women with permanent partial disability resulting from these illnesses. In that State the average woman suffering as a result of repeated motion lost 34 days from work, as compared to 16 days lost by men from the same cause. The average cost of compensation for women was $70; the cost was $133 in each of the two permanent partial cases.

The 11 cases compensated in Wisconsin included 5 with synovitis—4 in manufacturing and 1 a bookkeeper. Two women—1 a stenographer, the other a hosiery knitter—had ganglions; another hosiery knitter suffered from a felon; a woman with neuritis was a spray painter; a charwoman had bursitis; and a cook had a muscular infection as a result of her work. The neuritis case resulted in a permanent partial disability.

Of the 98 women compensated in New York in 1937 for diseases resulting from hazards of this nature, two-thirds were in manufacturing, an eighth were in domestic and personal service, and a twelfth were clerical workers.

In the 4 years 1935 to 1938 Ohio reported 197 cases of tenosynovitis and 12 of bursitis affecting employed women as a result of the work in which they were engaged. The great majority of the 197 women with tenosynovitis were in manufacturing, as the following summary shows:

Manufacturing	170
Paper products and printing	46
Shade roller 14, wrapper 7, assembler 4, packer 4, taping or sticking shades 4, other [1] 13.	
Rubber and its products	37
Rubber worker 20, package wrapper 3, other [1] 14.	
Metal products	28
Assorter of tin plates 12, other [1] 16.	
Food and beverages	17
Packer (various products) 7, polishing and inspecting whiskey bottles 4, other [1] 6.	

[1] Not over 2 cases reported in any one occupation.

[20] Ibid., February 1939, pp. 70 and 71.

Textiles	12
Worker on textile bags 4, other [1] 8.	
Automobiles and parts	7
Machine operators 3, other [1] 4.	
Electrical goods [1]	6
Shoes [1]	3
Miscellaneous manufacture [1]	14
Trade	11
Saleswomen 6, other [1] 5.	
Clerical	10
Stenographer and typist 7, other [1] 3.	
Service [1]	5
Not reported	1

[1] Not over 2 cases reported in any one occupation.

Ten of the twelve Ohio women with bursitis were employed in domestic and personal service, as cleaners, scrubwomen, or general maids, and the affliction was caused by kneeling to scrub floors. The other two women were employed in trade as saleswomen.

Lead poisoning.—Lead is the most common poisonous material used in modern industry. Dr. Elston L. Belknap, a well-known industrial physician in Wisconsin,[21] states that it is used in more than 150 industries. He lists the following 10 occupation groups as the commonest source of severe lead-poisoning cases: Storage-battery manufacture, cutting of lead-painted metal with oxyacetylene torches, use of machine abrasive wheels in smoothing welded auto bodies, spraying of lead arsenate in farm work, hand soldering in canning, spray-gun painting, burning off old painted surfaces with blow torch, printing (remelting type metal), sawing brass or tending brass furnaces, small battery-repair shops and junk yards where batteries are broken up. Dr. Belknap stresses the need for continuous inspection of industrial processes in which lead in any form is used. Potteries, once an industry with a high rate of disability from lead poisoning, have practically eradicated this hazard,[22] but other industries and processes have developed with hazards as pronounced.

The need for extraordinary vigilance is illustrated by the great increase in cases reported to the Ohio Department of Health in 1937, and the results of such vigilance are evident in the decrease in number of cases reported in 1938. The increase in 1937 was due to unusual outbreaks in three plants. All but 1 of the 26 women affected in that year worked in the manufacture of glassware; 1 woman was employed to set the ware on a spray machine, the others in glass manufacturing were decorators. The one woman not in glasswork was employed in the printing industry. In the glass plant, lead color was used in a powder form and lead poisoning resulted from inhalation of this powder.

Of the 36 women's cases in Ohio in the 2 years 1937 and 1938 (8 percent of all lead-poisoning cases), 29 reported age as well as industry and occupation. The following summary shows that the majority of these 29 women were less than 31 years old:

Under 25	9
25 to 30	8
31 to 35	3
36 to 40	1
41 to 45	7
46 to 50	1

[21] Belknap, Elston L., M. D. Common Poisons in Industry. Public Health Nursing, August 1938.
[22] Ibid., p. 66.

The unusual number of men reported as having lead poisoning in Ohio in 1937 resulted from the inhalation of dust in the manufacture of automobile and truck bodies. The dust was caused by the grinding of metallic lead used for filling cracks and seams in the metal bodies. In each case the cause was found and preventive methods were applied.[23] In the year following, the total number of cases reported by physicians had fallen from 195 to 55.

Ohio reports in the 2 years 1937 and 1938 the ages of men as well as of women injured by lead poisoning, together with the industry in which they were at work. Of the 213 men reported, over a third were in the manufacture of vehicles, their parts and accessories, and these men were not youthful workers: Four-fifths were 30 or older, well over half being 40 or over. In the manufacture of electrical apparatus and supplies, the industry with the third largest number of cases, the workers affected were in most instances young men: 14 of the 25 were under 30, and 2 were less than 20 years old. In the printing industry a boy of 16 was reported as having lead poisoning.

Cases of lead poisoning among women were relatively few in each of the 7 reporting States, as the following list shows:

	Men	*Women*
Connecticut (4 years)	36	7
Illinois (1938)	65	2
Massachusetts (4 years)	77	1
Michigan (1938)	83	--
New York (2 years, 1936 and 1937)	125	3
Ohio (4 years)	428	36
Wisconsin (1938)	10	--

In Connecticut five of the seven women affected were employed as assemblers in the manufacture of electrical apparatus; the other cases occurred in clock and watch and in metal-goods manufacture. Three of the five for whom age was reported were less than 20 years old, the other two, 20 and under 30 years.

One of the three women compensated for lead poisoning in New York was a mixer in the manufacture of batteries, another worked as lay-up girl in rubber manufacture, and the third was a bookkeeper. Construction ranked first in number of men having lead poisoning, with metal and metal-products manufacture second.[24]

In Massachusetts a young girl working as a sander in a toy factory suffered a brief period of incapacity from lead poisoning caused by fumes and dust from her work. She was transferred from this type of work.

Of the cases of men reported in the four States giving occupations of the injured, a greater number had been employed as painters in various industries than in any other single occupation. In Massachusetts as in Ohio there was an outbreak of lead-poisoning cases in automobile assembling. In Massachusetts this occurred in 1935. One establishment employing 60 men at grinding and smoothing soldered metal bodies with emery wheels and circular disks covered with carborundum powder had 18 cases of lead poisoning in the year. One and a half pounds of molten-lead solder was applied to each car body, and the operators worked at grinding the lead-coated seams

[23] Ohio Industrial Commission Monitor, June 1938, p. 84.
[24] New York Industrial Bulletin, July 1937 and February 1939.

and joints. Through the installation of an effective ventilating system the hazard was eliminated.[25]

Illinois, New York, and Wisconsin, reporting on the costs of medical care and compensation, find lead-poisoning cases among the most expensive occupational diseases. In Illinois the compensation of the two women affected averaged $475, over $100 more than for any other type of disease affecting women. Both of these cases resulted in permanent partial disability. For men in this State the average compensation was less than that for women and only slightly higher than their average for all diseases. The cost was exceeded by several other industrial poisons and by dust diseases. In Illinois lead poisoning resulted in 4 of the 17 deaths and permanent total cases and 26 of the 159 permanent partial cases.

In New York the 128 cases of lead poisoning occurring in 1936 and 1937 were the most costly group of occupational diseases in each year, with an average award of nearly $1,500 a case. The disability resulting may be summarized as follows: [26]

Total cases	128
Fatal	10
Permanent total	1
Permanent partial	5
Temporary	112

The 10 compensable cases in Wisconsin in 1938 had an average loss of 863 working days' time and received an average indemnity of $1,420, in contrast to 172 days' loss of time and $260 indemnity for all occupational diseases combined.

Volatile-solvent poisoning.—The volatile solvents, increasingly common in industry, have been the subject of investigation in several States in recent years. The conclusion has been reached that no volatile solvent is safe in high concentration, and that even the "safest" solvent requires watching.[27] In the consideration of benzol, a solvent that is notoriously unsafe, Massachusetts investigators have come to the conclusion that the only really safe concentration is zero. Over a period of 4 years medical officers of Massachusetts have made a special study of 89 individuals, including 19 women, exposed to benzol fumes.[28] The results, based on investigation of the industrial background as well as the chemical and pathological aspects of benzol poisoning, differ in certain important points from commonly accepted principles about this disease. It has been generally assumed that young women are more susceptible to poisoning than men. This study indicates, however, that exposed males tend to develop hyperplastic bone marrow, a form of the disease not yet generally recognized, while females have a tendency to develop aplastic bone marrow. Among the 4 women for whom a study of the pathology of the disease was made were the only 2 cases with aplastic marrows in the face of prolonged exposure (4 and 5 years). All these 4 cases showed aplasia. Ten of the twelve males for whom the pathology of chronic benzol

[25] Massachusetts. Annual Report of the Department of Labor and Industries, year ending November 30, 1935, p. 26.
[26] New York Industrial Bulletin, July 1937, February 1939.
[27] Belknap, Elston L., M. D. Common Poisons in Industry. Public Health Nursing, August 1938.
[28] Journal of Industrial Hygiene and Toxicology, October 1939, pp. 321–393. Chronic Exposure to Benzene.

poisoning was studied showed hyperplasia, and only 2 aplasia. It is true, however, that females can react to prolonged exposure with extreme hyperplasia. It is also true that because of the effect of benzol on the liver, pregnant women especially need protection, since the liver in pregnancy is peculiarly sensitive to injury.[29]

Most important, perhaps, was the discovery that the first symptoms of chronic poisoning may appear long after exposure has ceased. Two cases established this point. No signs of benzol poisoning were evident until the onset of what would otherwise have been a minor infection, when the injured bone marrow showed the effects of exposure. The author points out that workmen's compensation should be extended to include cases arising long after exposure is stopped.

Concentration of fumes is not the whole story in consideration of exposure of workers. Individual susceptibility and duration of exposure are of great importance. Individual susceptibility is highly varied and complex, so that one individual may be poisoned, another not, though exposed to the same concentration of fumes and other factors being equal.

The 19 cases of women studied, with the length of exposure, occupation (most of them were employed in the manufacture of crepe rubber soles for shoes), age, and the blood picture resulting from the exposure, are listed in the following:

Age	Work	Time at work	Exposure [1]	Blood picture
18	Cementing	5 months	★ ★ ★	Abnormal.[2]
19	do	10 months; 3 months	★ ★ ★	Do.
20	do	6 months	★ ★ ★	Do.
37	do	15 months	★ ★ ★	Do.
32	do	6 months	★ ★ ★	Do.
29	Maker	19 months	★ ★	Do.
18	do	5 months	★ ★	Do.
30	do	3 years	★ ★	Normal.
21	do	6 months; 4 months; 6 months	★ ★	Abnormal.
18	do	6 months	★ ★	Do.
22	do	4 months	★ ★	Normal.
21	do	4 months	★ ★	Do.
23	do	3 months	★ ★	Abnormal.
18	do	6 months	★ ★	Do.
20	do	5 months	★ ★	Do.
20	Varied	2 years	★ ★	Do.
24	do	3 years	★	Do.
36	Not reported	5 + months	★ ★	Do.
63	Telephone operator [3]	5 + years	Slight	Do.[4]

[1] Intensity of exposure is designated in the range from ★ to ★ ★ ★.
[2] Died June 16, 1938.
[3] Cleaned board daily with 50 percent benzol paint remover.
[4] Died February 18, 1939.

In the periodic reports of the eight States tabulating disease cases by sex, only four women were reported as having benzol poisoning. In Wisconsin in 1938 a young woman employed as a dipper of radio tubes suffered a permanent partial disability. Hers was the most costly woman's occupational-disease case in the State, receiving $3,940 in compensation. In Massachusetts three benzol-poisoning cases among women were investigated in 1938. Two of these women were employed in plants manufacturing crepe soles. One case was fatal.

[29] New York Industrial Bulletin, April 1938, pp. 166–168.

Among the remaining States benzol-poisoning cases of men were as follows:

State	Total number	Industry	Number reported by industry
Connecticut	7	Artificial-leather manufacturing	7
Illinois	1	Not reported	–
Massachusetts	12	Tannery	1
		Shoe manufacture	1
		Cleaning machines with solvent	2
		Artificial leather and miscellaneous	8
New York [1]	109	Textiles and clothing	27
		Leather, rubber, and composition	18
		Chemical and allied products	3
		Trade	3
		Metal and metal products	1
		Hotels and restaurants	1
		Other service	1
		Other industries	1

[1] New York Industrial Bulletin, July 1937, pp. 259–263.

In New York 3 of the 16 fatalities from all occupational diseases in 1937 were caused by benzol.[30] Two fatal benzol-poisoning cases were investigated in Massachusetts in 1938. In Illinois the one case of benzol poisoning for which compensation was closed resulted in permanent partial disability.

Other solvents are said to have caused the poisoning of workers in several States. In Connecticut 15 men and 1 woman were reported as suffering from such poisoning; the agency affecting the woman (a cleaner in the manufacture of electrical apparatus) and 8 of the men was carbon tetrachloride. In the 4-year period carbon tetrachloride caused the poisoning of 3 women and 8 men in Ohio; 2 of these women were employed at cleaning type in the manufacture of machinery, and 1 was a maid in a hospital. Other solvents used in connection with their occupations caused the poisoning of 10 men and 2 women in Ohio. Among women in New York who received compensation in 1936 and 1937 for injury from the use of solvents were 2 cases caused by wood alcohol, 2 by amido benzine, another by naphthalene, and another by benzine and ether.

Other systemic poisoning.—Six cases of radium poisoning in 3 years were reported in Connecticut; all these were women employed as dial painters in clock and watch manufacture. Of the four reporting age, none was more than 40 years old and two were under 30. The New York Division of Industrial Hygiene, noting an increase in dial-painting plants in the State, issued a warning in 1937 as to the dangers of work with radioactice material and standards for safe practice. The conclusion is reached that, even with the greatest care in handling, the effect of exposure to emanations of low power over long periods is not known.[31]

One woman with radium poisoning was awarded compensation in Illinois in 1938, and the company agreed to abide by the decision with regard to other similarly disabled women. This woman and 13 others who had been employed in the plant discovered the nature of their disability early in 1934. The award was contested on the basis that notice was not given the employer within 30 days of injury, though it is known that radium poisoning may develop years after exposure to

[30] Ibid., February 1939, p. 68.

[31] Ibid., July 1937, pp. 291–292.

the hazard has ceased. The Illinois commission agreed in this case that the 30-day time limit began when the women first were informed that they had the disease. The award made included $3,230 for medical and hospital expenses, $11 a week for 315 weeks, followed by a monthly pension of $23.13 for life, and a lump sum of $2,398 for compensation from April 25, 1934.[32]

Three women in New York State were compensated for chronic poisoning caused by the use of hydrofluoric acid in their work as solderers in electrical-apparatus manufacture.

Corn poisoning was reported as the cause of the death of a young girl cannery worker in Minnesota, and of the disability of seven others from 1935 to 1938. Dye poisoning was reported in 19 women's cases in Minnesota, most of them in garment manufacture, and 1 other Minnesota woman suffered from eye infection caused by cement dust.

Gas-fume poisoning was reported as the disabling disease of women in four cases each in Minnesota and Massachusetts. Poisoning from fumigants in 1938 affected two Connecticut women employed in trade occupations.

Chrome ulceration.—In the 4 years, work with chromic acid in the plating, dipping, and scrubbing of metal stampings caused ulcerations of the nasal septum of 33 women in Ohio. In 3 cases in 1936 the ulcer had resulted in perforation of the septum. Most of the cases occurred in 1936 and among the employees of one company. Twenty-three cases of chrome ulceration or poisoning, one of them a woman, received compensation in New York in 1936 and 1937.

Respiratory diseases.—Occasional cases are reported of respiratory disease of women from work in dusty occupations. In Ohio silicosis first became compensable in 1937, and in the year following 141 cases were reported to the Department of Health, more than the total reported in the 3 years 1935–37. Four of these 141 cases were women, 2 of them in the manufacture of tile, 2 in pottery and stoneware plants. All were seriously injured, 3 having tuberculosis as well as silicosis, and the other being in the third stage of silicosis. In the case of 1 of the women, employed 14 years in tile manufacture, the industrial commission found that she had been working in a room where 82 unhooded presses were used to press clay into tile, her particular jobs being to dust the tile as it came off the press and to place sand in the saggers of each layer of tile. Exposure to silica dust was pronounced. She was totally disabled from July 22, 1938, and the commission awarded her compensation of $1,050, the limit possible under the provisions of the silicosis act of 1937.[33]

A case of silicosis to a woman employee of a foundry and a case of pneumoconiosis to a woman rubber worker were reported in Connecticut. In Illinois in 1938 a woman was reported as having a permanent partial injury from work exposing her to organic dusts, and the case of another woman resulting from exposure to inorganic dust was closed during the year. A case of pneumoconiosis in a woman, and another of asbestosis, the latter causing death in 1936, were investigated in Massachusetts. Compensation was awarded in 1937 to 2 women in New York because of their exposure to dust and lint, and in 1936 to a woman machine operator in a bakery because of inhalation of flour.

[32] Chicago Federation of Labor, Federation News, July 1938.
[33] Ohio Industrial Commission Monitor, February 1939, p. 26.

Contagious diseases.—These diseases, not commonly considered occupational, were compensated in a number of cases in New York and in Wisconsin. There were 19 such cases of women compensated in New York in 1936–37, 13 of them employed as nurses, 5 as attendants in hospitals, and 1 as a hotel housekeeper. Nine of the 15 cases of women compensated for these diseases in Wisconsin in 1938 were nurses; 1 had chickenpox, 2 measles, 3 scarlet fever, 1 trench mouth, 1 tuberculosis, and 1 sore throat. Three cases of mumps were reported as occupational—a summer-resort waitress, a hospital attendant, and a city school teacher. The other cases included an office worker with scarlet fever, a maid in domestic service with measles, and a factory worker with an unclassified systemic infection. The tuberculosis case resulted in serious loss of time from work—301 days—and cost in compensation $983, with additional medical expense of $437.

From the point of view of these diseases, nursing is, of course, a most hazardous occupation. In *Proctor* v. *Willard Parker Hospital and Genesee Hospital, ex rel.*—a case appealed from the New York Industrial Board—the status of a nurse so injured was clarified. In this case the student nurse was taking training at Genesee Hospital in Rochester. Under a contract whereby the Willard Parker Hospital of New York City furnished Genesee Hospital student nurses with a 3 months' course in the nursing of communicable diseases, this nurse was transferred to New York City, and while nursing there contracted scarlet fever. The disease damaged her heart and contributed to her death. The State industrial board found the disease occupational, and made an award requiring compensation to be paid by both hospitals and their insurance carriers. Upon appeal the Genesee Hospital contended that the medical testimony connecting the scarlet fever with the death was conjectural, and that there was no employer-employee relationship between the nurse and this hospital during her work at Willard Parker Hospital. The appellate division unanimously affirmed the award on the finding that there was adequate competent evidence of causal relation between the occupational disease and the death of the decedent.[34]

Other occupational diseases of women.—Among the diseases reported that may not be classified in the foregoing groups was a case of undulant fever caused by food furnished to a nurse in a private Wisconsin hospital. This was a costly compensation case, requiring $1,073 in medical aid and $994 in compensation. The nurse lost 271 days of working time.

In Wisconsin a case of neurasthenia affecting a stenographer was compensated. In this connection may be mentioned a finding of the Ohio Industrial Commission in the case of a young woman employed as a piecer in a pants factory. The commission found that hysteria brought on by a sudden strain on the nerves is not compensable, and her claim for compensation due to such disability was disallowed.[35]

[34] New York Industrial Bulletin, March 1939, pp. 142, 146.
[35] Ohio Industrial Commission Monitor, November 1938, p. 151.

Heat prostration was compensated as occupational disease in the cases of 2 women in Wisconsin, 1 a mangle operator in a cleaning and dyeing establishment, the other a waitress in a summer resort.

Two cases of paralysis, 1 a woman, resulting from temperature abnormalities in stores, were reported as compensated in Connecticut in 1935. In 1938, in another woman's case in this State, arthritis was compensated as an occupational disease resulting from temperature extremes.

A case of hernia affecting an employed woman in Michigan was reported as an occupational disease.

Noncompensable occupational diseases.

In the period of this study Ohio compensated workers according to a limited schedule of diseases. In the 4 years the men and women reported to the department of health as having diseases caused by their occupations but not compensable numbered as follows:

Year	*Men*	*Women*
1935	47	13
1936	68	10
1937	72	18
1938	87	26

Included were cases of women with respiratory diseases, such as a pneumoconiosis resulting from dust in the making of pasteboard cartons, an inflamed respiratory tract caused by dust in the grinding of hard rubber in rubber manufacture, a nasal ulcer resulting from paper dust, rhinitis from the use of paint and lacquer. Also included were a case of a woman with heat exhaustion who worked as a presser in cleaning and dyeing and a case of typhoid acquired by a girl who worked as a counselor in public service. Other cases reported included, among many: Infected flea bite affecting a clerk in a pet shop; tularemia affecting a restaurant cook; tuberculosis in a 22-year-old girl who had been exposed to glass wool in her work in a glass factory.

In some of these the results may have been slight and of brief duration, in others they were of very serious nature. In either case they were of occupational origin and involved wage loss and medical expense. The Ohio Legislature recognized this fact, and in 1939 passed an all-inclusive law for the coverage of occupational diseases. The existence of such cases should point to the need for revision of every act based on a limited list of diseases.

Illness among employed women.

A survey made by the National Institute of Health in the winter of 1935–36 included a study of the occupational status, age, sex, and disability of approximately 280,000 white persons in 8 cities.[36] Included were 145,733 women, 34,085 of whom were workers 15 years old or over. For the women workers 15 to 64 years old the rate of illness, based on those ill on the day of the canvass, was 27.7 per 1,000, in contrast to 22 for male workers. For both men and

[36] U. S. National Institute of Health. Preliminary reports, National Health Survey, Sickness and Medical Care Series, Bull. 7, Illness Among Employed and Unemployed Workers. 1938. pp. 3 and 12.

women the rate increased directly with age. Women workers experienced an illness rate higher than that for men workers in each age group, and, as the following summary shows, the difference increased with age:

Age group	Number of workers disabled per 1,000	
	Male	Female
Total 15 to 64 years	22. 0	27. 7
15 to 24 years	13. 9	20. 2
25 to 44 years	19. 2	29. 1
45 to 64 years	30. 8	40. 0
65 years and over	49. 6	62. 1

An analysis by occupation of the male workers 15 to 64 years old in these cities shows a direct relation between occupation and disability.[37] The occupational class tends to be an index of economic status comparable to family income, and the variations in illness rates are similar for these two classifications. The summary following shows a disability rate more than twice as high for unskilled workers as for professional persons or proprietors.

	Number of male workers disabled per 1,000
All occupations	21. 9
Professional persons	15. 6
Dealers and other proprietors	16. 3
Clerks, salesmen, and kindred workers	18. 9
Skilled workers and foremen	22. 8
Semiskilled workers	24. 6
Unskilled workers	36. 0

[37] Ibid., table 4, p. 9.

Part III.—EVALUATION OF THE EXPOSURE OF WOMEN TO TOXIC SUBSTANCES AND CONDITIONS

STATE STUDIES

In about a third of the States the departments of health had published surveys of their industrial hygiene problems by the close of 1939. Most of these were completed during the years under discussion in this report. Made with the assistance, advisory and in some cases financial, of the United States Public Health Service, the studies cover a sample of the employments in mining, manufacturing and mechanical industries, transportation and communication, trade, and in dry-cleaning and laundry establishments. They include information as to the numbers of men and of women employed in these industries, the numbers exposed to specified hazards, and the sanitary, health, and medical facilities available to the workers.

Three of these States—Pennsylvania, second industrial State in the country as measured by the number of wage earners in manufacturing industries; Illinois, fourth in importance as a manufacturing State; and Iowa, primarily an agricultural State—have made separate tabulations giving the exposure of women to specified hazards. In each State figures show the possibilities of the problem and do not mean that the exposures will result in health impairment. They do not measure the degree nor magnitude of exposure. No physical examinations of the workers were made. The results do show the toxic materials and conditions to which men and women are being exposed, indicating the importance of watchfulness even in States not highly industrialized.

Pennsylvania.[1]

It is startling to note in the following summary that there were, in the 16,000 manufacturing establishments studied in Pennsylvania in 1934, over 4,500 women with potential exposures to lead and its compounds, and that 7,300 worked under conditions exposing them to inorganic nonmetallic dusts and 228,000 to organic dusts. More than 19,000 worked under abnormal temperature or humidity conditions.

The total number of exposures found was 323,332—larger than the number of women exposed because in many instances women were subjected to more than one hazard.

In the prevention of industrial diseases, the importance of separate lunchrooms, adequate wholesome drinking water, adequate washing and toilet facilities, has been emphasized elsewhere and reflected in State legislation and safety regulation in general. Nevertheless, the survey of 16,000 manufacturing plants in Pennsylvania found over nine-tenths of the establishments without a lunchroom and over half without a cloakroom. A fourth of all the factories provided only common drinking cups and almost as many provided common towels. There were 603 plants furnishing no drinking facilities whatsoever and

[1] Pennsylvania Division of Industrial Hygiene. Control of Occupational Diseases in Pennsylvania, November 22, 1937.

698 furnishing no toilet facilities. Unsatisfactory outdoor toilets were provided in 1,946 other industrial plants.

Hazard	Number of potentially exposed women [1]	Hazard	Number of potentially exposed women [1]
Organic dusts	228, 106	Acids	1, 687
Abnormalities of temperature or humidity	19, 120	Rubber and rubber compounds	1, 376
Repeated motion, pressure, and shock	13, 848	Aluminum and its compounds	1, 166
Metals	11, 695	Calcium compounds	1, 075
Miscellaneous	10, 800	Mercury compounds	811
Inorganic nonmetallic dusts	7, 322	Rosins, resins, and synthetic resins	585
Paints, pigments, inks, and dyes	6, 637	Sodium compounds	534
Lead and its compounds	4, 554	Washing compounds	344
Organic chemical compounds	3, 311	Chromium and its compounds	220
Inorganic chemical compounds	2, 711	Arsenic and its compounds	185
Petroleum and its products	2. 701	Cyanides	91
Solvents	2, 497	Radiant energy	72
Infections	1, 758	Asphalt and coal byproducts	64
		Ammonium compounds	55
		Disinfectants, insecticides, and fungicides	7

[1] Some women were exposed to more than one hazard.

Illinois.

In round numbers, 50,000 women were employed in the 2,846 plants studied in Illinois in 1938. Women comprised more than a fifth of all wage earners in these plants.[2] The industries included and the number of women surveyed are listed in table 6 following, with a distribution of the number of exposures to harmful substances or conditions.

TABLE 6.—*Industrial distribution of 50,064 women surveyed in Illinois in 1938, and number and percent of exposures to harmful conditions in industry* [1]

Industry	Women employed		Women's exposures to harmful substances	
	Number	Percent of total employees [2]	Total number	Number per 100 women
Total	50, 064	22. 5	29, 741	59
Chemicals and allied industries	2, 637	19. 9	2, 219	84
Cigars and tobacco	181	36. 2	67	37
Clay, glass, and stone	750	17. 1	508	68
Roofing, asbestos products, abrasives, etc	243	6. 0	146	60
Clothing	5, 919	70. 6	2, 494	42
Food	7, 537	35. 6	6, 400	84
Iron, steel, machinery, vehicle	3, 660	6. 1	3, 102	85
Other metal	4, 528	16. 9	2, 530	56
Leather	1, 445	26. 8	564	39
Lumber and furniture	1, 378	11. 1	1, 061	77
Paper, printing, and allied industries	3, 704	26. 0	747	20
Textile industries	3, 087	56. 2	2, 022	65
Miscellaneous manufacturing industries	11, 270	32. 0	7, 347	65
Personal service [3]	3, 577	62. 4	476	13
Commercial service [4]	47	8. 3	58	123

[1] Kronenberg, Milton H., MD., chief of Division of Industrial Hygiene, Illinois Department of Public Health. Women in Industry. In Industrial Medicine, September 1938.
[2] Clerical employees not included.
[3] Laundry, cleaning, and so forth.
[4] Warehouse, jobbing, and so forth.

[2] 32 of the 2,846 plants employed no women.

In proportion to the number employed, the personal-service industries in Illinois exposed the fewest women to harmful substances, 13 of every 100 employed women. Of the large employers of women, the food industry, iron, steel, machinery, and vehicle manufacturing, and chemicals and allied products had the highest numbers of exposures in proportion to the women employed—84 or 85 per 100 women.

Analysis has been made of the harmful materials to which the women employed in a selected list of miscellaneous industries were exposed. The industries include electrical manufacturing, buttons, brooms, brushes, rubber, artificial flowers, mattresses, signs, mirrors, hair goods, lamp shades, scientific instruments, plastic molding, and so forth. The greatest number of exposures, over one-fifth of the 7,347 exposures reported, were to lead; some 1,600 women had lead exposures. Close to 1,000 women, 13.4 percent of the total exposures, were exposed to organic dusts; there were 1,720 exposures to dusts of various kinds. The third source of exposure in point of numbers exposed were the alcohols, esters, and ethers, with 806 women, 11 percent of the total exposed. These three groups of harmful materials, lead, dusts, and alcohols, esters, and ethers, account for 56 percent of the exposures in miscellaneous manufacturing. Women were reported in 37 classified exposures, including 336 to petroleum products, 597 to lacquers, 138 to halogenated hydrocarbons, 130 to dermatitis producers, and 51 to fluorine gas.

From data based on electrical-manufacturing plants, 95 percent of all such plants in the State, the occupational exposures of women in this industry have been determined. The factories studied employed 16,026 persons; women, totaling 4,798, were employed in 23 occupations. Exposures of these women totaled 3,200, 49 percent of them lead, 9 percent alcohols, esters, and ethers, 8 percent lacquer. No occupation was entirely free from the possibility of harmful exposure. Ten occupations included lead among the harmful materials, five included silica and silicate dusts.

Chart III following makes an analysis for electrical-products and tinware manufacture in Illinois. In the tinware industry women are employed in a variety of occupations and they constitute 28 percent of total employment. Dusts, carbon monoxide, lead, solvents, and miscellaneous metals and gases were the principal harmful substances offering a potential hazard to the women employees.

CHART III.—*Harmful substances to which employed women are exposed in the electrical-products and tinware industries in Illinois, by occupation*

Occupation	Mineral acids	Alkalies	Coal-tar products	Dusts				Dermatitis producers	Fluorine	Gases	Lead	Other metals	Alcohols, esters, and ethers	Halogenated hydrocarbons	Lacquers	Oil	Petroleum products	Organic solvents	Other solvents	Carbon monoxide	Chromium	Paint
				Silica	Silicate	Nonsilicate	Organic															
ELECTRICAL-PRODUCTS MANUFACTURING																						
Amalgamator		★																				
Assembler	★		★		★	★	★		★	★	★	★	★	★	★	★	★		★			
Brusher					★							★										
Cable maker											★											
Coil maker											★											
Condenser maker								★					★	★			★					
Dipper, sprayer		★		★	★		★		★		★	★	★	★	★	★	★		★			
Finisher	★	★					★						★	★	★	★	★					
Flash dipper											★		★	★	★		★					
Glassblower										★												
Grinder			★	★	★	★		★				★										
Insulator			★								★		★									
Painter													★		★		★		★			
Pivot cutter						★		★				★		★								
Platers' sprayer helper								★					★									
Plug filler																	★					
Polisher		★			★		★					★	★									
Punch-drill operator							★	★								★	★					
Solderer	★							★			★	★	★	★		★						
Stock girls															★							
Welder helper										★		★										
Winder							★				★		★	★	★	★	★					
Wire cleaner		★				★	★				★	★	★		★	★			★			

Brusher				★	★						★	★								★		
Burner										★		★						★	★	★		
Cleaner																		★	★			
Enameler and helper					★				★			★										
Flux brusher																		★				
Hanger					★							★										
Inspector					★							★										
Lining-machine operator										★												
Lithograph-machine feeder			★												★			★	★			
Packer										★									★	★		
Punch-press operator	★							★														
Solderer											★											
Soldering-machine operator											★											
Sprayer										★		★							★			
Sprayer's helper										★		★							★			
Stamping-machine operator											★											★
Stenciler					★							★							★			

Iowa.

The potential exposure of women to toxic materials and hazardous conditions was the subject of special consideration in Iowa in 1938. The survey covered 28,170 workers in the extraction of minerals, manufacturing, and the two service industries, laundries and dry cleaning and pressing. It excluded office workers unless definite exposure to some harmful substance was found. The facts presented are proof of the need even in relatively nonindustrial States for constant watchfulness to prevent disease resulting from conditions in industry.

The Iowa Division of Public Health Engineering and Industrial Hygiene included in its study 4,388 women, 15.6 percent of all employees. Well over half of these women, 2,496, were exposed to some harmful material or condition. Table 7 following shows how these women were distributed by industry and the number of their harmful exposures. The greatest number of women in manufacturing industries, a fourth of all women studied, were working in food and allied industries. Nearly half of these (490) had some harmful exposure, principally from the presence of organic dusts and from the handling of oils, fats, and other materials.

TABLE 7.—*Industrial distribution of 4,388 women surveyed in Iowa in 1938, number exposed to harmful conditions, and number of such hazards per woman*[1]

Industry	Women wage earners			
	Number [2]	Percent of all workers	Number exposed to harmful conditions	Number of hazards per exposed woman
Total	4,388	15.6	2,496	1.4
Chemical and allied	253	30.0	143	1.1
Soap	53	31.2	----	----
Clothing	649	84.8	560	1.0
Gloves	256	78.8	----	----
Food and allied	1,088	18.4	490	1.1
Candy	133	63.6	----	----
Canning and preserving	95	65.1	----	----
Meat packing	589	18.4	----	----
Iron and steel	134	1.2	95	3.9
Leather	306	50.2	144	1.1
Shoe factories	175	52.6	----	----
Paper, printing, and allied	101	14.5	73	1.5
Miscellaneous:				
Buttons	451	56.2	----	----
Electrical machinery	258	55.5	----	----
Service:				
Laundries	184	79.3	36	1.0
Dry cleaning	155	46.8	69	2.1

[1] Iowa. Department of Health. Unpublished data.
[2] Totals exceed details. Only important woman-employing industries are shown separately.

Second in number of employed women but first in number with harmful exposures were the clothing industries. Over 85 percent of all women engaged in such work were exposed to organic dusts.

A relatively small proportion of women in the survey worked in the iron and steel machinery, and vehicle group of industries, but a large

proportion of the women there employed worked with materials or under conditions potentially hazardous. The exposed women in this industry group averaged almost four exposures—more than in any other. Exposures included silicate and asbestos dusts, extremes of temperature, petroleum products, carbon monoxide and other gases, metallic substances, various oils, waxes, and dermatitis producers.

In the laundry industry women especially need protection from the high humidity, from the extreme temperatures, and to some extent from organic dusts. Harmful materials are more diverse in dry cleaning; in addition to exposure of 58 women to extreme temperature, 35 women were exposed to organic dusts, 12 to acids, 8 to organic solvents, and smaller numbers to alkalies, organic chemicals, alcohols, halogenated hydrocarbons, oils, and silicate dusts.

Of the types of harmful material, organic dusts were the principal potential hazard to women workers. Women were exposed to these dusts in every industry studied except the clay, glass, and stone group, and in the following numbers:

	Women exposed to organic dusts
Total	1,491
Clothing	560
Food and allied	218
Leather	110
Iron, steel, and other metals	41
Laundries and dry cleaning	40
Lumber and furniture	39
Paper, printing, and allied	37
Textile	32
Chemical and allied	21
Miscellaneous manufacturing	393

One hundred seven women were exposed to the more hazardous dusts containing silica or asbestos, 52 of these in metals (including iron and steel).

Extremes of temperature may give rise to many varieties of illness. Exposure to high temperatures may result in heat exhaustion or heat stroke, and low temperatures may be a factor in the incidence of neuralgia and respiratory diseases. Of the 135 women working under conditions of excessive temperature or moisture, almost two-thirds (89) were in laundries or dry-cleaning establishments, and another large group (38) were in metal manufacture. Materials known to produce dermatitis existed in the principal industries and were potential hazards to 174 women, about half of them being in food and allied groups. Paper, printing, and allied, and metal industries (including iron and steel) each had a considerable group.

Ninety women were exposed to alkaline compounds in their work, chiefly in chemical and allied and food and allied industries.

The dangers of inhalation of even small amounts of carbon monoxide are well known, and chronic as well as acute cases are not uncommon in industry. In addition to the processes where high concentrations of the gas may be a hazard, as in automobile repairing, other processes where flames come in contact with cold surfaces may give rise to carbon-monoxide poisoning. Workers may be exposed to the gas because of leaky gas fixtures or pipes. Common appliances, such as ironing machines and hand irons, soldering stoves, and gas ovens and furnaces, may afford an exposure. The metal-manufacturing industry employed 37 of the 54 women exposed to carbon-monoxide gas.

Fifty women were in occupations exposing them to hazards that may accompany the use of dyes, 29 of them being in the lumber and furniture industry and 7 each in iron and steel and leather manufacturing.

Exposure to lead and its compounds was a potential hazard to 11 of the women in the Iowa survey, 7 of whom worked in paper, printing, or allied industries, 4 in the chemical and allied group.

Table 8 indicates the extent to which the women surveyed were protected by specified health services. Accident records are kept for 3,875 of all women surveyed, sickness records for 1,478. Least served by accident records were women in the paper, printing, and allied industries and in clothing manufacture. Sickness records were not kept for any women in laundries and dry-cleaning plants, nor in lumber and furniture factories, nor in paper, printing, and allied industries. Insurance provision was made for all but 29 of the women, 17 of them in laundries and dry-cleaning establishments. For a very considerable number (4,235), represented in every industry but lumber and furniture, a part-time physician was available in the plant. The advantage of a safety director was recognized by employers of 2,825 women; in most cases only the part-time services of such an official were provided.

TABLE 8.—*Numbers of women to whom health services specified were available in industries surveyed in Iowa, 1938* [1]

Health service	All industries [2]	Chemical and allied products	Clothing	Food and allied products	Iron and steel	Leather	Lumber	Paper, printing, and allied products	Buttons	Electrical machinery	Laundries and dry cleaning
Number of women surveyed	4,388	253	649	1,088	134	306	120	101	451	258	339
Safety provisions:											
Safety director [3]	2,825	171	71	820	52	284	4	37	392	258	162
Shop committee	1,177	----	----	853	45	----	----	----	----	258	----
Insurance	4,359	249	647	1,087	134	306	118	101	451	258	322
Medical provisions:											
Hospital	----	----	----	----	----	----	----	----	----	----	----
First-aid room	1,828	----	176	863	58	----	----	----	----	258	----
First-aid kit	3,426	253	433	419	90	306	120	101	451	258	337
Trained first-aid worker	2,239	205	176	767	106	----	2	3	84	258	120
Physician (part time)	4,235	253	643	1,085	108	306	41	94	451	258	312
Nurse (part or full time)	1,308	----	176	860	14	----	----	----	----	258	----
Sick-benefit association	1,052	----	----	676	72	16	----	----	----	258	----
Statistical information:											
Sickness record	1,478	209	176	676	75	16	----	----	53	258	----
Accident record	3,875	239	407	1,058	134	284	105	47	451	258	277

[1] Iowa. State Department of Health. Unpublished data.
[2] Totals exceed details. Only important woman-employing industries are shown separately.
[3] All but the 71 in clothing were on part time.

INDUSTRY STUDIES

Of the many industries that have been the subject of investigation from the point of view of industrial-disease prevention, the following are summarized here because of their particular interest to employed women:

Manufacturing:
- Pottery—West Virginia.
- Shoes—Massachusetts.
- Wood heels—Massachusetts.
- Asbestos textiles—Pennsylvania and North Carolina.

Service industries, Dry cleaning—Michigan.
Professional occupations, Nursing—Various.

Reports on these industries are of great importance to employed women, in some cases because of the large numbers of women employed, as in shoe manufacture, in others because of the peculiar susceptibility of women to the hazards presented.

Pottery manufacturing. [3]

Between September 1936 and July 1937 the United States Public Health Service, in collaboration with the West Virginia Bureau of Industrial Hygiene, completed physical examinations, with X-ray of the chest, of 2,516 men and women engaged in the manufacture of pottery products in West Virginia. Intensive surveys were made in 10 plants, selected on the basis of a preliminary engineering survey of the 17 plants operating in the State at this time, to evaluate the working conditions and investigate methods in use to control health hazards. Medical examinations were conducted in 9 plants.

More than a third of all workers in the 17 plants in the State were women, employed in various departments and occupations as follows:

	Number of women
Clay shop	332
Finishers (table ware) 172, finishers and drillers (insulator and porcelain-specialty) 122, trimmers and fettlers 34.	
Bisque kiln placers, drawers, and so forth	48
Bisque warehouse	339
Brushers, tumblers, sandblasters 308, tile sorters and mounters 25.	
Underglaze decorating	134
Printers 39, decorators, decal, foremen 93.	
Glaze department	170
Dippers, helpers, spray-machine operators, hand sprayers, foremen, and miscellaneous 141.	
Glost kiln drawers, sagger emptiers	32
Glost warehouse	388
Selectors 49, dressers and chippers, grinders, cleaners, and polishers 140, warehouse workers 167, foremen and miscellaneous 32.	
Overglaze decorating	874
Decal cutters and appliers 479, dusters 145, gilders and liners 107, patchers and burnishers 26, stampers 51, washer operators 43.	
Office, laboratory and miscellaneous	121

Data show that both women and men are likely to work for a longer time in this industry than in others studied by the Public Health Service. In 9 of the plants surveyed in 1936–37, 60 women, about 7 percent of the 889 studied, had been employed in the industry from 20 to over 45 years. As many as 249, 28 percent of the total studied, had worked at pottery manufacture 10 and under 20 years.

In making this study of the lead hazards involved in pottery factories, all the 92 men and 45 women making glaze, dipping ware in glaze, or handling glaze-coated articles were examined. One man, a dipper, was suffering from lead poisoning, and 6 other persons, 1 a woman employed as a dipper's helper, showed signs of lead absorption. The results of the medical study for lead poisoning indicate a very considerable reduction in incidence of lead poisoning since the pottery study of 1919.[4] The reduction is attributed to the substitution of fritted glazes for glazes containing more readily soluble lead compounds, and to the mechanical methods of applying glaze in use in

[3] U. S. Public Health Service. National Institute of Health. Division of Industrial Hygiene. Public Health Bull. No. 244. Silicosis and Lead Poisoning Among Pottery Workers. February 1939. Figures 1, 2, and 3, reproduced from figures 10, 19, and 65 on pp. 18, 38, and 121, respectively, are gratefully acknowledged.

[4] U. S. Public Health Service. Public Health Bull. No. 116. Lead Poisoning in the Pottery Trades. 1921.

many factories. The warning is made that where soluble lead compounds are added to the glaze before use and hand dipping is the method used or the spray machines are inadequately ventilated, the danger of poisoning is as great as ever.

The progress has by no means been so good in lessening the hazards from silicosis. Authors of the report conclude from engineering study of the industry that the gravity of the dust problem in the clay shops has not been adequately appreciated. In the clay shop a great variety of operations for forming ware are in use. The formed ware is placed on ware boards and air-dried to remove most of the remaining moisture. When sufficiently dry it is finished or fettled. Fettling and finishing are principally done by women who may be exposed to dangerous concentrations of dust. A single dust count made at the breathing level of a fettler working over a down-draft ventilator such as is pictured in figure 1 gave a valve of 2 million particles per cubic foot, while fettlers in other plants were exposed to an average of 19 million particles per cubic foot.

A large number of women are in occupations that may have a dust hazard in the bisque warehouse. Much of the work of women is in sandblasting, and much of the ware, particularly flatware, is now cleaned in sandblast machines, such as that shown in figure 2. These machines are provided with exhaust ventilation, requiring careful periodic inspection. Even partial failure of the ventilating system could result in the release of large quantities of dust.

In the careful medical examination of nine potteries 22 women were found to have silicosis, 5 of them second-stage cases complicated by infection. Seventeen were in the first stage, 10 without complications, 2 with tuberculosis, and 5 with infection of a nonspecific nature. Of these women with silicosis, 12 were 25 to 34 years of age, 1 was younger, 2 were 45 or older.

Eight of the 14 women who had worked at finishing and fettling for more than 20 years were found to have silicosis. One of the women silicosis victims who had been working as a fettler of tile in a press room for 14 years was exposed to an estimated dust of 153 million particles per cubic foot—an unusually high dust concentration for this type of fettling. Tableware finishing and fettling are carried on by women who are exposed to an average dust concentration of 12 million particles per cubic foot, of which about 33 percent is quartz. As the chart, figure 3, shows, silicosis was found in 11 percent of the finishers and fettlers employed in these operations from 10 to 19 years, in 37 percent of those employed from 20 to 29 years, and in 83 percent of the group employed for more than 30 years.

A similar rise in the incidence of silicosis with length of employment is observable if all clay-shop workers are grouped together. Two women working as decorators were found to have silicosis contracted in the course of earlier employment in the clay shop.

Bisque- and glost-kiln workers have similar dust exposures, about 6 million particles per cubic foot. Because of relatively high wages they tend to remain for long periods in the industry. Silicosis was found in 6 percent of those employed from 10 to 19 years, 21 percent of those employed 20 to 29 years, and in 52 percent of those employed over 30 years.

FIGURE 1.—GREENWARE FETTLING UNDER CONTROLLED CONDITIONS OVER DOWN-DRAFT VENTILATION.

FIGURE 2.—SANDBLASTING TABLEWARE.

Operations offering no exposure to the silicosis hazard include decorating, selecting ware, and work in the mold shop and office—work usually carried on in buildings or parts of buildings remote from dust-producing operations.

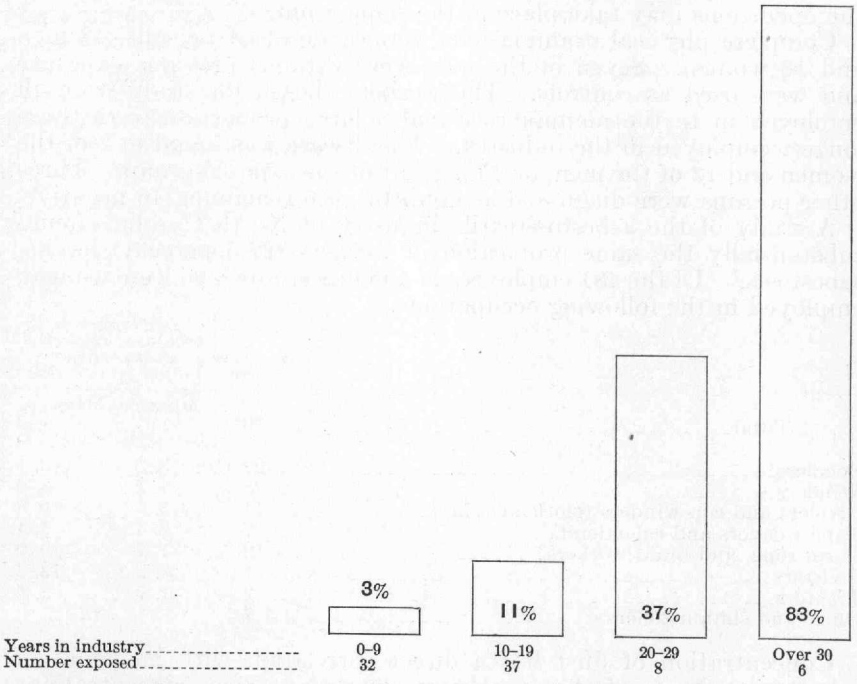

FIGURE 3.—PERCENTAGE OF FINISHERS AND FETTLERS WHO WERE FOUND TO HAVE SILICOSIS.

Two fatal cases of silicosis occurring in the plants studied are reported. One of these was a 26-year-old white woman who had worked for 5 years as a "finisher or remover" in the press room of a tile plant with an estimated dust exposure of more than 200 million dust particles per cubic foot. Symptoms of the disease were first noticed 2 years before her death. Radiograms taken during the 15 months' hospitalization preceding death, the post-mortem radiogram and the autopsy following gave a picture of advanced silicosis.

Asbestos textiles.

Asbestos textiles employed approximately 8,000 wage earners in the United States in 1929, 1,100 of them women. Asbestosis was recognized clinically in 1900, but it was not until 1930 that a study was made evaluating the degree of exposure in the industry.[5] Nearly a fourth of the plants and about two-fifths of the wage earners were in two States, New Jersey and Pennsylvania.

Pennsylvania, second in production of asbestos products, was the scene of an exposure study in the industry, findings of which were

[5] Merewether, E. R. A., and C. W. Price. Report on Effects of Asbestos Dust on the Lungs and Dust Suppression in the Asbestos Industry. Home Office. H. M. Stationery Office, London, 1930.

published in 1934 and 1935.[6] This study covered four plants and included not only data on the nature and amount of dust encountered but a report on the effects on the health of a group of workers of exposure to dust. While the various occupations differed considerably in dust concentration, occupation is not always important, since all the operations may take place in the same room.

Complete physical examinations were made of 64 persons, 48 men and 16 women. Seven of the men were without previous exposure and were used as controls. The workers chosen for study were all employed in textile manufacture and a large proportion were those longest employed in the industry. The disease was found in 2 of the women and 12 of the men, or 25 percent of the exposed group. Three other persons were diagnosed as doubtful, the remaining 40 negative.

A study of the asbestos-textile industry of North Carolina found substantially the same proportion of workers (27.5 percent) having asbestosis.[7] Of the 481 employees in 4 plants studied, 90 were women, employed in the following occupations:

	Number of women	*Dust exposure in occupations employing women (Million particles per cubic foot)*	
		Minimum	*Maximum*
Total	90	---	---
Spoolers	22	3. 2	13. 1
Winders	28	1. 2	8. 0
Creelers and cop winders (cloth weaving)	11	3. 6	9. 8
Tape weavers and calenderers	7	2. 4	5. 1
Cord, rope, and braid workers	12	1. 2	10. 2
Twisters	1	3. 2	13. 2
Treaters	2	1. 7	3. 6
Office and shipping clerks	7	. 12	

Concentration of dust has a direct correlation with incidence of asbestosis. None of the employees exposed to dust concentrations below 2.5 million particles per cubic foot had a case of asbestosis, and three doubtful cases fell in the range 2.5 to 4.9 million particles. Clean-cut cases of asbestosis were found only in dust concentrations exceeding 5 million particles. Engineering study demonstrated that it is possible to reduce the dust exposure of a majority of asbestos-textile workers to less than 5 million particles per cubic foot.

Shoe industry.[8]

The Massachusetts Division of Occupational Hygiene included in its industrial chemical survey of 1936, 49 establishments making shoes. Employed were 7,970 women, 44 percent of all workers. Thirty-one of the establishments used materials containing benzol. The chief use of benzol in the shoe industry is in rubber cements, but it is found also in stains and cleaners. In quantity of benzol, rubber-heel cements and breasting cements are most important. Benzol was used more commonly in the Massachusetts factories making high-grade shoes, in about 9 in 10 of these compared with only 1 in 7 of those making the cheap types of shoe.

[6] Pennsylvania. Department of Labor and Industry. Special Bull. No. 37. Asbestosis. Oct. 1, 1934. Special Bull. No. 42. Asbestosis. Sept. 20, 1935.

[7] U. S. Public Health Service. Public Health Bull. No. 241. A Study of Asbestosis in the Asbestos Textile Industry. August 1938. p. 16 ff.

[8] Massachusetts. Division of Occupational Hygiene. Report for year ending November 30, 1936. pp. 13 to 17.

Tests made of the 6 processes involving the use of benzol cements and not equipped with blower systems showed, in every case but 2, amounts of benzol vapor greater than 100 parts per million, the greatest concentration considered safe for all-day exposure. Local exhaust systems in several of the same operations resulted in exposure of less than 50 parts per million.

Tests of exposure in various individual operations using benzol showed women employed in breasting and using a breasting cement analyzing 50 percent benzol to be exposed to an average of 355 parts per million under natural ventilation. Women cementing rubber heels under local-exhaust ventilation had some exposure, but much less than the maximum safe concentration.

Air analyses for other solvents showed workers exposed to acetone in bleaching soles, to acetone and ethyl acetate in pasting underlays, and to ethyl acetate in cementing lasting allowance. Found in small quantities were carbon tetrachloride, methanol, and carbon bisulphide.

Wood-heel covering.[9]

An important source of employment for women in Massachusetts, the wood-heel-covering industry, employed in 1934 a total of 1,249 persons in 41 establishments. Practically all employees were women. In the 1936 industrial chemical survey, 13 plants, employing 508 persons, were studied. Women working in the covering rooms are exposed to methanol vapors. Methanol when breathed as vapors, though rarely fatal, may have serious effects on nervous tissue, particularly the optic nerve. Exposure may result in temporary or permanent blindness.

Air analyses in eight plants showed average concentrations of the vapor varying from 160 parts to 780 parts per million in the covering rooms surveyed. Average exposure exceeded the accepted safe maximum of 200 parts per million in five of the eight plants. While general ventilation was entirely inadequate in large rooms, it was found possible to install at small expense equipment with local exhaust ventilation bringing the exposure well below the maximum limit.[10]

Dry cleaning.[11]

In a survey of the health hazards of 2,141 inside employees in 97 dry-cleaning establishments in Detroit and the surrounding area, 1,147 women were studied. The principal occupations women operatives were engaged in may be listed as follows:

Pressers—fancy	392
Pressers—steam	179
Tailors and seamstresses	159
Shippers and receivers	154
Spotters—fancy	43

In point of numbers the principal exposures were of a physical nature. Constant lifting and pressure on the irons necessary in hand-pressing exposes these workers to tenovitis, an inflammation of the cords in the backs of the hands. Steam-press operators and to a less extent hand pressers using electric irons are subject to excessive heat.

[9] Ibid., pp. 17–20.
[10] Ibid. Year ending November 30, 1937. pp. 139–40.
[11] Cary, W. H., Jr., and Hepler, John M. Health Hazards in the Dry-Cleaning Industry. Industrial Hygiene Section, American Public Health Association. New Orleans. 1936. Mimeographed.

Steam-press operators are subject also to hazards of posture, since in operating the presses they are required to use both feet as well as their hands. Other exposures grow out of the use of spotting fluids (52 compounds listed), in addition to the naphtha solvents and chlorinated hydrocarbons used in general cleaning. The numbers of women exposed to these conditions and materials follow:

Total	973
Tenovitis	377
Heat	326
Posture	191
Spotting fluids	52
Chlorinated solvents	27

The study found many agents in use that have never been adequately investigated in connection with possible toxic properties under commercial use. Other findings include these facts: (1) In every instance of the use of chlorinated solvents a definite exposure was found to exist; (2) in most cases where very volatile petroleum products such as cleaners' naphtha and gasoline were used, unsafe concentrations of vapors were found; (3) dermatitis occurs on the hands and arms of practically all workers using solvents; (4) fancy spotters are exposed to a wide variety of solvent vapors. In specific instances spotters were found exposed to chlorinated-solvent vapors as much as cleaners working with the solvents.

In plants using synthetic solvents the cleaning operation generally is conducted in the same building and often in the same workroom as finishing and other operations, so neighboring workers in many cases are exposed to the toxic vapors produced by the solvents used by the cleaners, spotters, and soap makers.

The difficulty of carrying out an adequate program of prevention is increased by the seasonal character of the industry and by the small units commonly in operation. Of the 97 plants inspected, 66 had 25 or fewer employees, 44 of these having not more than 10. Only 4 had over 100 employees. Peak employment occurs in the spring.

The nursing profession.

The relation between tuberculosis and occupation is not easy to establish, but it is generally recognized that exposure to the tubercle bacilli through contact with cases of tuberculosis is an occupational hazard for nurses. A number of investigations of the extent of the problem as it relates to nurses have been made in recent years.

In a study of 12,000 university students overwhelming preponderance of lesions in students of the schools of nursing and medicine was noted, as compared to other departments. Of the three nursing schools included in a study [12] continuing since 1929, one had a 30-bed tuberculosis service and each student was required to spend 3 months on this service before graduation. Of all the students who entered this school from the fall of 1929 until 1937, 22.8 reacted positively to the tuberculin test on admission and 94.3 percent on graduation. The other hospitals had no regular tuberculosis service, but they accepted occasional patients for diagnosis and treatment and one of them had 1-year affiliation with a tuberculosis sanatorium. The

[12] Myers, J. Arthur. Tuberculosis Among Nurses. In Public Health Nursing, February 1939.

percentages of students graduating from these schools with a positive tuberculin test were respectively 43.6 and 35.3.

The high incidence of infection in students of nursing makes a sharp contrast with the marked decline in incidence of positive reaction among young adults in the general public. Of students attending the school of education of the University of Minnesota in about the same age groups as the student nurses, approximately one in a hundred in each of the 4 school years became infected. Other studies show that the infection attack rate in the community is about this figure.

That the hazard can be eliminated if it is recognized is evidenced by a study of Bellevue Hospital nurses published in 1936. In a 5-year period "tuberculosis * * * has been *controlled* so that its seriousness as a disabling and fatal disease does not appear to exceed that expected among young women in other occupations in New York City."[13]

Nurses have been awarded compensation for tuberculosis as an occupational disease by the industrial commissions of Massachusetts, New York, North Dakota, and Wisconsin.

[13] Amberson, J. Burns, Jr., and H. McLeod Riggins. Tuberculosis Among Student Nurses: A Five-Year Study at Bellevue Hospital. Annals of Internal Medicine, vol. 10, August 1936.

Part IV.—PROGRESS IN PREVENTION, 1935 TO 1939 [1]

Enactment of occupational-disease compensation laws.[2]

The years 1935 to 1939 have seen greatly increased interest in problems connected with the diseases of industry, an interest resulting in legislation in a number of States. At the close of 1934 only 12 States, 3 Territories, the District of Columbia, and the Federal Government compensated for occupational diseases. By the close of the legislative sessions of 1939 the number of States had doubled.[3]

Quite as important were the amendments enacted in New York in 1935, in Illinois in 1936, and in Ohio in 1939, which added to the schedule of diseases to be compensated in the State "any and all other occupational diseases." In Minnesota the schedule was enlarged to include certain diseases due to the hazards of fire fighting, and to make compulsory the reporting of all occupational diseases by physicians. In Washington the occupational-disease law of 1937 was amended to delete the provision that cost coverage should be borne equally by employer and employee.

On the other side of the ledger must be placed the 1939 amendment to the Pennsylvania occupational-disease law of 1937. While this amendment provided the same coverage as before, it greatly reduced the benefits injured workers will receive.

Of the 30 occupational-disease laws now on the statute books, 15 are laws in which the compensable diseases are listed.[4] There is considerable variation in the number of diseases included in these statutes, and even the longest lists fall short of the ideal situation—that industry bear the costs of all injuries resulting from its productive processes.

The remaining 10 States, the District of Columbia, two Territories, and the two Federal laws compensate for these diseases by general coverage, either a blanket inclusion under the law of all diseases peculiar to the occupation or a use of the word "injury" to cover both accidents and diseases.

That there is a trend away from the schedule plan of compensation is evidenced by the change from a schedule to a blanket law in New York, Illinois, and Ohio. From the resolutions and recommendations made by the International Association of Industrial Accident Boards and Commissions and by the Conferences on Labor Legislation held by the Secretary of Labor, it is apparent that administrators of work-

[1] Though the preceding pages of this report deal with the occurrence and prevention of occupational diseases as reported for 1935–38, legislation relating to this subject includes 1939.

[2] For detail of laws see U. S. Bureau of Labor Statistics Bull. No. 652, Occupational-Disease Legislation in the United States, 1936, with appendix for 1937, and Monthly Labor Review, July 1939, pp. 136–139.

[3] Arkansas (suspended pending referendum vote), California, Connecticut, Delaware, Idaho, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York, North Carolina, North Dakota, Ohio, Pennsylvania, Rhode Island, West Virginia, Washington, and Wisconsin.

[4] Arkansas (38 diseases), Delaware (12 diseases), Idaho (15 or more diseases), Kentucky (diseases due to inhalation of gases or silica dust), Maryland (34 diseases), Michigan (31 diseases), Minnesota (23 diseases), Nebraska (diseases of three industries), New Jersey (10 diseases), North Carolina (25 diseases), Pennsylvania (12 diseases), Rhode Island (31 diseases), Washington (21 diseases), West Virginia (silicosis only), and Puerto Rico (15 diseases).

men's compensation laws agree in favor of complete coverage of all diseases of industry. The Committee on Workmen's Compensation of the Conference on Labor Legislation recommended in 1934 and at each succeeding annual meeting that a blanket coverage of occupational diseases be adopted in preference to the schedule coverage.[5]

In line with the recent development of legislation in the field of compensation for occupational disease, a number of States authorized commissions to study the legislative problems involved and submit reports to the legislatures. During 1939 such commissions were appointed in New Hampshire, Oregon, Tennessee, Texas, and Utah.[6]

Industrial hygiene activity in the United States.

In 1935 it became possible for the Federal Government to use Social Security funds in cooperation with State authorities in the development of State industrial-hygiene projects. As a result divisions of industrial hygiene have been established in the public-health departments of a number of States. In addition to the two divisions previously established in State labor departments [7] and the two in State health departments,[8] there has been set up in the health departments of 25 States special personnel for investigation of the industrial-hygiene problems of the State. The importance of such research and regulatory bodies has been discussed elsewhere,[9] and something of the work already accomplished by the new divisions has been summarized in part III of the present study.

Development of independent agencies for the prevention of occupational diseases.[10]

Agencies not governmental in character have played an important part in industrial-health work in recent years. Certain private foundations and agencies have been active in this field for many years, for example, the American Association of Industrial Physicians and Surgeons organized in Detroit in 1916. For a quarter of a century the American Public Health Association has engaged through its Industrial Hygiene Section in a study of industrial-health problems.

Illustrative of the work of groups of employers in safeguarding the health of workmen is the Air Hygiene Foundation of America, Inc., a nonprofit organization supported by 250 affiliated corporations with approximately a million members. In addition to research in industrial health, the foundation makes plant surveys and special investigations for member companies, and serves as a central agent for the collection and distribution of data on occupational-health topics.[11]

Among notable efforts of labor organizations in the field of industrial health is the Union Health Center, since 1934 an integral part of the International Ladies' Garment Workers' Union. Supported almost entirely by fees from its members, it has developed a health program largely responsible for the fine health showing among New York garment workers. Recent evidence of the value of its work lies in

[5] Monthly Labor Review, April 1934, p. 781, November 1935, p. 1261, December 1936, p. 1440; and U. S. Department of Labor, Division of Labor Standards, Proceedings of the National Conference on Labor Legislation. 1937 and 1938. Bulls. No. 18 and 25.
[6] National Safety News, January 1940, p. 58.
[7] Massachusetts and New York.
[8] Connecticut and Ohio.
[9] U. S. Women's Bureau Bull. No. 114, State Reporting of Occupational Diseases. 1934. pp. 29–32.
[10] American Medical Association, Proceedings of First Annual Congress on Industrial Health, January 1939, pp. 17–19.
[11] National Industrial Conference Board, Inc., Management Record, January 1940, pp. 9–10,

the report of New York City's Tuberculosis Bureau, in which it was found that the tuberculosis rate among garment workers in the city, which is 1 in every 150 persons among members of the International Ladies' Garment Workers' Union, is only about half the general rate for the city's population.[12]

Labor organizations must be given credit, too, for pressure on the employers and State authorities for control of chemical hazards in the rayon industry of Pennsylvania,[13] in the fur-felt-hat industry of Connecticut, in the manufacture of insulated electrical wires, and in other highly organized industries. An indication that organized labor realizes its stake in the movement for healthful working conditions is found in the increased mention of the subject in labor contracts. An analysis of 7,000 labor contracts revealed that 2,500 carried some provision relating to safety and health.[14]

Among other organizations whose work should be consulted in a study of preventive programs are the following: American Medical Association (Section on Preventive and Industrial Medicine and Public Health), American Public Health Association (Industrial Hygiene Section), American Standards Association, National Safety Council, National Tuberculosis Association, Industrial Health Conservancy Laboratories. The insurance agencies are another group of independent associations actively interested in the promotion of industrial health work. A number of compensation carriers maintain industrial hygiene laboratories for the purpose of assisting plants they insure.

A recent study made by the National Industrial Conference Board, covering 301 establishments, shows the extent to which individual firms investigate cases of occupational disease.[15] Slightly over four-fifths of all the establishments investigated occupational diseases occurring, and the proportion rose to 96 percent for establishments with as many as 5,000 employees. The need for investigation of diseases of industry is not so well recognized as the need for investigation of industrial accidents. Over nine-tenths of all establishments investigated accidents and without exception all the largest firms made such investigations. It is interesting to note that nearly 70 percent of the 154,265 women covered by the study were found in the 22 companies having 5,000 or more workers. As would be expected because of the cost of such supervision, it is the large companies that are most likely to supervise the health of employees, to provide for physical examinations, and to furnish adequate medical and health programs.

Among the programs of individual employers whose health programs have been outstanding may be mentioned the medical work of a large communications organization, one feature of which is a health and nutrition course for its women employees. Others include a large chemical plant, whose laboratory of industrial toxicology determines the toxicity of the chemical products manufactured by the founding firm and recommends safe methods for their use.

[12] New York Times, February 6, 1940, p. 20.
[13] Labor. July 4, 1939, p. 3.
[14] Perkins, Frances. The Worker's Stake in Industry. U. S. Government Printing Office, 1940.
[15] National Industrial Conference Board, Inc. Studies in Personnel Policy, No. 17, Medical and Health Programs in Industry. 1939.