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## LETTER OF TRANSMITTAL.

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U. S. DEPARTMENT OF LABOR,  
CHILDREN'S BUREAU,  
*Washington, April 8, 1918.*

SIR: Herewith I transmit a study of infant mortality in the city of Brockton, Mass., for one year, which constitutes the fifth item in the series of studies of this subject conducted by the bureau.

Brockton was selected as an example of an industrial city with an infant mortality rate notably lower than the average rate for the registration area. It is a city of a single industry, the manufacture of shoes; skilled operatives are employed at comparatively high wages, and trade-union conditions prevail.

Acknowledgment should be made of the cooperation given by the citizens of Brockton in securing information upon which this study is based. City officials, the press, the pulpit, women's organizations, and the shoe workers' unions aided in making the purpose and method of the study thoroughly understood. The essential material was secured by interviewing the mothers of the babies under consideration, and the generous assistance of these mothers alone made the study possible. No mother refused to give the desired information.

The field work for this study was directed, and the report was written, by Miss Mary V. Dempsey. Miss Emma Duke supervised the tabulation of the statistics. Dr. Robert M. Woodbury wrote the appendix on method of procedure.

Respectfully submitted.

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*Chief.*

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*Secretary of Labor.*

# INFANT MORTALITY—BROCKTON, MASS.

## INTRODUCTION.

Brockton, Mass., was chosen as a unit in the inquiry of the Children's Bureau into the social, economic, and civic factors underlying infant mortality for three reasons:

First. It is situated in a State with excellent birth registration, an important consideration on account of the assistance afforded by the birth records in finding the mothers to be interviewed.

Second. As a town devoted to a single industry, employing skilled workers, and paying high wages, Brockton presents an interesting phase of the infant mortality problem. The city is almost exclusively given over to the manufacture of shoes and shoe findings.

Third. Brockton has had for some years comparatively low death rates and low infant mortality rates. The general death rate, moreover, has shown a steady decrease year by year; each year, from 1910 to 1913, inclusive, the city can claim the distinction of having had the lowest rate among the cities in Massachusetts of at least 50,000 population, and for the 10-year period from 1901 to 1910, inclusive, its average annual death rate also was the lowest in this group of cities.<sup>1</sup>

## INFANT MORTALITY RATES.

An interesting comparison is afforded by a study of the infant mortality rates for the State of Massachusetts and the cities in the State having a population of 50,000 or more in 1910, and the general infant mortality rate of 124 for the death registration States in the same year.<sup>2</sup>

TABLE I.—*Infant mortality rates 1910–1913 for the State of Massachusetts and for cities having a population of 50,000 or over in 1910.*

City.	1910 <sup>a</sup>	1911 <sup>b</sup>	1912 <sup>a</sup>	1913 <sup>a</sup>
The State.....	133	119	117	110
Boston.....	124	126	117	110
Brockton.....	102	78	100	98
Cambridge.....	120	114	97	98
Fall River.....	186	177	151	151
Holyoke.....	213	183	163	200
Lawrence.....	168	141	135	128
Lowell.....	231	189	184	151
Lynn.....	100	102	112	82
New Bedford.....	180	148	156	143
Somerville.....	102	93	78	86
Springfield.....	126	102	102	104
Worcester.....	137	111	133	105

<sup>a</sup> Seventy-third Annual Report on Births, Marriages, and Deaths in Massachusetts for the Year 1914, pp. 206, 207. Boston, 1915.

<sup>b</sup> Seventieth Annual Report on Births, Marriages, and Deaths in Massachusetts for the Year 1911, pp. 181, 182. Boston, 1912.

<sup>1</sup> Seventy-third Annual Report on Births, Marriages, and Deaths in Massachusetts for the Year 1914, p. 201. Boston, 1915.

<sup>2</sup> U. S. Bureau of the Census, Mortality Statistics 1911, pp. 10, 25. Washington, 1913.

## DESCRIPTION OF CITY.

Brockton, located 21 miles south of Boston, has an area of 21½ square miles, more than half of which is decidedly rural in character. The city's growth has been from north to south along Main Street, which is the center of all business activities.

The merchants of Brockton do not suffer in commercial competition, because of the city's proximity to Boston, in contrast to many other communities within the same radius of the larger city. The wealthy owners of factories and high-salaried officials connected with the shoe industry live in Brockton. Their beautiful homes scattered here and there save the city from the monotonous appearance which so often characterizes manufacturing cities.

## HISTORY.

Brockton has an interesting history dating back to the time when Miles Standish purchased the Bridgewater from Massasoit in 1649. Although settled in 1700 as part of the town of Bridgewater, not until 1821 did it become a separate town known as North Bridgewater. In 1874 the name of Brockton was adopted and in 1881 the city was incorporated. The development of Brockton has kept pace with that of the shoe industry in New England, the population having increased from 13,608 in 1880 to 56,878 in 1910.

## INDUSTRIAL CONDITIONS.

Brockton is the largest center in the United States for the manufacture of men's high-grade shoes and "also occupies [the] chief place in Massachusetts in the production of shoe-factory tools and supplies."<sup>1</sup> Within the city limits are about 30 shoe factories and several factories devoted to the making of shoe parts and shoe findings. In addition, many factories of the same kind are situated in adjacent towns. No other manufacturing is extensively done in Brockton; those who do not work in the shoe factories are to a large extent engaged in meeting the needs of those who do. It is pre-eminently a one-industry town, and that industry is carried on by highly specialized workers who make good wages and possess an unusual degree of skill. The unskilled workman, or the man who has learned his trade in the manufacture of cheap shoes, must market his labor elsewhere. As a result, the Brockton shoe operatives are, for the most part, a picked force representing the best of the shoe workers of New England.

The industrial situation in the city can not perhaps be better summarized than in the abstract of a report made by the British Board of Trade:<sup>2</sup>

<sup>1</sup> U. S. Bureau of Labor Statistics. *The Boot and Shoe Industry in Massachusetts as a Vocation for Women*, p. 25. Washington, 1915.

<sup>2</sup> *Living Conditions of the Wage-earning Population in Certain Cities of Massachusetts. Abstract of a Report by the Labor Department of the British Board of Trade*, pp. 262-263. Massachusetts Bureau of Statistics, Boston, 1911.

The boot and shoe trade in Brockton is highly organized, and practically all the manufacturers recognize agreements with the men's unions. The trade-union stamp system has been developed with considerable success. There is little doubt that the manufacturers regard the stamp as an asset of some value for advertising purposes and as a quid pro quo for their concession of union claims. The agreement, known as the "union stamp agreement," is entered into between the manufacturer and the Boot and Shoe Workers' Union, the international organization which forms a coordinating body for the unions concerned with special branches of the trade. The principal provisions of the agreement are that "the union agrees to furnish its union stamp to the employer free of charge, to make no additional price for the use of the stamp, to make no discrimination between the employer and other firms, persons or corporations who may enter into an agreement with the union for the use of the union stamp, and to make all reasonable effort to advertise the union stamp and to create a demand for the union stamped products of the employer, in common with other employers using the union stamp." On the other side the employer agrees to hire as boot and shoe workers only members of the union. It is further agreed that the union will not cause or sanction any strike, that the employer will not lock out his employees while the agreement is in force, and that all questions of wages or conditions of labor which can not be mutually agreed upon shall be submitted to the Massachusetts State Board of Conciliation and Arbitration.

The progress of the city under this régime is evident on every hand. One rarely hears of dissatisfaction with the "union stamp agreement." Although the high scale of wages demanded by the unions is said to keep away from the city the cheaper sort of contracts, it keeps away also much of the cheaper labor and draws to the city only those workmen who are at least fairly skilled. Labor men throughout the State consider that labor conditions in Brockton were more satisfactory than in any other Massachusetts city.

In no [shoe] factory in Brockton and in few situated in surrounding towns can a nonunion man be employed \* \* \*. Altogether about four-fifths of the women in the Brockton district belong to unions \* \* \*. In Brockton the higher wage, good factory equipment, and permanence of business concerns are no doubt largely due to the intelligent and moderate management of the unions. The fact that the unions have to deal with a superior class of manufacturers, who reside among and respect their working force, must be given a large place in the accomplishment of these results.<sup>1</sup>

Wages in the boot and shoe industry are generally conceded to be high as compared with those in other manufacturing industries. The British Board of Trade states,<sup>2</sup> furthermore, that—

there appears to be no doubt that the average yearly earnings of the boot and shoe operatives are higher in Brockton than in any other boot and shoe center in Massachusetts. It is claimed, indeed, that they are higher than in any other center in the world.

Although these statements were made about four years prior to the year considered in this study, conditions had not materially changed up to the time of this inquiry.

<sup>1</sup> U. S. Bureau of Labor Statistics. *The Boot and Shoe Industry in Massachusetts as a Vocation for Women*, pp. 98, 99. Washington, 1915.

<sup>2</sup> *Living Conditions of the Wage-earning Population in Certain Cities of Massachusetts*. Abstract of a Report by the Labor Department of the British Board of Trade, p. 264. Massachusetts Bureau of Statistics, Boston, 1911.

An interesting feature of Brockton is the high proportion of children in high school. In 1912-13 there were 1,382 children in high school, compared to an estimated child population 15 to 19 of 5,336,<sup>1</sup> or nearly 26 per cent. This figure is in striking contrast with that of Fall River, 8 per cent, and of New Bedford, not quite 7 per cent. This result is probably due to the city's high economic level, which permits children to continue in school longer than would otherwise be the case, but it shows also an appreciation of the value of education.

In summary, high wages appear to have developed high standards of living, a desire for better education, and a sense of civic responsibility; as a result, the city enjoys improved civic conditions which in turn react favorably upon the health of its residents.

#### METHOD OF PROCEDURE.

This inquiry was designed to show the effect upon infant mortality of various economic, social, and physical factors. Births in a selected year were studied and the number of deaths under 1 year of age among them was determined; in this way an infant mortality rate, or the deaths under 1 year per 1,000 live births, was found for the city and the various subgroups. The year selected was from November 1, 1912, to October 31, 1913. The work of copying the birth certificates on schedules was begun in October, 1914; if a death certificate was recorded for a child born in the selected year, the facts on this certificate were also transferred to the schedule. The women agents of the bureau then began interviewing mothers, from whom most of the data used in this study were obtained. No mother was interviewed before her baby's first birthday. Every home was visited whether the mother was rich or poor, native or foreign, provided the baby was born in Brockton during the year selected and his birth was registered at the city hall.

Although no attempt was made to find unregistered births by making a house-to-house canvass, by examination of baptismal records, or by other means, 28 such births were discovered. Twenty-four of these were obtained from death certificates and four living unregistered babies were found purely by accident. Inasmuch as the agents probably did not find all births which were not registered, the bureau deemed it advisable to base the detailed study upon registered births alone.<sup>2</sup>

Copies were made of 1,585 birth certificates (exclusive of duplicates). Three hundred and twenty-eight registered births and 10 registered miscarriages were excluded from the detailed study, 247 of the births being to mothers who had moved from the city or whose correct ad-

<sup>1</sup> The ages 15 to 19 are chosen as the group given by the Federal census that offers the best basis for comparison. The figure 1,382 includes all children in high school, not merely those 15 to 19.

<sup>2</sup> See Appendix, p. 62.

dresses could not be found.<sup>1</sup> No baby was included whose mother did not reside in Brockton the greater part of the first year after his birth. Complete data were obtained for the remaining 1,247 births, including 37 stillbirths.

### ANALYSIS OF FINDINGS.

#### INFANT MORTALITY RATE.

Of the 1,247 registered births included in the detailed study of infant mortality in Brockton, 37, or 3 per cent, were stillbirths. The deaths among the live-born infants numbered 117, giving an infant mortality rate of 96.7.

#### AGE AT DEATH.

Nearly one-half the infant deaths occurred in the first month of life and as many before the end of the first day as between the ages of 6 and 12 months. Of the 117 infant deaths, one-third occurred in the first week; and more than one-fifth took place before the babies were 1 day old.

TABLE II.—*Number and per cent distribution of deaths among infants born in Brockton during selected year, by age at death.*

Age at death.	Infant deaths.	
	Number.	Per cent distribution.
All ages.....	117	100.0
Less than 1 month.....	57	48.7
Less than 1 day.....	24	20.5
1 day but less than 2.....	2	1.7
2 days but less than 3.....	4	3.4
3 days but less than 7.....	9	7.7
1 week but less than 2.....	3	2.6
2 weeks but less than 1 month.....	15	12.8
1 month but less than 2.....	9	7.7
2 months but less than 3.....	10	8.5
3 months but less than 6.....	17	14.5
6 months but less than 9.....	12	10.3
9 months but less than 12.....	12	10.3

A study of the proportion of deaths occurring at various ages reveals interesting differences between Brockton and the other cities studied by the Children's Bureau. (Table III.)

TABLE III.—*Per cent distribution of deaths among infants born in specified cities during selected periods, by age at death.*

Age at death.	All cities.	Brockton.	Johns-town.	Manchester.	Saginaw.	New Bedford.
All ages.....	100.0	100.0	100.0	100.0	100.0	100.0
Less than 1 month.....	35.5	48.7	37.8	27.9	56.6	30.3
Less than 1 day.....	11.8	20.5	14.3	6.6	8.4	12.2
1 day but less than 2.....	2.9	1.7	1.0	2.3	12.0	2.7
2 days but less than 3.....	2.2	3.4	2.0	3.1	2.4	1.2
3 days but less than 7.....	5.8	7.7	5.6	5.8	8.4	4.5
1 week but less than 2.....	5.0	2.6	7.1	3.9	9.6	4.5
2 weeks but less than 1 month.....	7.8	12.8	7.7	6.2	15.7	5.3
1 month but less than 2.....	9.3	7.7	9.2	9.3	10.8	9.5
2 months but less than 3.....	7.8	8.5	8.2	9.3	3.6	7.1
3 months but less than 6.....	20.7	14.5	21.4	22.1	12.0	23.4
6 months but less than 9.....	16.2	10.3	15.8	19.0	7.2	18.7
9 months but less than 12.....	10.5	10.3	7.7	12.4	9.6	11.0

<sup>1</sup> See Appendix, pp.64 to 67, for detailed reasons for exclusions.

The percentage of deaths occurring in the first day of life was strikingly high in Brockton; it was nearly twice as large as the average for all cities studied.

A baby who dies at a very early age is one who has not had a fair start in life. In other words, the baby is born with a handicap and dies before he has an opportunity to reap any benefit from breast feeding, sanitary environment, and the ample income and superior intelligence of his parents. In Brockton, therefore, the importance of these factors was lessened by the fact that a large proportion of the deaths occurred at a very early age.

#### STILLBIRTHS.

Thirty-seven stillbirths were included in the detailed analysis. The per cent that stillbirths formed of all births in the various cities studied is shown in Table IV. Brockton's stillbirth rate compared favorably with that for New Bedford and Saginaw and was considerably lower than the rates for Johnstown and Manchester.

TABLE IV.—*Per cent of stillbirths during selected year to mothers of specified nativity, for specified cities.*

City.	Stillbirths per 100 births.		
	Total mothers.	Native mothers.	Foreign-born mothers.
All cities.....	3.8	3.8	3.9
Brockton.....	3.0	2.0	3.9
Johnstown.....	4.5	4.0	5.1
Manchester.....	4.8	4.6	4.9
Saginaw.....	3.3	3.7	2.4
New Bedford.....	2.8	3.2	2.7

Stillbirths to mothers of 30 years of age or over were proportionately more than four times as numerous as those to mothers under 30. The proportion increased slightly but steadily with the number in order of birth. (See Table XII, p. 20.)

Foreign-born mothers had proportionately almost twice as many stillbirths as native mothers; 12 of the 37 stillbirths included in the study were to native mothers and 25 to foreign-born mothers. Compared with the other nationality groups, the Italian and British mothers had a high percentage of stillbirths. The Swedish and Jewish mothers had none. (See Table XVIII, p. 24.)

The proportion of stillbirths was large among illiterate mothers, as well as among mothers who were unable to speak English. (See Tables XX and XXI, p. 29.) Also, mothers in the lower economic classes had more stillbirths proportionately than did those who were more fortunately situated. (See Table XXIII, p. 32.)

## CAUSE OF DEATH.

A careful study of the certified or immediate cause of death affords clews leading to the more remote social or economic conditions affecting the prevalence or incidence of disease. The number and per cent of deaths caused by each group of diseases are shown in Table V.

TABLE V.—Number and per cent distribution of deaths among infants born during selected year, by cause of death.

Cause of death.	Infant deaths.	
	Number.	Per cent distribution.
* All causes.....	117	100.0
Gastric and intestinal diseases.....	15	12.8
Respiratory diseases.....	16	13.7
Malformations.....	6	5.1
Early infancy.....	45	38.5
Premature birth.....	20	17.1
Congenital debility.....	18	15.4
Injuries at birth.....	7	6.0
Epidemic diseases.....	10	8.5
Diseases ill defined or unknown.....	6	5.1
All other causes.....	19	16.2

Diseases peculiar to early infancy.—Forty-five, or 39 per cent, of the 117 deaths, were traceable to causes peculiar to early infancy; of these, 32 died in the first two weeks. Diseases peculiar to early infancy, then, constituted the chief cause of death among the Brockton babies studied.

Of every 1,000 babies who were born alive in Brockton during the year chosen, 37 died of causes peculiar to early infancy. In proportion to the total deaths, these causes were relatively of much greater importance than in other cities studied, notably Manchester; but the rate—which is the fairer comparison—was about average.

TABLE VI.—Infant mortality rates for specified cities, by cause of death.

Cause of death.	All cities.	Brockton.	Johnstown.	Manchester.	Saginaw.	New Bedford.
All causes.....	127.0	96.7	134.0	165.0	84.6	130.3
Gastric and intestinal diseases.....	37.8	12.4	32.8	63.3	8.2	48.3
Respiratory diseases.....	22.8	13.2	26.7	26.2	10.2	27.8
Malformations.....	5.3	5.0	3.4	9.0	4.1	4.6
Early infancy.....	35.5	37.2	39.6	39.6	37.7	29.0
Premature birth.....	12.9	16.5	14.4	14.7	12.2	9.7
Congenital debility.....	19.2	14.9	20.5	24.3	24.5	15.5
Injuries at birth.....	3.3	5.8	4.8	.6	1.0	3.9
Epidemic diseases.....	7.7	8.3	11.6	3.2	5.1	8.9
Diseases ill defined or unknown.....	5.0	5.0	7.5	7.0	4.1	2.7
All other causes.....	12.9	15.7	12.3	16.6	15.3	8.9



A striking contrast between the comparative infant mortality rates for five cities studied by the bureau is shown in Table VI. The rate from gastric and intestinal diseases for Brockton is low compared with the rates for Johnstown and Manchester. The rate from diseases of early infancy is about the same in all the cities studied. Evidently, while great progress has been made in decreasing the number of deaths from gastric and intestinal diseases, little has yet been done to decrease the deaths in early infancy. The very high percentage of deaths in the first week or month of life merely presents the same truth with a different emphasis. In Johnstown, Manchester, and New Bedford the work of mothers before confinement may have contributed to a high rate in those cities, but in Brockton, where the work as described was much less arduous than in other cities, this employment can not be considered a factor in the infant mortality of 37 from diseases peculiar to early infancy.

**Gastric and intestinal diseases.**—Fifteen babies died during their first year from gastric and intestinal diseases; this number represents 12.8 per cent of all infant deaths. In Manchester 38.4 per cent of all deaths under 1 year were due to this cause and in New Bedford 37.1 per cent. The proportion of deaths under 1 year from this cause in Massachusetts cities having a population of at least 100,000 in 1910 is shown in Table VII.

TABLE VII.—*Per cent of deaths under 1 year in 1913 due to gastric and intestinal diseases in Massachusetts cities with a population of 100,000 and over in 1910.*

City.	Per cent. <sup>a</sup>
The State.....	28.3
Boston.....	22.8
Cambridge.....	31.3
Fall River.....	36.1
Lowell.....	37.5
Worcester.....	28.5

<sup>a</sup> Derived from U. S. Census Bureau, Mortality Statistics 1913, pp. 532 and 601-603.

Although these percentages are available only for cities which are much larger than Brockton, it is plainly evident that the proportion of deaths caused by gastric and intestinal diseases was unusually low in Brockton. This difference is shown in a more striking way by the infant mortality rates from these diseases in the cities studied. (See Table VI, p. 15.) In Brockton 12 out of every 1,000 live-born infants died from gastric and intestinal diseases, while in Johnstown 33, in Manchester 63, and in New Bedford 48 died from these causes.

Of the 15 deaths from gastric and intestinal diseases, 14 occurred during August, September, and October. (See General Table 3.) The mortality from these diseases is usually greatest in the late summer months.

**Respiratory diseases.**—Of all infant deaths, 16, or 13.7 per cent, were caused by respiratory diseases. This proportion is somewhat lower for Brockton than for the other cities studied, with the exception of Saginaw. Twelve of these deaths occurred during the winter months. Five of the children who died from this cause had native mothers and 11 had foreign-born mothers. Ventilation of homes, which, if inadequate, might be a factor in deaths from these diseases, was found to be good in 82 per cent of the homes of native mothers and in 56.5 per cent of the homes of foreign-born mothers.

Ten babies died from epidemic diseases, six from diseases ill defined or unknown, and 19 from all other causes.

#### ATTENDANT AT BIRTH.

A circumstance which clearly indicates the progress of the foreign-born residents of Brockton is the fact that they have become accustomed to engaging physicians as attendants at childbirth. Of the births to foreign-born mothers, 36 or 5.7 per cent were attended by midwives; these mothers were all Lithuanians. These 36 births were 2.9 per cent of all births during the selected year. In Manchester 13.6 per cent and in New Bedford 30 per cent of the births to foreign-born mothers were so attended. Three of the births to foreign-born mothers in Brockton were attended by neighbors or relatives, 3 had no attendant, and in 2 cases the attendant was not reported. All the births to native mothers were attended by physicians.

Two midwives made birth reports to the city clerk during 1913; an investigation of the practice of midwifery made in 1909 showed that 3 midwives were at that time practicing in Brockton.<sup>1</sup> The midwife has a peculiar status under the Massachusetts law; the Massachusetts Commission on Immigration states that "as she is not a medical practitioner under the law she can not legally practice. And yet she is required to register all the births she attends, and is paid a fee for doing this."<sup>2</sup>

This curious inconsistency in the law may tend to discourage the registration of births by midwives in some cities throughout the State, but nothing has been found to indicate that Brockton is among their number.

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<sup>1</sup> Huntington, J. L., M. D. "Midwives in Massachusetts." Boston Medical and Surgical Journal, Vol. CLXVII, No. 16, pp. 542-548.

<sup>2</sup> The Problem of Immigration in Massachusetts, Report of the Commission on Immigration, p. 193. Boston, 1914.

TABLE VIII.—*Number and per cent distribution of births during selected year to mothers of specified nativity, according to kind of attendant at birth.*

Kind of attendant at birth.	Total mothers.		Native mothers.		Foreign-born mothers.	
	Births.	Per cent distribution.	Births.	Per cent distribution.	Births.	Per cent distribution.
All classes.....	1,247	100.0	613	100.0	634	100.0
Physician.....	1,203	96.5	613	100.0	590	93.1
Midwife.....	36	2.9			36	5.7
Other, none, or not reported.....	8	.6			8	1.3

Various secret and fraternal orders, foreign societies, unions, and private clubs have customarily engaged physicians for their members by the year. As a rule each member pays a stated sum to this physician and is in return entitled to his services for a year without further charge.

## SEX.

The masculinity, or ratio of male births to female births which occurred in Brockton during the selected year, was 1,058 to 1,000. The infant mortality was higher among male children. This conformity to frequently observed phenomena is shown not only for the births and for the infant mortality rate in the city as a whole but for the children of native and of foreign-born mothers as well. In spite of the high infant mortality among the males, more male than female children survived at the end of the first year.

TABLE IX.—*Births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, according to sex of infant and nativity of mother.*

Sex of infant and nativity of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
					Number.	Per cent of total births.
All mothers.....	1,247	1,210	117	96.7	37	3.0
Male.....	641	623	70	112.4	18	2.8
Female.....	606	587	47	80.1	19	3.1
Native mothers.....	613	601	61	101.5	12	2.0
Male.....	307	301	37	122.9	6	2.0
Female.....	306	300	24	80.0	6	2.0
Foreign-born mothers.....	634	609	56	92.0	25	3.9
Male.....	334	322	33	102.5	12	3.6
Female.....	300	287	23	80.1	13	4.3

AGE OF MOTHER.

The influence of the age of the mother on infant mortality is shown in Table X.

TABLE X.—Births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, according to age of mother at birth of infant.

Age of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate. <sup>a</sup>	Stillbirths.	
					Number.	Per cent of total births. <sup>a</sup>
All mothers.....	1,247	1,210	117	96.7	37	3.0
Under 20.....	58	57	8		1	
20 to 24.....	346	340	36	105.9	6	1.7
25 to 29.....	352	349	30	86.0	3	.9
30 to 39.....	422	398	38	95.5	24	5.7
40 and over.....	66	63	5		3	
Not reported.....	3	3				

<sup>a</sup> Not shown where base is less than 100.

In Brockton the infant mortality rate was highest among babies whose mothers were less than 25 years of age.

The combined data for the five cities studied show that the infant mortality rate was highest for babies whose mothers were under 20, while children of mothers 40 and over had the next highest rate. Mothers between the ages of 25 and 29 lost proportionately the fewest babies.

TABLE XI.—Infant mortality rates for specified cities, according to age of mother at birth of infant.

Age of mother.	Infant mortality rates for <sup>a</sup> —					
	All cities.	Brockton.	Johns-town.	Manches-ter.	Saginaw.	New Bed-ford.
All mothers.....	127.0	96.7	134.0	165.0	84.6	130.3
Under 20.....	180.6					259.3
20 to 24.....	131.2	105.9	121.1	181.2	105.4	128.3
25 to 29.....	117.4	86.0	143.2	153.3	73.8	114.0
30 to 39.....	121.5	95.5	135.9	146.6	70.5	129.8
40 and over.....	142.1					142.9

<sup>a</sup> Not shown where base is less than 100.

ORDER OF BIRTH.

The first-born children, according to Table XII, had a slightly greater chance of dying than the second or third-born children; the infant mortality rate increased for the fourth-born children, as well as for those who were fifth or later in order of birth. This is in general accord with the findings of other infant mortality studies and with a similar table concerning number of pregnancies in the maternal history section of this study. (See Table XXXIV, p. 41.)

TABLE XII.—*Births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, according to number in order of birth.*

Number in order of birth.	Total births.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
					Number.	Per cent of total births.
All mothers .....	1,247	1,210	117	96.7	37	3.0
First.....	416	408	38	93.1	8	1.9
Second.....	262	256	23	89.8	6	2.3
Third.....	185	178	16	89.9	7	3.8
Fourth.....	124	119	12	100.8	5	4.0
Fifth and later.....	260	249	28	112.4	11	4.2

## FEEDING.

All medical authorities are agreed as to the superiority of breast milk over any other kind of food for infants. Yet in spite of the constant reiteration of this well-known fact many mothers resort to various other foods for their babies.

Thirty-three of the 1,210 live-born babies died before they were fed, although a few of them lived for two or three days. Of the 1,177 babies who were fed 232, or 19.7 per cent, were never breast fed. The proportion of breast-fed babies decreased as the age increased, since more and more of them were given some food in addition to breast milk or else were exclusively artificially fed. Table XIII shows the percentage of infants surviving at the beginning of each month of life that were exclusively breast fed in that month. This percentage fell from 78.5 in the first month to 33.2 in the ninth.

A baby who is breast fed in a given month has almost invariably enjoyed the same type of feeding since birth. On the other hand, the baby who is artificially fed in the ninth month may never have had any breast milk, but he is far more likely to have been nursed for a long or short time before being weaned. In other words, feeding is a changing process that does not readily lend itself to tabular presentation. A table showing the type of feeding at different periods of an infant's life should be regarded as a series of snapshots rather than as a moving picture of his feeding during his first year.

TABLE XIII.—*Infants born during selected year, and surviving at beginning of specified month<sup>a</sup> and number and per cent exclusively breast fed during specified month.*

Month of life.	Total infant survivors.	Breast fed exclusively.	
		Number.	Per cent.
First.....	<sup>a</sup> 1,177	924	78.5
Second.....	1,153	815	70.7
Third.....	1,144	752	65.7
Fourth.....	1,134	650	57.3
Fifth.....	1,128	608	53.9
Sixth.....	1,122	554	49.4
Seventh.....	1,117	467	41.8
Eighth.....	1,114	424	38.1
Ninth.....	1,110	368	33.2

<sup>a</sup> Excluding 33 who died not fed.

The mortality among artificially-fed infants was considerably higher than among the breast-fed infants, as shown in Table XIV. In this table figures are presented showing the number of deaths in each month of life per 1,000 survivors at the beginning of the month; the monthly rate was highest for the first month and was still high for the second and third months. A comparison between the death rates for the breast fed and the artificially fed indicates clearly the great advantage the breast-fed infants enjoyed over the artificially fed. The percentage difference in the rates was relatively greater for the later months than for the first. The deaths in the first month were probably influenced more by prenatal causes than by the type of feeding in the month.

TABLE XIV.—Deaths in the month per 1,000 survivors at beginning of month and monthly death rates per 1,000 infants fed in specified way, by month of life.<sup>a</sup>

Month of life.	Deaths in month per 1,000 survivors at beginning of month.	Deaths in month per 1,000 infants—	
		Breast fed.	Artificially fed.
First.....	20.4	17.3	30.0
Second.....	7.8	4.9	16.3
Third.....	8.7	4.0	19.8
Fourth.....	5.3	.....	14.3
Fifth.....	5.3	1.6	11.4
Sixth.....	4.5	.....	10.9
Seventh.....	2.7	2.1	2.1
Eighth.....	3.6	2.4	6.0
Ninth.....	4.5	.....	9.7
Tenth to twelfth (average).....	3.6	2.7	5.2

<sup>a</sup> Derived from General Table 6.

<sup>b</sup> The rate is per 1,000 infants who lived to be fed. The rate per 1,000 live births is 47.1; 33 infants died not fed.

The facts in this table can be summed up as follows: If the monthly rates for all infants are applied to 1,000 live births, subtracting successively the deaths in each month to find the survivors at the beginning of the next month, the number of survivors at the end of the year would be 903. The deaths in the year (97) divided by 1,000 births would correspond to rate (96.7) for the city. If applied to 1,000 infants who lived to be fed, the deaths in the year would total 71.

The relative difference between breast feeding and artificial feeding may be expressed most clearly by applying to the group of 1,000 infants who lived to be fed the rates for each kind of feeding successively. If the group were breast fed throughout the year, there would have been 960 survivors; if artificially fed, only 872 survivors. In other words, the mortality rates would be 40 and 128, respectively. The rate for the artificially-fed is three times the rate for breast-fed infants. The difference may be stated in still another way. Among the infants who had either artificial or mixed feeding, 55 deaths actually occurred. If all these babies had been breast fed and the

rate for the breast-fed group had applied to them, only 17 deaths, instead of 55, would have occurred in this group.

**Feeding and mother's nativity.**—Artificial feeding was more commonly practiced by the native mothers than by the foreign-born mothers. In fact, three native mothers were feeding their babies artificially at the end of three months to every two foreign-born mothers. At the end of six months and nine months the ratio was still the same. Since the mortality among the artificially-fed babies was higher, the fact that a larger proportion of infants of native mothers was artificially fed may explain in part the relatively high death rate among the native. Comparison of monthly rates by kind of feeding for native and foreign-born groups indicates that the mortality among breast fed is approximately the same for the foreign-born as for the native group, but among the artificially fed the mortality is considerably lower for infants of native mothers than for infants of foreign-born mothers. This difference is obscured in the average rates for the groups by the relatively larger proportion of infants of native mothers that was artificially fed. Probably greater care exercised by native mothers in selection of good quality milk, preparation and modification of the milk in accordance with physicians' formulæ might account for much of the difference.

TABLE XV.—*Number and per cent distribution of infants born during selected year and surviving at end of third, sixth, and ninth month, by type of feeding during the month specified, according to nativity of mother.*

Type of feeding and nativity of mother.	Infants surviving at end of—					
	Third month.		Sixth month.		Ninth month.	
	Number.	Per cent distribution.	Number.	Per cent distribution.	Number.	Per cent distribution.
All mothers.....	1,134	100.0	1,117	100.0	1,105	100.0
Breast exclusively.....	749	66.0	554	49.6	368	33.3
Mixed.....	38	3.4	111	9.9	226	20.5
Artificial exclusively.....	347	30.6	452	40.5	511	46.2
Native mothers.....	559	100.0	553	100.0	546	100.0
Breast exclusively.....	337	60.3	239	43.2	145	26.6
Mixed.....	16	2.9	45	8.1	109	20.0
Artificial exclusively.....	206	36.9	269	48.6	292	53.5
Foreign-born mothers.....	575	100.0	564	100.0	559	100.0
Breast exclusively.....	412	71.7	315	55.9	223	39.9
Mixed.....	22	3.8	66	11.7	117	20.9
Artificial exclusively.....	141	24.5	183	32.4	219	39.2

**Feeding and father's earnings.**—The most interesting fact shown in Table XVI, giving the proportion artificially fed for each earnings group, is the relatively small proportion of artificially fed among the lowest group compared with the proportion in the highest group. The differences, however, were not very great, but their significance

is greater than might at first appear to be the case because of the fact that the death rate among the artificially fed was so much higher.

TABLE XVI.—*Infants born during selected year and surviving at end of third, sixth, and ninth months, and number and per cent artificially fed during specified month, according to earnings of father.*

Earnings of father.	Infants surviving at end of—								
	Third month.			Sixth month.			Ninth month.		
	Total.	Artificially fed.		Total.	Artificially fed.		Total.	Artificially fed.	
		Num-ber.	Per-cent.		Num-ber.	Per-cent.		Num-ber.	Per-cent.
All classes.....	1,134	347	30.6	1,117	452	40.5	1,105	511	46.2
Under \$650.....	250	68	27.2	248	86	34.7	246	100	40.7
\$650 to \$1,049.....	652	205	31.4	627	263	41.3	628	296	47.1
\$1,050 and over.....	219	70	32.0	219	97	44.3	218	108	49.5
No earnings and not reported	13	4	30.8	13	6	46.2	13	7	53.8

**Feeding and mother's working status.**—The employment of mothers away from home probably bears a closer relation to the method of feeding than does nativity, custom, or economic status of the family. But in Brockton only 13 or 1.1 per cent of the 1,134 mothers whose babies survived to the age of three months, had begun to work away from home prior to that time, and of these, 8 were feeding their babies artificially. Even at the age of 9 months only 31 or 2.8 per cent of the 1,105 mothers whose babies had survived, had begun to work away from home previous to this period, and of this number, 23 gave their babies artificial food.

It is obvious that the number of mothers who went to work away from home during the baby's first year was so small that little importance can be attached to conclusions based on this group.

TABLE XVII.—*Infants born during selected year surviving at end of specified period and number and per cent artificially fed, according to working status of mother.*

Type of feeding at specified age.	Total infant survivors.	Mother not gainfully employed before specified time.*	Mother gainfully employed before specified time.		Mother gainfully employed, but time of resumption not reported.	
			At home.	Away from home.	At home.	Away from home.
			Infants living at end of three months.....	1,134	958	158
Number artificially fed.....	347	291	47	8	1	1
Per cent artificially fed.....	30.6	30.4	29.7	23	4	1
Infants living at end of six months.....	1,117	922	167	23	4	1
Number artificially fed.....	452	365	69	16	1	1
Per cent artificially fed.....	40.5	39.6	41.3	23	4	1
Infants living at end of nine months.....	1,105	894	175	31	4	1
Number artificially fed.....	511	403	83	23	1	1
Per cent artificially fed.....	46.2	45.1	47.4	23	1	1

\* Not shown where base is less than 100.



## NATIONALITY.

In 1910 slightly more than one-fourth (15,425) of the entire population of Brockton and three-eighths of the population 20 years of age and over were foreign-born white, yet more than one-half the babies included in this study were the children of foreign-born mothers.

**Infant mortality rates by nationality.**—The infant mortality rate for the native group was 101.5 compared with 92.0 for children of foreign-born mothers, an unusual condition in New England manufacturing towns. This difference in favor of the foreign born, however, was more than offset by the fact that among these mothers stillbirths were twice as numerous as among native mothers.

TABLE XVIII.—*Births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, according to nationality of mother.*

Nationality of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate. <sup>a</sup>	Stillbirths.	
					Number	Per cent of total births. <sup>a</sup>
All mothers.....	1,247	1,210	117	96.7	37	3.0
Native mothers.....	613	601	61	101.5	12	2.0
Foreign-born mothers.....	634	609	56	92.0	25	3.9
Lithuanian and Polish <sup>b</sup> .....	153	147	17	115.6	6	3.9
Italian.....	118	111	8	72.1	7	5.9
Irish.....	90	86	3		4	
Swedish and Norwegian <sup>c</sup> .....	62	62	1			
Jewish.....	57	57	5			
English, Scotch, and Welsh <sup>d</sup> .....	33	30	5		3	
French Canadian.....	22	21	3		1	
Other Canadian.....	60	58	8		2	
All other <sup>e</sup> .....	39	37	6		2	

<sup>a</sup> Not shown where base is less than 100.

<sup>b</sup> Including 133 Lithuanian and 20 Polish.

<sup>c</sup> Including 60 Swedish and 2 Norwegian.

<sup>d</sup> Including 24 English, 6 Scotch, and 3 Welsh.

<sup>e</sup> Including 11 Syrian, 8 Greek, 4 Armenian, 4 German, 4 Russian, 2 Finnish, 2 French, 1 Portuguese, 1 Roumanian, 1 European Spanish, 1 American Spanish.

**Foreign nationalities.**—Of the 15,425 foreign-born white residents of Brockton in 1910, 6,862 came from English-speaking countries. The only other countries represented by more than 1,000 people were Russia with 3,178 and Sweden with 2,608. The different nationality groups have come to Brockton approximately in the following order:

English-speaking people.

Swedes.

French Canadians.

Italians.

Poles.

Jews.

Albanians and Greeks.

Syrians and Armenians.

The tendency of foreigners to live in old and congested districts where they can obtain the lowest possible rents was not so marked in Brockton as in many other New England cities. The only foreign colony of any size was that of the Lithuanians, who lived near the outskirts of the city in the section known as Montello, where there was no possibility of lot congestion, although considerable crowding existed within the buildings themselves. The Lithuanians, together with the Italians, Jews, and southeastern Europeans, comprised what was known as the "foreign element" of Brockton; the Swedes have been in the city so long that they are practically assimilated, while the English-speaking foreign born become Americanized in a very short time and consider the Lithuanians "foreigners."

About one-half the foreign-born inhabitants of Brockton in 1910 were born in northwestern European countries. This fact has been offered as an explanation of the low infant mortality rate enjoyed by the foreign born of that city. But comparatively few of these northern Europeans were parents of children born in this decade; they were, rather, grandparents whose descendants are classified as children of native mothers. Approximately 30 per cent of the foreign-born mothers considered in this study were northern Europeans; while those born in southern and eastern Europe, being more recent immigrants and therefore younger, comprised about 54 per cent of the foreign-born mothers. This refutes, for the year selected at least, the above explanation of the low infant mortality rate for the foreign born.

*Lithuanians and Poles.*—In Montello the Lithuanians and Poles live side by side, the former being far the more numerous, and for this reason the average citizen calls them all "Lithuanians." For convenience, they have been considered as one group in this study, although it is recognized that the nationalities are quite distinct. The Poles have in some cases intermarried with the Lithuanians, and they seem generally to have adapted themselves to the customs of the Lithuanians among whom they live.

The births to Lithuanian and Polish mothers were more numerous than those of any other nationality group; the infant mortality rate for their babies was the highest for any one racial group excepting that for the British and for the Canadian groups. (See Table XVIII, p. 24.)

In 1910 the Lithuanians and Poles formed a negligible element of the population, but since that time they have come to Brockton in ever-increasing numbers. They have a compact colony and, with their churches, stores, and fraternal organizations, are socially self-sufficient. Because of their numbers and close association with one another they have had little necessity for learning English. The men as a rule have a fair working knowledge of the language

after being in this country several years, but most of the women are limited to the phrase, "No speak English." Of the 153 babies in this group, 64 had mothers who were able to read and write in English or in their own languages, while but 39 had mothers who could speak English.

The Lithuanian colony in Montello had become at the time of this inquiry perhaps the most congested as well as one of the most untidy parts of the city. The health department found that the number of infant deaths had been greatest there during the five years prior to 1913; as a result, one of the milk stations<sup>1</sup> was established there.

This section is a recent development of the city, hence most of the tenement blocks have been erected during the past decade and are in good repair. These buildings, generally of the three- or six-family type, are decidedly above the average in other cities for homes of workingmen whose incomes range from \$500 to \$1,000 a year. Although standards of cleanliness in this section were below the general level for the city and the best use was not made of the means of ventilation available, few fundamental housing defects were prevalent in this foreign quarter. The homes of 32 of the 153 babies of Lithuanian and Polish mothers were in a dirty condition when visited, while in 69 more cases the homes were but moderately clean. The most conspicuous object in the Lithuanian homes was the stove, which was brilliantly polished regardless of the general condition with respect to cleanliness.

*Italians.*—The inquiry embraces 118 babies of Italian mothers who were scattered over the city. This group had no colony, but, with the exception of wards 3 and 6, was quite evenly distributed through the different wards.<sup>2</sup> The incidence of death among the Italian babies was small, 72 out of 1,000 having died in infancy, but the stillbirth rate was relatively high.

The Italians generally lived in the oldest buildings in the city—often a dilapidated one-family house rearranged for two or three families, or in many cases a few rooms back of a small fruit or grocery store. They evidenced a decided tendency toward thrift, as indicated by the great efforts made to own their homes. Among the more ambitious Italians was one family in possession of a three-tenement house. This family lived on the third floor and rented the two lower floors, the mother explaining that they had only an equity in the house, but were trying to pay for it. The Italians are looked upon as older settlers than the Lithuanians and Poles; more of them can speak English and many of the second generation have been fairly well educated. Some of the large and prosperous stores of the city are operated by children of Italian parents.

<sup>1</sup> See p. 49.

<sup>2</sup> General Table 5.

The Italians are most ambitious for the future of their children. They do not feel that "what was good enough for me is good enough for my children." One young Italian mother told of her plans for the college education of her four scrupulously neat little children. She had no doubt that this aim could be accomplished on her husband's earnings of \$1,000 a year if they saved until the children were old enough. An old man stated in broken English that all the Italians in the city were glad that the United States Government had come to Brockton to look out for the little babies; that an Italian's first duty was to care for his "bambinos" in every way in his power. It is true, however, that he did not know the best way of caring for them, inasmuch as he "always kept the windows shut tight for fear his grandchildren might catch cold." In nearly every instance they seemed willing, even eager, to learn the best methods of caring for their babies. An educational campaign on the care of babies would undoubtedly be very effective among the Italian mothers of Brockton.

*British and Canadians (except French Canadians).*—This group embraces 33 babies of English, Scotch, and Welsh mothers and 60 of English and Scotch Canadian mothers. By comparing the 90 Irish with the 93 in this group a curious result is obtained. But three deaths occurred among the Irish, compared with 13 deaths among the British and Canadian. This great difference is not susceptible of a ready explanation. Although, because of the small numbers in each case, no particular significance can be attached to this contrast in infant mortality rates, this tendency coincides with the fact that the Irish infant mortality rate, in general, is lower than the English.<sup>1</sup>

In this connection it is of interest to note the variations in type of feeding among the Irish on the one hand and the combined group of British and Canadian (except French Canadian) on the other.

TABLE XIX.—*Infants born to mothers of specified nativity and surviving at the end of the third, sixth, and ninth month of life, and number and per cent fed in specified way during the month specified.*

Month of life.	Irish mothers.					British and Canadian (except French Canadian) mothers.				
	Infant survivors.	Breast fed.		Artificially fed.		Infant survivors.	Breast fed.		Artificially fed.	
		Number.	Per cent.	Number.	Per cent.		Number.	Per cent.	Number.	Per cent.
Third.....	84	63	75.0	18	21.4	81	52	64.2	26	32.1
Sixth.....	84	52	61.9	22	26.2	77	37	48.1	33	42.9
Ninth.....	83	36	43.4	28	33.7	77	27	35.1	37	48.1

<sup>1</sup> In 1914 the infant mortality rate was 87 in Ireland and 105 in England and Wales. U. S. Bureau of the Census, Birth Statistics, 1915, p. 18. Washington, 1917.

The proportion of babies who received no food other than breast milk was always greater among the Irish; similarly, the proportion of babies who were artificially fed was greater among the British and Canadian group. This fact may suggest a partial explanation of the difference in infant mortality rates.

Living standards of the British and Irish families differed but little from American families having the same economic status. The homes visited were for the most part clean and the mothers seemed to be thrifty and ambitious.

*Scandinavians.*—The Scandinavian group studied is very small, consisting of 60 births to Swedish and 2 to Norwegian mothers. Only one death and no stillbirths occurred among their number.

The strength of the Swedish settlement in the section known as Campello, in the southern part of the city, is not represented accurately by these numbers, because so many of the families are Americans of Swedish extraction. Brockton owes much to its Swedish colony; they have established homes on a plane as high if not higher than that of the average American; they earn good wages in the shoe factories, and spend them wisely, obtaining apparently the best possible results therefrom; as a rule they own their homes and are thrifty, public-spirited citizens.

*Other nationality groups.*—Most of the Jewish mothers who had babies during the selected year lived in the western end of the fifth ward. All of their 57 babies were live-born, five of them dying in the first year, giving a mortality rate of 87.7.

Twenty-two infants of French Canadian mothers were included, one of them being a stillborn child. Three of the 21 live-born babies died during their first year.

Thirty-nine babies were born to mothers of various other nationalities; these groups were too small to be of any statistical significance.

#### LITERACY AND ABILITY TO SPEAK ENGLISH.

A mother familiar with the requirements of infant care is, next to a good endowment of physical health, a baby's greatest asset. It is unfortunately impossible to measure maternal intelligence directly, but an analysis of mortality according to literacy and ability of the mother to speak English is presented. If the mother is able to read and write in some language, or to speak and understand English, invaluable sources of information on the care of the infant are open to her that would otherwise be entirely closed.

The mortality was greater among babies of illiterate mothers in Brockton than among those of literate mothers. Since all but three of the infants whose mothers were illiterate had foreign-born mothers, it is somewhat fairer to confine the comparison to the foreign-born group only. The mortality rate was then 88.1 for the literate and 103.9 for the illiterate. The percentage of stillborn babies is about twice as high among the illiterate as among the literate group.

TABLE XX.—Births during selected year to all mothers and to foreign-born mothers, infant deaths, infant mortality rate, and per cent of stillbirths, according to literacy of mother.

Literacy of mother. <sup>a</sup>	Total births.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
					Number.	Per cent of total births.
All mothers.....	1,247	1,210	117	96.7	37	3.0
Literate.....	1,079	1,052	100	95.1	27	2.5
Illiterate.....	167	157	17	108.3	10	6.0
Not reported.....	1	1				
Foreign-born mothers.....	634	609	56	92.0	25	3.9
Literate.....	469	454	40	88.1	15	3.2
Illiterate.....	164	154	16	103.9	10	6.1
Not reported.....	1	1				

<sup>a</sup> Mothers who can read and write in any language were reported literate; all others illiterate.

Thirteen per cent, or 167, of the 1,247 births were to illiterate mothers; of the 634 births to foreign-born mothers, 164, or 26 per cent, were to mothers who could not read and write. Only 3 births were to native illiterate mothers.

The distribution of births to foreign-born mothers according to the ability to speak English is shown in Table XXI; in addition, one native American mother was unable to speak English.

TABLE XXI.—Births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, according to mother's ability to speak English.

Ability of mother to speak English.	Total births.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
					Number.	Per cent of total births.
All mothers.....	1,247	1,210	117	96.7	37	3.0
Able to speak English.....	1,037	1,011	97	95.9	26	2.5
Unable to speak English <sup>a</sup> .....	210	199	20	100.5	11	5.2
Foreign-born mothers.....	634	609	56	92.0	25	3.9
English-speaking nationalities <sup>b</sup> .....	183	174	16	92.0	9	4.9
Non-English speaking nationalities.....	451	435	40	92.0	16	3.5
Able to speak English.....	242	237	21	88.6	5	2.1
Unable to speak English.....	209	198	19	96.0	11	5.3

<sup>a</sup> Includes one native mother.

<sup>b</sup> English, Irish, Scotch, Welsh, and Canadian (except French Canadian).

Of the 451 births to mothers of non-English speaking nationalities, 209 or 46.3 per cent were to mothers who could not speak English. These 209 births were 16.8 per cent of all births included in this study.

Raising the standard of literacy, then, may tend to reduce the infant mortality rate. Not that an illiterate mother is incapable of caring for her baby as she should; it is simply a question of being unable to avail herself of all the advantages which the literate mother enjoys;

for example, the leaflet on "Care of the Baby" which is sent by the board of health to every mother in the city immediately after her child's birth has been reported. When one realizes that the law requires every birth to be reported within 48 hours,<sup>1</sup> and a notice of all births to be sent daily by the clerk or registrar to the local board of health, it is easy to appreciate the great amount of good that may be accomplished by this pamphlet giving advice on the care of the baby.

In the same way, the mother's inability to speak or understand English sometimes deters her from attending lectures which might prove to be of untold advantage to her.

#### ECONOMIC FACTORS.

The family income plays a large part in determining a very young child's chance of life. A low income in an industrial city implies poor home sanitation, congestion, lack of adequate medical care, a restricted diet, and a mother who is overworked, either in the factory or at home. And to the combination of these circumstances, if not definitely to the separate factors, is to be ascribed the heavy mortality of babies born under such conditions.

**Father's earnings as an index of economic status.**—The earnings of the father constitute the best single index of the standard of living of the family, though in some respects not altogether satisfactory. In many cases mother's earnings can not be secured accurately on account of the difficulty of separating net from gross income. This is particularly true regarding income received from lodgers, the principal single source of mother's earnings in Brockton. Mother's earnings are sometimes secured at a cost of neglect that is out of proportion to the value of the added income. Income from other sources is so fluctuating and uncertain in its nature as to impair to a great extent the value of total family income as an index of the standard of living in the family. In view of these facts, father's earnings have been used as the best available index of the family standard.

The annual earnings shown were the amounts actually earned by the father during the year following the birth of the infant. On account of lack of employment or for other reasons the father may not have worked steadily. If the father had been unemployed for a period during the year, he was classed in the earnings group corresponding to the amount he had earned. These amounts, therefore, are not yearly rates of wages, since the periods of unemployment are not included. Rough estimates for the average amount of unemployment made by both employers and employees ranged from one to four months. The pay roll of one of the larger factories showed 46 weeks of fairly steady work during 1913, a figure repre-

<sup>1</sup> Massachusetts Acts of 1912, chap. 280.

senting 11.5 per cent of unemployment, exclusive of slack time during the 46 weeks of work. In some cases other reasons beside unemployment shortened the period of actual work. In several instances the father was sick for two or three months; in a few others the father died or deserted during the baby's first year; in these cases he was classed in the earnings group corresponding to the amount he had actually received.

**Distribution of economic groups.**—In Brockton only 12.5 per cent of the babies born during the selected year had fathers earning less than \$550, while the corresponding proportion in Manchester, Saginaw, and New Bedford was 30.4, 17.9, and 37.7 per cent, respectively. The fathers of 954, or 76.5 per cent, earned \$650 and over, compared with 48.8 per cent in the same class in Manchester, 64.1 per cent in Saginaw, and 44.7 per cent in New Bedford. In Brockton 43.3 per cent earned \$850 and over, while 18.6 per cent earned \$1,050 and over during the year after the baby's birth.

In the lowest earnings group the foreign born were nearly three times as numerous as the native; the reverse was true in the highest group.

**Occupation of father.**—Of the 1,247 births included in this study, 688 or 55.2 per cent had fathers who were employed in the making of shoes, shoe parts, and shoe findings; of these 634 were classed as operatives, i. e., they had occupations peculiar to the shoe industry; and the fathers of the other 54 were employed by the shoe factories in other capacities such as officials, managers, clerks, machinists, electricians, firemen, etc. The distribution of births according to the occupation of the father in the various industries of the city is shown in detail in General Table 8.

TABLE XXII.—*Number and per cent distribution of births during selected year to mothers of specified nativity, according to earnings of father.*

Earnings of father.	All mothers.		Native mothers.		Foreign-born mothers.	
	Total births.	Per cent distribution.	Births.	Per cent distribution.	Births.	Per cent distribution.
All classes.....	1,247	100.0	613	100.0	634	100.0
Less than \$550.....	156	12.5	40	6.5	116	18.3
\$550 to \$649.....	122	9.8	51	8.3	71	11.2
\$650 to \$849.....	414	33.2	181	29.5	233	36.8
\$850 to \$1,049.....	308	24.7	160	26.1	148	23.3
\$1,050 to \$1,249.....	95	7.6	69	11.3	26	4.1
\$1,250 and over.....	137	11.0	103	16.8	34	5.4
No earnings and not reported.....	15	1.2	9	1.5	6	.9

**Infant mortality rates according to father's earnings.**—The infant mortality rate was highest (132.2) for the earnings group \$650 to \$849, and lowest for the group \$1,050 and over (65.5). Contrary to the findings for other cities, the mortality rates for the earnings



groups under \$550 and \$550 to \$649 were considerably lower than for the group \$650 to \$849. Two explanations for this peculiar showing may be advanced: First, the groups are comparatively small, and consequently may have been considerably influenced by exceptionally favorable conditions in the year selected; second, the earnings as reported in the lowest earnings group do not always reflect the family's standard of living. The relatively high percentage of stillbirths in the lowest earnings groups may be significant in connection with the low mortality rates.

TABLE XXIII.—*Births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, according to earnings of father.*

Earnings of father.	Total births.	Live births.	Infant deaths.	Infant mortality rate. <sup>a</sup>	Stillbirths.	
					Number.	Per cent of total births. <sup>a</sup>
All classes.....	1,247	1,210	117	96.7	37	3.0
Less than \$550.....	156	149	10	67.1	7	4.5
\$550 to \$649.....	122	116	10	86.2	6	4.9
\$650 to \$849.....	414	401	53	132.2	13	3.1
\$850 to \$1,049.....	308	301	25	83.1	7	2.3
\$1,050 and over.....	232	229	15	65.5	3	1.3
No earnings.....	6	5	1		1	
Not reported.....	9	9	3			

<sup>a</sup> Not shown where base is less than 100.

The general rate for Brockton, which is relatively low compared to the other cities presented in Table XXIV, may be attributed in part to the high wages prevailing in this city. In Manchester, Saginaw, and New Bedford the rates for babies of the lowest earnings group were from 3 to 5 times as great as for those in the highest earnings group; the infant mortality rates for all cities combined show a regular decline as the earnings increase. In the group studied in Brockton this tendency does not appear.

TABLE XXIV.—*Infant mortality rates for specified cities, according to earnings of father.*

Earnings of father.	All cities.	Brockton.	Manchester.	Saginaw.	New Bedford.
All classes.....	125.4	96.7	165.0	84.6	130.3
Under \$550.....	167.0	67.1	204.2	142.0	168.7
\$550 to \$649.....	127.7	86.2	174.5	103.4	115.8
\$650 to \$849.....	123.3	132.2	162.6	105.7	98.4
\$850 to \$1,049.....	101.4	83.1	125.0	44.6	134.7
\$1,050 and over.....	53.4	65.5	63.2	26.5	59.8

The rate for the selected year for the lowest earnings group appears, in comparison with previous years, to be exceptional. The mortality rate for previous births to the mothers in the group under \$550 would normally not vary much from the rate in the selected year, for conditions in the main in these families would not be materially different in preceding years. But the mortality among previous

births to mothers in this group was actually 151.3 or over twice the rate found for the selected year. The other rates, given in Table XXV, are also somewhat higher than for the year studied; for these groups the earnings in previous years may not have been as high as during the selected year which determined the earnings class, and consequently conditions surrounding the infants born in previous years may not have been so favorable.

TABLE XXV.—*Infants born previous to selected year to mothers included in study, infant deaths, and infant mortality rate, according to earnings of father during selected year.*

Earnings of father during selected year.	Live births.	Infant deaths.	Infant mortality rate. <sup>a</sup>
All classes .....	b 2,404	b 274	114.0
Under \$550 .....	357	54	151.3
\$550 to \$649 .....	247	25	101.2
\$650 to \$849 .....	831	101	121.5
\$850 to \$1,049 .....	531	50	94.2
\$1,050 and over .....	400	42	105.0
No earnings .....	25	1	.....
Not reported .....	13	1	.....

<sup>a</sup> Not shown where base is less than 100.

<sup>b</sup> The apparent discrepancy between the births and deaths shown in this table and the figures secured by subtracting the live births in the selected year and the deaths among them from the births and deaths reported by the mothers in the maternal history section is due to the omission from the latter of the record for 6 mothers. See section on maternal histories, p. 39.

Another point that might be mentioned in part explanation of the low rate in the lowest earnings group for the selected year, is the fact that a few fathers who earned comparatively little during the year were classed in this group because of the low actual earnings. Actually the family standard in some of these cases was considerably higher than the earnings would indicate. If the father deserted during the year, or died, or lived for part of the year on savings because of illness or incapacity to work, the family was put into the group corresponding to the amount that the father actually earned. In this group was also included one father who earned less than \$200, but who received enough from rents and other sources to place him in the highest group on the basis of family income. In fact, in 16 cases where the father earned less than \$450 the earnings were low on account of unusual circumstances rather than inefficiency of the father or chronic slack work or short time in industry. These unusual cases would occur principally in the lowest group.

The analysis by type of feeding, as given in Table XVI, p. 23 shows that a somewhat smaller proportion of infants in the lowest earnings groups were artificially fed than in the higher earnings groups. This fact may account in part for the low rate in this group.

**No-earnings group.**—A few instances were found where the fathers earned or contributed nothing to the support of the family. In one case the father was separated from his wife; another deserted before

the baby was born; the others did not work at all during the year after the baby's birth on account of illness or injury. These were classed in a separate group because of the various sources from which the families drew their incomes. The mother who separated from her husband went to work to support herself and baby; her two older children were cared for by relatives. The deserted mother was obliged to send three of her children to the State Home and the grandmother supported her and the baby. The family of one man who was afflicted with tuberculosis lived on savings, which can not properly be classed as earnings or income. This family was also given some relief by the city.

**Conditions favorable to low mortality rate.**—A classification of the 1,247 births according to a combination of favorable conditions is shown in Table XXVI. Class I is a "baby aristocracy," to be a member of which one must meet five prerequisites. These prerequisites represent conditions generally supposed to be favorable. Only those babies were put in Class I who met all the following conditions:

1. The father must have earned \$850 or more during the year after the birth.
2. The mother must not have been gainfully employed either during the year before or the year after the baby's birth.
3. The attendant at birth must have been a physician.
4. Both parents must be literate.
5. Housing conditions must meet the following standard:
  - (a) Good means of ventilation must have been provided and good use must have been made of these means.
  - (b) The house must have been clean at the time of the agent's visit.
  - (c) The family must have had exclusive use of a water closet located within the home.
  - (d) City water must have been available within the home.
  - (e) The home must have housed less than one person to a room.

Of the 1,247 births during the selected year, 208 met all the prerequisites and of that number 205 were live-born.

TABLE XXVI.—*Births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, according to specified class.*

Class.	Total.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
					Number.	Per cent of total births.
All classes.....	1,247	1,210	117	96.7	37	3.0
Class I.....	208	205	15	73.2	3	1.4
Class II.....	1,039	1,005	112	111.4	34	3.3

The benefits of a fairly good income with its concomitants are more clearly demonstrated in this table than in Table XXIII. In other words, 73 out of every 1,000 babies died if their fathers earned fair amounts, if their mothers remained at home, if they had at least fair care at birth, and lived in good homes; while among those babies who failed to meet one or more of these requirements, 111 of every 1,000 died.

**Supplementary sources of income.**—Of the 1,247 births included in this study, the families of 856 or more than two-thirds of the whole number subsisted on father's earnings alone; 389 received in addition to this amount earnings of mother or other income or both; two had no income whatever. The mothers of 244 of these 389 babies were gainfully employed; for the rest the father's earnings were supplemented from other sources, usually children's earnings, rents, and, in rare instances, interest on money invested.

The percentage of families who lived on father's wages alone varied directly with the amount of earnings. When the father earned less than \$550 only 56 per cent of the families lived on these earnings only; the proportion increased until, when the father earned \$1,250 and over, four-fifths were found to be subsisting on father's wages as a sole source of income. The distribution of births in families having supplementary sources of income according to the amount of father's earnings is shown in General Table 9.

**Size of family and father's earnings.**—In considering the effect of income upon the infant mortality rate, the size of the family is of prime importance. With a given income a large family is obviously much less comfortable than a small family.

The number of persons in the family according to father's earnings is given in General Table 10. This number is exclusive of the scheduled baby. The lowest earnings group contained the largest proportion of live births in families with six or more members (19.5 per cent); the proportion decreased to a minimum of 11.3 per cent in the group \$850 to \$1,049; in the group where the father earned \$1,250 and over it increased slightly to 14.7 per cent. In case of many of the relatively larger families, the father's earnings were often supplemented by the earnings of the mother or of the other children.

**Father's earnings and employment of mother.**—The proportion of mothers gainfully employed the year after childbirth declines progressively as father's earnings increase. One mother out of every five worked for wages or kept lodgers; but when the father earned less than \$550 proportionately more than four times as many mothers were employed as when the father received \$1,050 and over. In other words, the amount the father earned was a factor in determining whether or not the mother should go to work.

TABLE XXVII.—Births during selected year and number and per cent of births to mothers gainfully employed during year following birth of infant, according to earnings of father.

Earnings of father.	Total births.	Births to mothers gainfully employed.	
		Number.	Per cent.
All classes.....	1,247	244	19.6
Less than \$550.....	156	53	34.0
\$550 to \$649.....	122	29	23.8
\$650 to \$849.....	414	56	20.8
\$850 to \$1,049.....	308	56	18.2
\$1,050 and over.....	232	18	7.8
No earnings and not reported.....	15	2	13.3

Even in the very lowest earnings group slightly more than one-third of the births during the selected year were to mothers who worked during the year following the birth of the baby; this proportion gradually decreased to 7.8 per cent when the father earned \$1,050 and over. Of the 278 births to mothers whose husbands were paid less than \$650 during the year, 82 or 29.5 per cent were to mothers having gainful occupations; 16.8 per cent were to mothers gainfully employed when the father earned more than this amount. This latter percentage (16.8) is lower than the percentage of mothers gainfully employed for all the earnings groups together. Less than one-seventh of the births were to mothers gainfully employed in the families where the fathers earned \$850 and over.

**Mother's earnings.**—More than one-half the mothers gainfully employed during the year following the baby's birth earned less than \$150 during this period. This amount was low for two reasons: The majority of these mothers kept one or two lodgers; those who were industrially employed worked only part of the year. In these circumstances one would not expect large earnings. In only nine instances did the mothers earn \$550 and over. The percentage of births in the different mother's earnings groups is shown for native and foreign-born mothers;<sup>1</sup> a relatively larger proportion of the births to foreign-born working mothers was in the lowest group.

**Employment of mother during year preceding birth of baby.**—Employment of the mother during some part of the year before confinement is shown in Table XXVIII. More mothers worked the year before than the year after confinement, the ratio being 128 to 100. Compared with mothers employed in the year after confinement fewer mothers were gainfully employed at home, but nearly four times as many were engaged in occupations which took them away from home.

<sup>1</sup> General Table 7.

The infant mortality rate for children of mothers who did housework only—that is, were not gainfully employed—the year before confinement was 100.4, while the children of mothers who were gainfully employed died at the rate of 85.5; the same tendency is shown for native and foreign-born as well as for all mothers. The mortality rates were about equal in the groups where the mothers worked at home (84.4) and away from home (86.7). Mothers who were gainfully employed the year before confinement and those who were not had proportionately the same number of stillbirths.

TABLE XXVIII.—Births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, according to employment of mother during year before birth of infant and nativity of mother.

Employment of mother during year before birth of infant and nativity of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate. <sup>a</sup>	Stillbirths.	
					Number.	Per cent of total births. <sup>a</sup>
All mothers.....	1,247	1,210	117	96.7	37	3.0
Not gainfully employed.....	934	906	91	100.4	28	3.0
Gainfully employed.....	313	304	26	85.5	9	2.9
At home.....	161	154	13	84.4	7	4.3
Away from home.....	152	150	13	86.7	2	1.3
Native mothers.....	613	601	61	101.5	12	2.0
Not gainfully employed.....	475	466	48	103.0	9	1.9
Gainfully employed.....	138	135	13	96.3	3	2.2
At home.....	47	45	5	.....	2	.....
Away from home.....	91	90	8	.....	1	.....
Foreign-born mothers.....	634	609	56	92.0	25	3.9
Not gainfully employed.....	459	440	43	97.7	19	4.1
Gainfully employed.....	175	169	13	76.9	6	3.4
At home.....	114	109	8	73.4	5	4.4
Away from home.....	61	60	5	.....	1	.....

<sup>a</sup> Not shown where base is less than 100.

In all cities except Brockton the lowest infant mortality rate is shown for babies of those mothers who were not gainfully employed the year before confinement; mothers doing gainful work at home lost their babies at a somewhat greater rate. (See Table XXIX.) The highest rate of all, however, is for the babies whose mothers worked outside the home, usually in industrial occupations. In Brockton, the babies of mothers who worked in any capacity during the year before confinement appear to have the advantage over babies whose mothers were not employed.

It must be remembered, however, that mothers not "gainfully employed" often do as hard physical labor at housework as that performed by the gainfully employed, whether at home or away from home. Not so much difference, therefore, actually exists between these groups, as might be inferred from the comparison.

TABLE XXIX.—*Infant mortality rates for specified cities, according to employment of mother during year before birth of infant.*

Employment of mother during year before birth of infant.	All cities.	Brockton.	Manchester.	Saginaw.	New Bedford.
All mothers.....	125.4	96.7	165.0	84.6	130.3
Not gainfully employed.....	105.5	100.4	133.9	78.3	108.8
Gainfully employed.....	158.4	85.5	199.2	132.7	154.5
At home.....	121.5	84.4	149.8	(a)	121.8
Away from home.....	179.1	86.7	227.5	(a)	167.8

a Not shown where base is less than 100.

**Interval between cessation of work and confinement.**—An analysis of the 150 live-born babies whose mothers worked outside the home during the year before the baby's birth shows that two-fifths worked less than half the year. The mothers who ceased this work six months or more before the baby's birth lost fewer babies proportionately than did those who worked later.

TABLE XXX.—*Live births to mothers gainfully employed away from home during year before birth of infant, infant deaths, and infant mortality rate, according to length of interval between mother's ceasing work and confinement.*

Interval between mother's ceasing work and confinement.	Live births.	Infant deaths.	Infant mortality rate.
All mothers.....	150	13	86.7
Less than 6 months.....	88	10	113.6
Six months and over.....	62	3	48.4

**Employment of mother during year following birth of baby.**—Two hundred and thirty-seven live-born babies, or 19.6 per cent of the entire number included in the study, had mothers who were gainfully employed during some part of the year following the birth of the baby; three-fourths of these had mothers who kept lodgers and almost 60 per cent of this number had but one lodger. The mothers of 42 live-born babies were employed outside the home; 9 of these had mothers who went to work after the baby died. Only 33, then, had mothers who took up industrial occupations during the lifetime of their babies and 2 of these babies died. The mothers of only 13 went out to work before their babies were 3 months old; hence, 99 per cent of the Brockton babies were cared for by their mothers during the most critical period of infancy. Obviously, the question of mother's employment during the year after the baby's birth was of slight importance in Brockton.

TABLE XXXI.—*Live births during selected year, infant deaths, and infant mortality rate, according to working status of mother during year following birth of infant.*

Working status of mother during year following birth of infant.	Live births.	Infant deaths.	Infant mortality rate. <sup>a</sup>
All mothers.....	1,210	117	96.7
No gainful work.....	973	91	93.5
Gainful work.....	237	26	109.7
Resumed after infant's death.....	14	14	-----
Resumed during infant's life.....	223	12	(b)
Work at home.....	195	15	76.9
Resumed after infant's death.....	5	5	-----
Resumed during infant's life.....	190	10	(b)
Work away from home.....	42	11	-----
Resumed after infant's death.....	9	9	-----
Resumed during infant's life.....	33	2	(b)

<sup>a</sup> Not shown where base is less than 100.

<sup>b</sup> A rate for this group is not computed, as it would not be comparable with the other rates shown. The infants in this group are obviously at risk only for that part of the year after the commencement of the employment of the mother.

The effect of a mother's gainful employment upon her child's chance of survival does not readily lend itself to statistical measurement. One may concede that an industrial occupation which takes the mother away from her home and precludes the possibility of her nursing her baby at regular intervals can not be considered as a factor other than detrimental to the well-being of a young child. The number of mothers pursuing such occupations in Brockton was so very small that no conclusions may be drawn from the data here presented.

#### MATERNAL HISTORIES.

The mothers visited in the course of this study gave information not only as to the children born between November 1, 1912, and October 31, 1913, but also with reference to all former pregnancies. Data derived from these maternal histories on infant mortality rates by nationality and by age and order of birth are presented to supplement and corroborate the findings of the study of the scheduled infants. Though the information was derived from the mother's statement only, and therefore may not be so reliable or so complete as when checked by official records, yet the larger number of births considered makes it possible to base the conclusions on a larger body of evidence.

Inasmuch as 10 mothers gave birth to twins, the 1,247 babies had 1,237 mothers. The records of six mothers were excluded from the tabulation because their statements were considered incomplete. Information, then, is presented for 1,231 mothers who had given birth to an aggregate of 3,703 children, of whom 95 or 2.6 per cent were stillborn. Of the 3,608 live born, 389 died in their first year.



**Infant mortality rate.**—The infant mortality rate for all children of the mothers considered was 107.8, a rate somewhat higher than that found among babies born in the year selected. This infant mortality rate can not be considered an index typical of conditions in Brockton, since many of the babies included in the maternal history study were born before their parents moved to Brockton and only a small proportion of all the babies born in the city during a period of years was included.

**Miscarriages.**—In addition to the live births and stillbirths mentioned above, these mothers had had 206 miscarriages; these data are not used in other tabulations. The information in regard to miscarriages is presented for whatever interest it may have, although it is considered to be more or less unreliable, because some mothers were reluctant about giving this information and others forgot. Foreign-born mothers reported 107 miscarriages and native mothers 99. Five women reported having had more than 3 miscarriages; of these two foreign-born mothers had had 6 and 7, respectively, while three native mothers reported 4, 5, and 6, respectively.

**Nativity of mother.**—The infant mortality rate for all babies of foreign-born mothers was slightly lower than that for all babies of native mothers. The rate for babies born to foreign-born mothers during the selected year was likewise low, compared with that of the native group. (See Table XVIII, p. 24.)

TABLE XXXII.—Total mothers, and births from all pregnancies, infant deaths, infant mortality rate, and per cent of stillbirths, according to nationality of mother.

Nationality of mother.	Total mothers.	Total births.	Live births.	Infant deaths.	Infant mortality rate. <sup>a</sup>	Stillbirths.	
						Number.	Per cent of total births. <sup>a</sup>
All mothers.....	1,231	3,703	3,608	389	107.8	95	2.6
Native mothers.....	605	1,699	1,661	182	109.6	33	2.2
Foreign-born mothers.....	626	2,004	1,947	207	106.3	57	2.8
Lithuanian and Polish <sup>b</sup> .....	150	429	418	62	148.3	11	2.6
Italian.....	114	435	415	46	110.8	20	4.6
Irish.....	90	303	296	23	77.7	7	2.3
Swedish and Norwegian <sup>c</sup> .....	62	180	180	9	50.0	.....	.....
Jewish.....	56	157	154	13	84.4	3	1.9
English, Scotch, and Welsh <sup>d</sup> .....	33	123	118	14	118.6	4	3.3
French Canadian.....	22	91	90	10	.....	.....	.....
Other Canadian.....	60	174	165	17	103.0	9	5.2
All other <sup>e</sup> .....	39	113	111	13	117.1	2	1.8

<sup>a</sup> Not shown where base is less than 100.

<sup>b</sup> Including 133 Lithuanian and 20 Polish.

<sup>c</sup> Including 60 Swedish and 2 Norwegian.

<sup>d</sup> Including 24 English, 6 Scotch, and 3 Welsh.

<sup>e</sup> Including 11 Syrian, 8 Greek, 4 Armenian, 4 German, 4 Russian, 2 Finnish, 2 French, 1 Portuguese, 1 Roumanian, 1 European Spanish, 1 American Spanish.

Curiously enough, all the babies born to Lithuanian and Polish, Italian, Irish, and Swedish and Norwegian mothers included in the study died at a much higher rate than did those born in the selected year. On the other hand, the incidence of death among all babies born to mothers of the British and Canadian groups, other than

French Canadian, was much smaller than among those born in the year chosen.

**Deaths in early infancy.**—The 1,231 mothers considered in the maternal history study had lost 389 live-born infants; of these 128, or 32.9 per cent, died before they had attained the age of 2 weeks. This high percentage of early deaths among all babies indicates that the still higher proportion of deaths (35.9 per cent) in the first two weeks among babies born in the selected year was not peculiar to the year chosen.

**Plural births.**—The mortality among twins and triplets is much greater than among single births. Although the number of plural births to the 1,231 Brockton mothers is small, a comparison of the infant mortality rates for both classes of births is of interest. Of the 3,608 live births to these mothers, 63 were plural births; of the latter, 31 died in infancy, giving an infant mortality rate of 492.1, in striking contrast to the rate (101) for single births.

TABLE XXXIII.—*Single and plural births resulting from all pregnancies, infant deaths, infant mortality rate, and per cent of stillbirths.*

Single and plural births.	Total births.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
					Number.	Per cent of total births.
All births.....	3,703	3,608	389	107.8	95	2.6
Single births.....	3,639	3,545	358	101.0	94	2.6
Plural births.....	64	63	31	492.1	1	1.6

**Order of pregnancy.**—An analysis of the 3,703 births according to the order of pregnancy is shown in Table XXXIV. Although by no means regular in its rise from one pregnancy to the next, the infant mortality rates show a tendency to increase with the number of the pregnancy. The general trend was not very different, however, from that shown in Table XII (see p. 20), based on births in the selected year.

TABLE XXXIV.—*Births from all pregnancies, infant deaths, infant mortality rate, and per cent of stillbirths, according to number in order <sup>a</sup> of pregnancy.*

Order <sup>a</sup> of pregnancy.	Total births.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
					Number.	Per cent of total births.
All pregnancies.....	3,703	3,608	389	107.8	95	2.6
<b>Pregnancies:</b>						
First.....	1,241	1,211	126	104.0	30	2.4
Second.....	824	804	70	94.5	20	2.4
Third.....	561	541	62	114.6	20	3.6
Fourth.....	378	367	43	117.2	11	2.9
Fifth.....	252	248	29	116.9	4	1.6
Sixth.....	173	169	16	94.7	4	2.3
Seventh.....	116	114	16	140.4	2	1.7
Eighth and over.....	158	154	21	136.4	4	2.5

<sup>a</sup> Excluding miscarriages.

**Age of mother.**—The analysis by age of mother of all births included in the maternal history study is presented in Table XXXV. The general tendency for the rate to decrease as the age of the mother increased was the same as that shown in Table X for infants in the selected year. The rate for infants of mothers under 20 was the highest, 145. The percentage of stillbirths on the other hand was highest for mothers 30 and over, a tendency also shown in rates for the selected year.

TABLE XXXV.—*Births from all pregnancies, infant deaths, infant mortality rates, and per cent of stillbirths, according to age of mother.*

Age of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate. <sup>a</sup>	Stillbirths.	
					Number.	Per cent of total births. <sup>a</sup>
All mothers.....	3,703	3,608	389	107.8	95	2.6
Under 20.....	268	262	38	145.0	6	2.2
20 to 24.....	1,206	1,181	133	112.6	25	2.1
25 to 29.....	1,135	1,114	109	97.8	21	1.9
30 to 34.....	677	658	72	109.4	19	2.8
35 to 39.....	332	312	30	96.2	20	6.0
40 and over.....	79	76	6	-----	3	-----
Not reported.....	6	5	1	-----	1	-----

<sup>a</sup> Not shown where base is less than 100.

**Infant mortality rates by number of births to mother.**—Infant mortality rates according to the number of births to the mother are presented in Table XXXVI. The rate was much higher where the mother had had many births than where she had had but few. The rate for infants of mothers reporting 4 births or less was 89.7; while the rate where the mother had 5 or more births was 128.3.

TABLE XXXVI.—*Live births from all pregnancies, infant deaths, and infant mortality rate, according to the number of births to mother.*

Births to mother.	Live births.	Infant deaths.	Infant mortality rate.
Total.....	3,608	389	107.8
1 to 4 births.....	1,917	172	89.7
5 births and over.....	1,691	217	128.3

#### WARD DISTRIBUTION.

The wards of Brockton radiate from the central part of the city like the spokes of a wheel; each ward has a congested region near the center of the city generally given over to business, a residential district in which the population is evenly distributed, and a large stretch of farm land. In regard to housing and sanitation, each ward contained examples of the best conditions, the worst conditions, and all intermediate stages. Little or no homogeneity existed in the nationality

or income of the residents of any one ward, ward boundaries being of political significance only. The differences in mortality rates in the various wards of the city are shown in Table XXXVII.

TABLE XXXVII.—*Births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, by ward of residence.*

Ward of residence.	Total births.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
					Number.	Per cent of total births.
The city.....	1,247	1,210	117	96.7	37	3.0
Ward:						
1.....	128	127	9	70.9	1	.8
2.....	126	124	12	96.8	2	1.6
3.....	149	146	14	95.9	3	2.0
4.....	156	147	12	81.6	9	5.8
5.....	226	220	25	113.6	6	2.7
6.....	300	289	28	96.9	11	3.7
7.....	162	157	17	108.3	5	3.1

The first ward had an infant mortality rate of 70.9, the lowest in any ward in the city. It also had the lowest stillbirth rate. Two-thirds of this ward was a farming district dotted with old-fashioned, unimproved cottages. This portion had no paved streets, no sewerage system; in fact, it possessed all the advantages and disadvantages of a country district. The western part of the ward, farthest from the center of the city, was largely given over to one-family houses of the attractive semibungalow type, of frame or concrete construction, with well-kept lawns and gardens. Houses for two or more families were marked exceptions. Most of the finest homes in Brockton were located on West Elm Street, which runs through the center of this ward. Streets were well shaded and presented a most attractive appearance.

Main Street with its crowded business district formed the extreme eastern end of the first ward. Some of the worst housing conditions to be found in Brockton were in this immediate vicinity. Four babies were born during the year selected in Alton Court, an unpaved, insanitary alley inhabited by Italians. One of these babies died. Since the time of this inquiry conditions in this alley have been improved to some extent.

The other wards bore a close resemblance to the first; the second was the only one having no rural area. In no ward except the first, however, was the one-family house the prevailing type. The section known as Campello, comprising parts of the third and fourth wards, was originally the home of the Swedes and is now inhabited by the natives of Swedish descent. Throughout Campello the well-kept homes and yards bore witness to the thrift of the Swedish people. Most of these people were skilled shoe operatives who owned their homes.

The homes in this section presented a striking contrast to those found along the boundaries of the fourth and fifth wards in the vicinity of the gas house, where the homes were not so well kept up and boasted in many cases of a heterogeneous collection of outhouses in a more or less advanced stage of decay. Chickens were kept in many instances, and the henhouses did not always comply with the regulations of the health department which required them to be placed at least 25 feet away from a dwelling. Smoke and odors from the gas house and near-by shoe factories made this region somewhat unattractive. Paved streets and sidewalks were almost unknown and dirty yards were characteristic. Even in cases where fairly clean and up-to-date houses were found, many of the yards appeared to be filled with the accumulated rubbish of years.

The western end of the fifth ward was the home of the Jews, Italians, Greeks, and Syrians. Here were found the oldest and dingiest tenement houses of the city, and as the mothers and children were so often out on the sidewalks sunning themselves, the streets had the appearance of the typical foreign quarter of a large city. The yards were small and full of rocks and rubbish, while green grass was almost unknown in the neighborhood. The infant mortality rate for this ward was the highest in the city, being 113.6.

The northern part of the sixth and seventh wards, known as Montello, differed from other parts of the city in that no such great disparity of social and economic status existed among its residents. The Lithuanians had a compact colony in Montello, which was distinctly different from the rest of the city.

The number of deaths in each ward, according to the certified cause of death, is presented in General Table 4. The deaths were few and more or less evenly distributed. The fifth and sixth wards in which housing conditions were relatively poor showed the greatest number of deaths from respiratory diseases.

#### HOUSING.

Brockton styles itself the "city of workers and winners." Judging from the general appearance of the town, this phrase seemed decidedly appropriate. Although one or two congested alleys and a few isolated cases of dilapidated dwellings were to be found, Brockton had no acute housing problem. Nor had it, according to the British Board of Trade report, "to contend with any evil legacy in the shape of large blocks of dwellings, built according to the loose standards of bygone days, such as characterize other and larger cities."<sup>1</sup> This condition was no doubt partly due to the recent development of the city, although the high standard of intelligence demanded of the shoe operatives, together with the fairly high wages they received,

<sup>1</sup> Living conditions of the wage-earning population in certain cities of Massachusetts, p. 268. Boston, 1911.

was a potent factor in maintaining this housing standard. The city has few or no housing laws except for fire protection.

The dwellings of Brockton were almost invariably frame. Among the well-to-do, a family generally had the exclusive use of an entire house and often a lawn and gardens. Among the working people, however—the shoe operatives and small tradesmen—although the “cottage” or one-family house was by no means uncommon, the two-tenement, three-tenement, and even six-tenement “blocks” were far more numerous.

The distribution of the 1,247 births considered in the detailed study according to the number of families in the building appears in Table XXXVIII.

TABLE XXXVIII.—*Number and per cent distribution of births during selected year, according to number of families in building.*

Families in building.	Births during selected year.	
	Number.	Per cent distribution.
All families .....	1,247	100.0
Families to building:		
1.....	249	20.0
2.....	452	36.2
3.....	376	30.2
4.....	30	2.4
5.....	10	.8
6.....	101	8.1
7 and over.....	26	2.1
Not reported.....	3	.2

The older type was a two-story house with gabled roof and attic which was originally intended for the use of a single family. In some cases it was rented to two families who shared the attic as a storeroom; in others the attic was occupied by a third family. This sort of building was invariably attractive in appearance, inasmuch as it lent itself to a variety of design. The casual observer would have taken it for the home of a well-to-do business man rather than a house for two or three families. On the other hand, one would not for a moment have mistaken the new three-tenement houses; they were built on square lines with three separate porches, both front and rear. This was the most common type of residential building being constructed at that time for the workers of Brockton, and, in fact, throughout other New England manufacturing towns. The general criticism of these buildings is that the fire hazard is great.

The Lithuanians and Poles had until recently shown but little tendency toward the acquisition of real estate. One reason for this was that practically all the homes in their community were three- or

six-family tenement houses which probably would have cost altogether too much and could not have been paid for by even the most prosperous in many years. The prospect was too discouraging.

The New American Association, an organization formed for the purpose of Americanizing foreigners in Brockton, interested a real estate firm in building seven one-family cottages in the Lithuanian section, and they were all sold to families of this nationality before the foundations were laid. After this encouragement the association decided to make plans for the building of many homes of this type. Under ordinary circumstances the moderately prosperous Lithuanian would be able to pay for such a home in about 10 or 12 years.

Among most of the foreign-born families and many of the native both living room and dining room had a particularly uninhabited appearance, while the kitchen represented every phase of the family's activities. The rooms of each flat were compactly grouped about the kitchen to facilitate heating. In the lower-priced tenements such an arrangement was essential because of the fact that all the rooms were heated from the kitchen range.

The distribution of births included in the detailed study according to the amount of rent paid and the ownership of the home appears in Table XXXIX.

TABLE XXXIX.—Number and per cent distribution of births during selected year, according to tenure and rental of home.

Tenure and rental of home.	Births during selected year.	
	Number.	Per cent distribution.
All classes.....	1,247	100.0
Home owned.....	224	18.0
Home not owned.....	1,023	82.0
Monthly rental:		
Less than \$10.00.....	142	11.4
\$10.00 to \$12.49.....	307	24.6
\$12.50 to \$14.99.....	172	13.8
\$15.00 to \$17.49.....	204	16.4
\$17.50 and over.....	136	10.9
Free.....	9	.7
Not reported.....	20	1.6
Boarding.....	33	2.6

Eighteen per cent of the births occurred in families owning their homes; 65.7 per cent in families paying \$10 or more rent per month; and 27.3 per cent in families paying \$15 or more rent per month. Since fairly good flats of four rooms could be obtained for \$10 a month and \$15 paid for a flat with all modern conveniences, it is apparent that the majority of Brockton's babies born in the selected year were comfortably housed.

Of the 1,210 live-born babies included in this study, 1,083 lived in homes of more than three rooms and 677 in homes of more than four

rooms. The number of persons living in dwellings having a specified number of rooms is shown in detail in General Table 11. These data are assembled in Table XL and infant mortality rates are given for babies who lived under varying conditions as regards congestion.

TABLE XL.—*Live births during selected year, infant deaths, infant mortality rate, according to average number of persons per room.*

Persons <sup>a</sup> per room.	Live births.	Infant deaths.	Infant mortality rate. <sup>b</sup>
Total.....	1,210	117	96.7
Less than 1.....	705	61	86.5
1 but less than 2.....	472	52	110.2
2 but less than 3.....	32	4	.....
Not reported.....	1	.....	.....

<sup>a</sup> Excluding infant born during selected year.

<sup>b</sup> Not shown where base is less than 100.

The greatest mortality occurred among babies who lived in the most congested homes. Overcrowding is an evil so closely allied with poverty, ignorance, and dirt that it is difficult to obtain an absolute measure of its importance. Nevertheless it may be conceded that the baby brought up in a home in which the number of rooms is equal to or greater than the number of persons has a decided advantage over one living under conditions of greater congestion.

More than half the homes, or 59 per cent, were rated as "clean," while but 12 per cent were reported "dirty"; city water was available in all but 10 homes; and in only six instances did the mother have to carry water in from outdoors. In short, the percentage of families living under favorable conditions was large. Every home visited had the advantage of some modern conveniences; and in 41 per cent all the following conditions were reported: Clean rooms, good means of ventilation, city water in the home, exclusive use of a toilet located within the dwelling, and sewer-connected sink and toilet.

Throughout the thickly settled sections, tenements were generally provided with toilets within the home, 81 per cent of the homes visited being so equipped. In this connection it may be noted that the 185 yard privies, as well as the houses lacking city water and sewer connection, were found mostly in the rural area included within the city limits.

Although means of ventilating the toilet were commonly provided, one six-family house was found where the bathrooms were without windows and had no light or ventilation except indirectly through the kitchen. The tenants complained of the difficulty of keeping the toilet clean and aired under such conditions. A serious housing defect was found in a few instances in the Lithuanian quarter, where the back door of a few apartments opened directly into the toilet, which in turn served as a hall leading to the kitchen. The disad-



vantages of such an arrangement are obvious. Eight toilets were found on porches and 36 were located in cellars. The latter were objectionable from two standpoints: First, because they were invariably poorly ventilated and often damp; second, because the families had to descend one, two, or even three flights of stairs in order to reach them.

Fifty-nine of the families visited had to share the toilet with one or more other families. Where such a division of responsibility existed, the difficulty of keeping the toilet clean was greatly increased, because, as one mother expressed it, "What is everybody's business, is nobody's business." This sentiment applied with equal force to the halls and stairways of the six-family tenements, which were usually found to be very dirty, although often the rooms within might be immaculately clean.

Ample means for light and ventilation were found, as there was no lot congestion in the city; there were many vacant lots, few rear houses, and few, if any, basement tenements.

The typical Brockton lot was 60 by 120 feet. Inasmuch as the usual three-tenement house had a frontage of about 25 feet and a depth of about 40 feet, it can readily be seen that a very large proportion of the lot remained uncovered. Fifty-two alley and rear houses were found and conditions in and about these houses did not come up to the general standard established throughout the city; but in no case did the occupants suffer from lack of light and air because of overcrowding on lots.

In general, for an industrial city, Brockton's housing accommodations were exceptionally good. The dwellings were almost uniformly in good repair, sanitary and other conveniences might be secured at a fairly low rental, and neither lot congestion nor congestion within the tenement existed to any extent; in the homes visited, not a single dark room was found. Where dirt and insanitary conditions existed, they could usually be traced to the family rather than to any lack of public sanitation facilities. The citizens have aimed high in regard to housing, and they have largely succeeded in maintaining a standard of comfortable homes for workingmen's families.

#### SOCIAL AGENCIES.

The board of health is the most active agency in Brockton in reducing infant mortality. It is composed of three members, one an executive officer giving full time to the work and the other two physicians who work part time.

Each birth occurring within the city limits must be reported to this board within 24 hours. Immediately after this notice has been received, the health department sends the mother a pamphlet "issued for the purpose of lowering the infant mortality, and to give infor-

mation as to the proper care of milk in the home." This is printed in both English and Lithuanian. The law requires all cases of ophthalmia neonatorum to be reported to the health department. Such cases were visited by the tuberculosis nurse who was in the employ of the department. Between May 19 and December 31, 1913, she made 207 calls to 16 babies who were referred to her by midwives and doctors as ophthalmia neonatorum cases. The health department also has charge of the milk inspection and chemical analysis of the city water. The total expenditures of this department for the year ended November 30, 1913, amounted to \$40,821.47.

The Brockton Milk and Baby Hygiene Association was organized in 1913 and supported during that year by private contributions. The health department made a spot map showing where all the infant deaths in the city for the past five years had occurred, as well as the deaths from digestive disturbances, and milk stations were established at the two points in the city where the number of infant deaths had been greatest during that period of time—the sixth ward and the fifth ward. The following extract has been taken from the association's report:

Stations opened on Everett Street and Ames Street on June 11th, closing on September 20th [1913]. True to the name, the aim has been to provide and distribute clean milk, modified to suit the need, and to teach mothers the proper care of babies. Ninety babies have been cared for, twenty-eight conferences with physicians held and three hundred and seventy-four calls made by nurses in the homes. Nearly all the babies have improved under our care and several lives of little ones saved. We have proven that there is need for such service and that the city should continue the service in some form. This work was accomplished at an expenditure of \$728.37.<sup>1</sup>

Of this amount only a small part was refunded by the mothers in payment for milk. A trained nurse was in charge of the station during the three months in summer when the work was in active operation. Physicians were in charge of the clinics. So successful was this work the first year that the city took charge of it the following year (summer of 1914), and since that time a third station has been established. The Lithuanians and Jews were the nationalities profiting most by this work, as the two stations on Ames and Everett Streets were located in the heart of their respective districts. Their interest and cooperation were aroused by mass meetings and indorsement by their more prominent clubs and organizations.

The Brockton Visiting Nurse Association was established in 1904. Its four nurses cared for the sick who were unable to secure proper care in their homes and who could not get or did not need hospital care. An insurance company also engaged them for the care of all its cases. The care of tubercular patients took a large part of their time. During 1913 they made 882 visits to patients. Owing to

<sup>1</sup> Thirty-second Annual Report of the Department of Public Health, 1913, p. 26. Brockton, 1914.

the inadequate force no prenatal work was done at that time and little educational work could be accomplished in the families beyond the directions necessary for the care of the patients. Since the time of this inquiry, however, the number of nurses has been doubled and they have been able to devote considerable time and attention to preventive work, including instructions to prospective mothers on prenatal care. The supervising nurse of the association also acts in the capacity of public health nurse for the city; this cooperation has brought about many beneficial results.

The Brockton day nursery was organized in May, 1909, in the center of the Jewish and Syrian quarter. A philanthropic citizen made this work possible by presenting the building and a sum of money, the interest of which was to be expended in maintenance. The purpose of the nursery was to provide a place where widowed mothers who were compelled to work might leave their babies during the day. As a rule no baby was admitted whose father was living, unless he were ill or apparently unable to secure employment. The nursery cared for very few children under 1 year of age. A kindergarten was conducted in connection with the day nursery and small children were admitted upon the payment of 10 cents a day. In cases where the mothers were unable to pay the babies were admitted free.

Mothers' pensions were paid in part by the city. The State paid one-third and the city paid the remaining two-thirds. Widows were eligible for this pension, as well as wives whose husbands had been away for over a year and who had taken out a warrant charging their husbands with nonsupport. They might apply for it or be recommended. The State had its own investigator, who conferred with the overseer and her report was referred to the authorities in charge and acted upon by them. No stipulated amount was fixed by law, but a budget was arranged by some one in the department and the same rates were applied to almost every family. The home conditions were inspected from time to time and the State had the privilege of withdrawing the pension if it seemed unwise to continue it. Two mothers of children born during the selected year benefited by this law.

The public charities were under the control of the overseer of the poor. Outdoor relief was given to the poor in their homes and patients were supported in the almshouse and other institutions. The main burden of supporting the poor fell on this department although a great deal of relief was given by churches and societies. Twelve of the families included in this study were the recipients of city relief.

Until the spring of 1915 Brockton had no charity organization society. While the city had to deal with no acute poverty problem,

such a society was nevertheless greatly needed to prevent the duplication of effort, which had existed up to that time. The central relief association was beginning to meet this need by maintaining a confidential exchange.

The income from the Snow fund, which was left to the city several years ago, was expended under the direction of the mayor, but he referred practically all cases to the overseer of the poor. This income amounted annually to about \$3,500 and had to be spent for excursions and for Christmas dinners and presents. The school nurses made the recommendations for the excursions and outings.

The public-school department was an active influence in the broadest sense. It maintained industrial classes, evening schools, special classes for non-English speaking children, continuation classes for boys and girls between 14 and 16, summer schools, playgrounds, school gardens made by the pupils, a parent-teacher association, dental clinic, three medical inspectors, and a school nurse.

The New American Association aimed to protect foreigners from exploitation, to train them to become true American citizens, and to enable them to be assimilated into the community with a minimum of struggle and delay. Through its influence public evening schools for immigrants had been maintained, as well as special schools for adults, schools for prospective citizens, and an immigrant protective and advisory bureau. Once a year a reception is held to welcome the newly naturalized citizen. This association had been directing a study of the community from the immigrant standpoint. The secretary for the association has written "The Shoe City Reader," a simple textbook for the use of foreigners who are employed in the shoe industry and who wish to learn English.

### CIVIC FACTORS.

**Milk supply.**—The bacteriological laboratory of the health department was one of the most complete and best equipped in New England and the bacteriologist was a recognized authority throughout the State. Sanitary milk inspection was begun in 1906 with the purpose of securing for the city "a clean, fresh, and healthful milk supply, as well as one that would not fall below the standards prescribed by law."<sup>1</sup>

The maximum bacterial count permissible was 500,000 per cubic centimeter; this standard remained unchanged from summer to winter. The dairies were inspected periodically. When pus or streptococci were found in milk from any dairy, the individual cows were examined until the infected animals were found, and these animals were then immediately isolated.

<sup>1</sup> Thirty-second Annual Report of the Department of Public Health, 1913, p. 39. Brockton, 1914.

The health department published the names of the 14 dairymen, who during 1913 had an average of 50,000 or less bacteria to the cubic centimeter, as well as the names of the 15 dealers with the lowest average bacterial counts during the eight years since milk inspection had been in force. As only four of these had had averages of less than 50,000 throughout the whole time, it was evident that conditions were being improved every year. Householders and physicians might consult these records at the office of the health department. "The constant inquiries for such information is evidence of the interest taken by the thinking public in this work."<sup>1</sup> Out of 638 mothers who gave their children cows' milk at some time during the first year, 185 or 29 per cent purchased it of the 14 dairymen whose milk averaged 50,000 bacteria or less during 1913.

During the year 196 dairies were scored and, with 100 as a maximum, the average score was 53. Two per cent scored below 31; and 11 per cent below 41; only 2 per cent scored above 81. In this connection, the bacteriologist in his annual report for 1913 stated:

In the matter of scoring dairies we have found nothing to shake our faith in the belief that what the Brockton milk consumers are primarily interested in is the actual quality of milk they are receiving rather than its possible production in a dairy scoring 95 per cent.

**Water supply.**—Brockton obtained its water supply from Silver Lake, the largest of a chain of lakes about 15 miles distant from the city. The water was chemically analyzed by the bacteriologist once a week and the results of this analysis were published as a monthly average. He reported "a general freedom from pollution from animal sources,"<sup>2</sup> as well as an extremely low bacterial count with a total absence of colon bacilli and streptococci. The water of 23 wells and springs was chemically tested also during 1913. Only 10 families included in this study used other than city water. One death occurred in Brockton during 1913 because of typhoid fever.

**Sewerage system.**—Brockton had 125.02 miles of accepted public streets and 71.79 miles of sewers in 1913. Since the city limits included a large area which was rural in character, the proportion of accepted streets in the city proper which had sewer mains was much larger than at first appears. But the city engineer estimated that the city had from 75 to 100 miles of "private ways" which were not "accepted streets." A "private way" was a street laid out by individuals and not yet accepted as such by the city council. The city assumed no responsibility whatever for accidents which might occur on these streets. Though efforts were constantly being made to have the city take these "private ways" under its jurisdiction, but little headway had been made at the time of this inquiry.

<sup>1</sup> Thirty-second Annual Report of the Department of Public Health, 1913, p. 47. Brockton, 1914.

<sup>2</sup> Thirty-second Annual Report of the Department of Public Health, 1913, p. 36. Brockton, 1914.

The "private ways" had no connection with the city sewer and were unable to obtain it until they had been accepted as streets. In the report of the city engineer and the sewer commissioners these "private ways" were ignored. If they were taken into consideration, but 30 or 40 per cent of the streets had sewers. The majority of dwellings in the city proper, however, were sewer connected, although the homes of 320 or 25.7 per cent of the babies included in this study did not have sewer-connected toilets and the homes of 209 or 16.8 per cent had sinks not connected with the sewer main. Some of these were practically rural homes; others in the more thickly settled part of the city were located on streets on private ways which had no sewers; and some had availed themselves of the exemption in the ordinance quoted below from the rules and regulations of the board of health.

SECTION 1. *Buildings to be connected with sewer.*—Every building situated on a public street, court, or passageway in this city, in which there is a public sewer, is hereby required by this board to be connected by a good and sufficient particular drain with such public sewer.

SEC. 2. The board of health may exempt from the provisions of the preceding section any building or buildings which in their judgment ought to be exempted, and said exemption may be either temporary or permanent, as said board may determine.

The city engineer's report for 1913 showed that the work of connecting buildings with the city sewer was progressing rapidly, 339 connections having been made during 1913. He estimated, however, that at the end of the year 1913 about 17 per cent of the property abutting on city sewers was at that time still unconnected.

**Sewage disposal.**—The method of sewage disposal in Brockton was that of intermittent sand filtration. According to Rosenau, "the efficiency of intermittent sand filtration is higher than that of any other process."<sup>1</sup> The system is described by Merriman as follows:

The method of purifying sewage by filtration is founded on the same principles as those \* \* \* for the artificial filtration of water. Sewage is a very impure water, but not much more impure than the surface drainage of some pastures and swamps; by passing it through soil at a slow rate and supplying sufficient air to enable the useful bacteria to work, the dead organic matter becomes completely changed into harmless gases and mineral compounds, so that the resulting effluent is clear and pure water.<sup>2</sup>

The disposal plant was constructed in 1893 and has been improved in 1905, 1908, and 1912. The city had 37 acres of sand beds in 1913. The plant is located in the extreme southwestern section of the city in the third ward where the sandy soil is well adapted to the purpose, and where it is convenient to a small stream, into

<sup>1</sup> Rosenau, Milton J. Preventive Medicine and Hygiene, p. 969. New York, 1917.

<sup>2</sup> Merriman, Mansfield. Elements of Sanitary Engineering, p. 204.

which the effluent is discharged. In his report on municipal engineering, Baker states that "among the best-known examples of intermittent filtration in America are the works at \* \* \* Brockton, Massachusetts."<sup>1</sup>

**Surface drainage.**—Surface drainage was excellent, being entirely separate from the sewerage system. The streets were, in the main, well graded and the rainfall was carried off by 19.51 miles of surface drains.

**Garbage collection and disposal.**—Garbage collection in Brockton was under the supervision of the overseer of the poor. Garbage must be "placed in covered vessels, and no ashes or other refuse matter shall be mingled therewith."<sup>2</sup>

Collections were made in the central portion of the city three times a week, and in the more remote sections only once a week. The city furnished teams and hired labor to haul the garbage a mile and a half from the center of the city, where it was either dumped on the poor farm to be used as fertilizer or fed to the pigs. Complaints were sometimes made because of the odor from the wagons passing through the streets on the way to the poor farm.

The overseer of the poor stated that it was only a matter of time when some other system of garbage disposal would have to be adopted, but no steps had been taken in that direction at the time of this study.

Ashes and noncombustible rubbish were drawn to the city dumps. These dumps appeared to be unnecessarily numerous and were very unsightly, but they were an indication of the rapid growth of the city rather than a menace to health. In the rural districts of the city were many shallow pools of stagnant water into which tin cans and other rubbish had been thrown. Apparently no attention had been paid to these breeding places for mosquitoes. As far as it was possible to determine, the ordinance regarding collections of garbage and ashes was very well enforced.

**Cleanliness of streets.**—The highway commissioner reported that no complaints of dusty streets were received during the summer of 1913. The streets were sprinkled with hot asphalt and a coating of sand. This treatment was supposed to keep them dustless the entire season, but opinions casually expressed indicated that the method was not altogether satisfactory. Undoubtedly much of the dust came from dirty sidewalks which were everywhere in evidence. In the outlying districts, where few of the streets were improved, serious annoyance was occasioned after a hard rain by the mixture of mud and sticky oil. By far the larger proportion of the streets in the

<sup>1</sup> Baker, M. N. *Municipal Engineering and Sanitation*, p. 150.

<sup>2</sup> Rules and Regulations of the Board of Health, p. 11.

sparsely settled districts were, however, merely country roads. The paved streets of the city proper were kept in fair condition.

**Street and sidewalk paving.**—Only 8.26 miles of streets were paved while 31.32 miles were macadamized. This was exclusive of State roads which passed through the city.

Brockton had 10.98 miles of concrete and asphalt sidewalks and 8.53 miles of granolithic sidewalks, making 19.51 miles of sidewalks in all, as compared with 125 miles of accepted streets. In addition, the 75 or 100 miles of "private ways" had no improvements at all unless provided by the individual property owner.

**Smoke nuisance.**—The city had never adopted a definite policy in regard to the smoke nuisance, although an ordinance on this subject was being considered for the future. The only noticeable annoyance from smoke was in the vicinity of the gas house; the odors there were especially trying also. Most of the factories burned soft coal, but the fact that these factories were located in somewhat sparsely settled parts of the city and were themselves widely separated eliminated the smoke nuisance to a large extent. One of the largest shoe factories in the city had had its steam power plant taken out and electricity installed in its place about the time of this inquiry, and since then other factories have taken similar action. But it was through chance rather than design that Brockton had no smoke nuisance.

### THE LIQUOR QUESTION IN BROCKTON.

Alcoholism is recognized as one of the important causes of infant mortality. Hence, the no-license law of Brockton which has been in effect every year since 1886, with the single exception of 1898, was believed by many inhabitants of the city to be a factor in the low infant mortality rate.

While it is easy to show the effect of drink on infant mortality in specific cases, it is difficult to state how many infant lives are saved by prohibition of the sale of liquor. Any influence which tends to make healthier parents, better homes, and more contented families will tend to reduce the number of infant deaths. In common with most of the complex social and economic factors underlying the causes of infant mortality, the effect of prohibition, although admittedly beneficial, can not be measured directly. In a city having excellent sanitation facilities, a strong sense of civic pride, good wages, and intelligent workers, the abolition of saloons might be considered either as cause or effect.

### CONCLUSIONS.

**Infant mortality rate.**—During the year selected for this study Brockton had an infant mortality rate of 96.7, which is relatively low compared with other manufacturing cities having similar climatic



conditions. This low rate has been attributed to the high wages paid by the dominant industry of the city, the intelligence of the workers, the fact that very few mothers were gainfully employed away from home, and the generally good municipal sanitation. But when the infant mortality rates of other cities of similar size and the general type of population are considered, the Brockton rate does not seem to be commensurate with the advantages generally enjoyed throughout the city.

**Nativity of mother.**—The mortality among babies of foreign-born mothers was lower than among babies whose mothers were native Americans. Few, if any, New England manufacturing cities have shown similar results. To a certain extent this favorable condition is due to the fact that most of the foreigners who come to Brockton with their families are skilled workmen. Furthermore, they are not obliged to live under extremely poor housing conditions, as in more congested cities.

The shoe industry demands skilled workers—others do not come to the city in great numbers; the high wages paid enable the workers to live in fairly comfortable homes. Although the more recent immigrants have not yet reached the standards of living attained by the Swedes, Irish, and British in the city, nevertheless Brockton has no problem of vast numbers of foreigners of an extremely low economic status with a standard of living correspondingly low.

**Earnings of father.**—Earnings of father appear to have a much less definite influence on infant mortality in Brockton than in the other cities studied. To what extent this was due to the good conditions which prevailed generally throughout the city, to what extent to the absence of saloons, or to chance variation due to the small numbers considered in this study, could not be determined.

**Employment of mother.**—The number of mothers who were gainfully employed in Brockton was so small that this employment can not be considered a factor in the general infant mortality rate, although it may have been a factor in the mortality of their infants.

**Age and cause of death.**—The proportion of deaths occurring in the first day, week, and month of life was unusually high. Most of these deaths were caused by the diseases of early infancy and those classified as "other causes." Inasmuch as apparently no organized effort had been made prior to 1915 to reduce the number of deaths from prenatal causes, the city's most crying need seems to be that of an adequate force of nurses to do prenatal work, as well as a clinic where mothers might obtain advice and medical care before the births of their children. In order to secure the maximum amount of benefit from such a clinic, an educational campaign would first be necessary for the purpose of convincing mothers of the value of pre-

natal care. Mothers should also be aroused to the importance of having the best medical care obtainable at childbirth. Shortly before the publication of this report the visiting nurses had begun to extend their work into the field of prenatal instruction and advice, but they had not yet been able to secure enough nurses to reach the mothers to any appreciable extent.

The deaths from gastric and intestinal diseases, on the other hand, form a relatively small percentage. These deaths are most easily preventable. Breast feeding, high standards of living, intelligent care, and good milk are factors which tend to reduce the death rate from these causes. Infant-welfare stations were beginning to play a prominent part in lowering the number of diarrheal deaths. In Brockton these stations had been so recently established at the time of this study that they had had no opportunity to reach the maximum of efficiency.

**Municipal sanitation.**—At the time of the study the city had passed no laws with reference to housing except for the purpose of fire protection. Housing conditions, however, were exceptionally good throughout the city. But, as Brockton grows, will it keep up this high housing standard? The experience of other cities has proved that most industrial communities succumb sooner or later to the temptation to overcrowd both homes and lots. If laws are passed to prohibit these evils in the immediate future the city may continue to possess a fair name as far as housing is concerned. On the other hand, at the present rate of development and with the commercial spirit everywhere rampant in an industrial town, Brockton can scarcely expect to fare better than conspicuously bad examples in her own State.

The city's system of sewerage and sewage disposal was excellent. The sewage disposal plant, although not an unusual type in modern cities to-day, was installed in 1893—a time when such high-grade sanitation facilities were practically unknown. Unfortunately, many homes in the city still lacked sewer connections in 1913.

Brockton has a problem to contend with in the abolition of the many "private ways." Since these streets were located within the city limits, it was difficult to understand why they should not have had the privilege of being sewer-connected and protected by the city, even though paving and sidewalks were out of the question for some years.

The code in regard to the handling of milk in Brockton was a good one and the laws were stringently enforced. The official bacterial standard of 500,000 per cubic centimeter was very low, but the bacteriologist, by appealing to the public to buy milk of those dairymen whose milk averaged less than 50,000 bacteria has unofficially succeeded in raising the standard.

With all the advantages existing in Brockton the infant mortality rate should have been lower than it really was. One must remember, however, that the city has developed very rapidly, having been incorporated only 32 years at the time of this inquiry. During that time remarkable progress has been made along the lines of sanitation and civic betterment, and improvements along every line of city activity were being pushed with much energy.

## APPENDIX.

### METHOD OF PROCEDURE.

**Scope of inquiry.**—In the law creating the Children's Bureau, passed by the Sixty-second Congress, infant mortality was specified first in the list of subjects to be investigated. The mortality among infants under 1 year is higher than mortality at any other period of life except old age. The report of the Census Bureau on Mortality Statistics showed that in 1911 for every thousand live births registered in the death registration States there were 124 infant deaths under 1 year of age. In the birth registration area, including the New England States, New York, Pennsylvania, Michigan, Minnesota, and the District of Columbia, in 1915, for every thousand live births registered there were 100 infant deaths. In these States the rate of infant mortality varied from 70 to 120 for the States as a whole, while for cities of 25,000 population or over (in 1910) in these States the range of the rates is much greater—from 54 in Brookline and Malden, Mass., to 196 in Shenandoah, Pa.

TABLE I.—*Infant mortality rates for States in the birth registration area: 1915.\**

State.	Infant mortality rate.
Connecticut.....	107
Maine.....	105
Massachusetts.....	101
Michigan.....	86
Minnesota.....	70
New Hampshire.....	110
New York.....	99
Pennsylvania.....	110
Rhode Island.....	120
Vermont.....	85

\* U. S. Bureau of the Census, Birth Statistics, 1915, p. 10. Washington, 1917.

It is evident from these figures that conditions in some States and in some cities are much more favorable than in others. On the causes of low or high mortality the figures of the Census Bureau throw little light. If inquiries were made in restricted areas and information on the physical, social, economic, and civic conditions were secured for all births and all infant deaths under 1 year it would be possible to determine the underlying causes that favored a low mortality or produced a high rate.

With this object in view the Children's Bureau selected a number of cities that offered contrasts in economic, industrial, and social conditions in which to make intensive studies of the conditions of infant life and infant mortality. The choice of the first cities to be studied was limited for practical reasons to cities with acceptable birth registration, on account of the facilities afforded by these

records for learning where the mothers to be interviewed lived. It was further necessary to choose cities of such size that they could be covered thoroughly within a reasonable time by the few agents available for the work. Certain characteristics of the cities chosen are summarized in Table II. All were manufacturing cities, the populations ranging, in 1910, from 50,000 to 100,000. All had a large foreign element. In addition, judging by the provisional figures available when the choice was determined upon, every city with the exception of Brockton had a high infant mortality rate.

TABLE II.—Population in 1910, infant mortality rates 1910 and 1915, percentage of adult population foreign born, principal foreign nationality,<sup>a</sup> and principal industry of the cities chosen for infant mortality studies.

City.	Popu- lation in 1910.	Infant mortal- ity rates.		Percent- age of adult popula- tion over 20 foreign- born, 1910.	Principal foreign nationality. <sup>a</sup>	Principal industry.
		1910. <sup>b</sup>	1915. <sup>c</sup>			
Johnstown, Pa.....	55,482	165	116	39.9	Varied Slavic d...	Iron and steel.
Manchester, N. H.....	70,063	193	150	56.1	French Canadian..	Cotton textiles.
Brockton, Mass.....	56,878	99	82	37.3	Lithuanian.....	Shoe manufacture.
Saginaw, Mich.....	50,510	145	101	33.7	German.....	Varied industries.
New Bedford, Mass.....	96,652	177	143	59.0	Portuguese.....	Cotton textiles.
Waterbury, Conn.....	73,141	149	143	50.5	Italian.....	Brass manufacture
Akron, Ohio.....	69,067	123	-----	26.0	German.....	Rubber factory.

<sup>a</sup> Principal nationality of foreign-born mothers of infants included in the infant mortality studies.

<sup>b</sup> Figures published by the U. S. Bureau of the Census, Bulletin 109, Mortality Statistics, 1910, pp. 18-19, based on provisional figures for births. The rate for Akron, Ohio, was furnished by the Ohio State Registrar.

<sup>c</sup> U. S. Bureau of the Census, Birth Statistics, 1915. Washington, 1917.

<sup>d</sup> No particular Slavic group of sufficient importance to mention separately.

**Infant mortality rate.**—An infant mortality rate expresses the probability of a live-born infant dying before his first birthday and is usually stated as the number of deaths under one year per thousand live births.<sup>1</sup> The usual approximate method of finding the infant mortality rate for a certain area is to divide the number of registered deaths of infants under 1 year of age occurring in a given calendar year by the number of registered live births in the same year. The number of deaths thus secured includes not only deaths of infants born in the same calendar year but also some deaths of infants born in the preceding year or in a different area; it excludes deaths of infants included in the group of births if the death occurred either in a different area or in the following calendar year. The two numbers (of deaths and births) do not refer to the same group of infants. To avoid this inaccuracy, the method employed by the Children's Bureau in all studies has been to follow each infant born in a given selected year in a certain area for a period of 12 months. The deaths among these infants are then compared to the births; in this way the deaths include no infants not included in the births and the true probability of dying in the first year of life is secured.

The chief difficulty in practice in computing infant mortality rates arises from the incompleteness of registration of births and deaths. It is not always safe to compare infant mortality rates in cities with those in country districts; in one State with those in

<sup>1</sup> Stillbirths are omitted from both births and deaths.

another; in one city with rates in another; or even to compare rates in one year with those for preceding years in the same city on account of differences and changes in completeness of registration. If the per cent of omissions of deaths under 1 year of age is equal to the per cent of omissions of births, the infant mortality rate, though based on incomplete data, will still be correct. In general, however, death registration is better than birth registration. If birth registration is more defective than registration of infant deaths, the infant mortality rate will be too high. Inaccuracies will affect not only the general rate for a given area but may affect also the comparability of the rates for different classes within the area. In an analysis of births and deaths by race and nativity classes if the degree of completeness of registration varies with the different classes the rates found by dividing the deaths by the births may not be comparable. For the purpose of these investigations comparable rates are essential.

It is not of so much importance that the rate secured shall characterize general conditions of infant mortality for a given area, as that rates for the different nativity classes, earnings groups, and other subclasses shall indicate the true differences for the area in the incidence of infant deaths. There are two methods of treating the original data to make them more serviceable for this purpose. One is to exclude the least accurate material, where it is known to be incomplete or inaccurate. The other is to make a selection of material on some unbiased basis and use the data selected as a representative sample of the city. An alternative policy is so to supplement the original data that the figures used include all the evidence applicable to the groups studied in this city.

Certain groups for which the information is inaccurate or incomplete have been excluded in all the studies made by the bureau. The groups for which the rates are most open to question and most difficult to obtain are illegitimate births, births in families that have moved away, and births to nonresident mothers.

The first of the groups that have been excluded from the general analysis is the group of illegitimate births. The information secured is probably not so complete as for legitimate births; furthermore, it relates to an abnormal family group. Special studies of mortality rates for illegitimate children have been made for one or two cities, but the findings can not be considered so satisfactory as those presented in the general analysis.

Births to mothers who moved away in the first year of the infant's life form the second group of exclusions. The information as to the number of deaths that occurred in this group is not complete. Obviously, if the infant moved away from the city after the first few weeks or months of life, his death, if he died before his first birthday, would not be registered in the city. Deaths registered in the city of infants born to mothers who later moved away also have to be excluded; otherwise the rates would be biased by the exclusion of live births only, with no exclusion of infant deaths to correspond.

A third group of exclusions is the births to nonresident mothers. These were excluded not only on the ground that in most cases the infant did not live in the city during his entire first year of life but also on the ground that the conditions under which nonresident mothers lived prior to entering the city hospitals may be different

from those of the average mother in the city. In order to make the rate as characteristic of the city as possible these births were excluded.

Births to mothers who could not be found were also excluded. In such cases the probability was that the mother had moved away. No reliable information could be secured about these cases and hence the only safe policy was to exclude them.

In practice since the agent's visit always was made after the first anniversary of the birth of the child, in some cases a year or more afterward, births were excluded if the mother had moved away from the city prior to or could not be found at the time of the agent's visit.<sup>1</sup>

The data submitted in the report apply, therefore, to births in the city during the selected year to resident married mothers who lived there during the child's first year and were found there at the time of the agent's visit.

Though the records for births to resident married mothers are much more complete and satisfactory than for all births in the city, there still remains the difficulty that differences in the completeness of registration for different groups may affect the comparability of rates. If all births and all infant deaths are registered, the rates for these groups would be correct. It was found, however, in examining the birth and death certificates that occasionally a death had been registered of an infant born in the city whose birth had not been recorded. Obviously the more incomplete the birth records are the more frequently such cases would occur.

There were three possible methods of meeting this difficulty. The first was to accept these death records and treat them as if the births had been recorded. The second was to make a selection of births and include only deaths among the births selected, the obvious basis of selections being the fact of registration of birth. The third was to attempt to complete the records of births and of deaths by a canvass. The first method was rejected in favor of the second and third, on the ground that the inclusion of all these death records would tend to exaggerate the mortality rates.

The second method was followed in Manchester, Brockton, and New Bedford. In Brockton and New Bedford a special canvass is made by State officials to check up registration of births during the preceding year. Consequently in these cities a birth might have been registered either by the physician soon after the birth or by the State canvasser on his visit. All births recorded, whether regularly registered or added by this special canvass, were treated as registered for the purposes of this study.

The third method, or a modification of it, was followed in the other cities studied. In Johnstown, Pa., the original plan was to limit the investigation to registered births in 1911. But during the progress of the investigation it was found that many births to Serbian mothers escaped registration and it was thought that this group was too important to be omitted entirely. Accordingly the birth records

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<sup>1</sup> The rulings in two special cases might be mentioned:

1. If the mother died during the child's first year, the birth was included if the infant (or, in case of death, his family) had lived in the city during the first year after his birth.
2. In a few cases mother and child were away from the city for a part only of the child's first year, but later moved back and were found by the agent. In the cities first studied agents were not instructed to inquire as to continuous residence in the city. If, however, the fact that the mother had moved away for a period was noted, the birth was excluded in tabulation, if the absence from the city had been three months or more.

were supplemented by the baptismal records of the Serbian church, and a canvass was made of the principal Serbian quarter. Agents were instructed to take schedules for any infants found who were born in Johnstown in 1911, even if the birth had not been recorded. In Saginaw the registered births were supplemented by the births secured in various ways—death certificates, baptismal records, through neighborhood inquiries, and other sources. The agent calling on each mother inquired if there were other children in the neighborhood of about the same age. By these means 116 births to resident married mothers were added. In Saginaw three unregistered deaths were added to the 113 recorded.

With the general plan of the investigation determined, the more important points in the detailed procedure were as follows: The first step was to copy the birth certificates for the year selected; then the death certificates for the year selected and the year following were examined and the facts as to birth and death for infants born in the year selected were transferred to the schedules. These records usually gave the address of the mother, though not in all cases the present address. In cities where a canvass was made, the actual address of the mother was found directly. If the mother had moved, the agent attempted to learn from the neighbors her present address in the city or whether she had moved away. Most of the information contained in these reports is derived from the answers secured from the mothers interviewed. As the bureau has no power or desire to compel answers, the information secured was based on the voluntary statements of the mothers. To the willingness of the mothers to answer all questions and to cooperate in every way, is due the completeness of the records; upon this completeness the value of much of the information depends.

In comparing, then, the rates for the group included in the study with the rates for the corresponding calendar year computed in the ordinary manner, the following points must be borne in mind:

First. In rates computed by the ordinary method the deaths and births refer to the same year. In the rates for these studies the births in a selected year are compared to the deaths among them. The deaths are scattered over a period of two years, including the selected year and the year following.

Second. Illegitimate births are excluded from these studies.<sup>1</sup> The death rate for illegitimate births is usually considerably higher than the average rate. The rates as shown in these studies, therefore, may be expected to be somewhat lower than the rates as usually computed.

Third. Births to nonresident mothers are excluded in order to make the rates as characteristic as possible of the conditions of the locality studied.

Fourth. Births of infants whose mothers moved away during the year following the birth of the infant and deaths that occurred in this group are excluded, because in the absence of data on age at removal it is impossible to use the figures except on the basis of arbitrary assumption. Deaths in the city of infants born elsewhere are also excluded because there is no information on age at migration. This policy, of course, excludes infant deaths in foundling asylums, if the birth did not occur in the city.

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<sup>1</sup> Except for Johnstown, where illegitimate births were included.



Fifth. In some of the cities rates are based on the deaths among the registered births. Infant deaths where the birth was not recorded have therefore been omitted, to correspond with the probable omission of infants surviving the first year of life, whose births were not recorded.

Finally, in other cities the birth records have been completed or supplemented by a canvass. In these cases the rates for the groups included are probably more accurate than the rates as usually computed.

**Exclusions in Brockton.**—With the foregoing explanation of the method of procedure in mind, the significance of the exclusions and the rates for the excluded groups may be more easily grasped. During the selected year there were 1,547 live births in Brockton; 174 of these had moved out of town and no trace of 71 could be found, a total of 245; 5 of these were found through death records. Obviously, owing to the difficulty of finding unregistered births to mothers who had moved away and could not be found, nothing could be done with these 5 live births and 5 deaths in forming a rate. Among the 240 registered live births to mothers who could not be found or had moved away, 27 deaths were known to have occurred. These deaths registered in the city probably do not include all deaths among this group. The rate of 112.5 is probably somewhat less than the true rate.

There was one case where the infant survived his first birthday, but the information was incomplete.

Among the 63 live births in the city excluded on grounds of non-residence of the mother, 4 deaths occurred in the city. In most cases these mothers probably left the city soon after the birth of the child. The rate therefore, 63.5, represents an understatement of the true rate for this group.

Eleven births to mothers resident in the city both at the time of the infant's birth and at the agent's visit were excluded on the ground of illegitimacy; 5, or nearly one-half, died before the end of the first year.

TABLE III.—Registered and unregistered live births in Brockton, infant deaths, and infant mortality rates for births included in and for births excluded from detailed analysis, by reason for exclusion.

Inclusions or exclusions and reasons for exclusions.	Live births.			Infant deaths.			Infant mortality rate. <sup>a</sup>		
	Total.	Registered.	Un-registered.	Total.	Births registered.	Births un-registered.	Total.	Births registered.	Births un-registered.
Total known births.....	1,547	1,525	22	171	153	18	110.5	100.3	.....
Total births included.....	1,210	1,210	.....	117	117	.....	96.7	96.7	.....
Total births excluded.....	337	315	22	54	36	18	160.2	114.3	.....
Reasons for exclusion:									
Nonresidence or lack of information: Total.....	309	304	5	36	31	5	116.5	102.0	.....
Not found.....	71	67	4	11	7	4	.....	.....	.....
Data incomplete or unreliable.....	1	1	.....	.....	.....	.....	.....	.....	.....
Nonresident.....	63	63	.....	4	4	.....	.....	.....	.....
Removed.....	174	173	1	21	20	1	120.7	115.6	.....
Illegitimacy.....	11	11	.....	5	5	.....	.....	.....	.....
Nonregistration of births.....	17	.....	17	13	.....	13	.....	.....	.....

<sup>a</sup> Not shown where base is less than 100.

<sup>b</sup> Including illegitimate births to nonresident mothers.

Seventeen live births were excluded on the ground that the birth had not been registered. In this group 13 deaths occurred. The reason the proportion is so high is because all but 4 of the 17 live births were found by means of the death certificates. The 4 not found by death certificates were discovered only by accident. It is difficult to form a rate for this group because no attempt was made to supplement the records of births by a canvass of the city.

Light may be thrown upon the completeness of registration of births in Brockton from these figures. If the deaths where the birth had not been registered are compared to the total deaths in the city among births in the selected year, the figure of 10.5 per cent is obtained as an index of the proportion of births not registered. This index gives the true percentage of births not registered only in case the mortality among groups where registration is faulty is the same as the average, and the fact of death in infancy has no effect upon subsequent registration of the birth by the canvasser. But the mortality rates are usually high in the foreign-born and low-earnings groups, among whom births are most likely to escape registration. Furthermore, in Brockton, the State canvasser, on his annual visit to check up registration of births and deaths, is probably more likely to find and register a birth in the previous year, if the infant is still alive, than if a death had occurred. This percentage, therefore, probably represents a maximum statement of the percentage of births unregistered. Another method of determining the percentage of births unregistered is by comparing the unregistered births with the total. There were 22 unregistered live births in Brockton during the selected year that were definitely known to have occurred. If compared to the 1,547 live births, 1.4 per cent were not registered. Perhaps a somewhat fairer comparison would be of the 17 births that occurred to mothers known to have been resident in the city both at the time of the infant's birth and at the time of the agent's visit to the total of 1,238 in the same group; the percentage, however, is only slightly lower. This percentage represents a minimum statement of births unregistered, because it includes only those cases where an unregistered birth was known to have occurred. Owing to the fact that no special measures were taken to discover other cases of omission, the true percentage is probably somewhat above this figure.

The infant mortality rate for the births included in the study is 96.7. For the excluded groups the rate varies with the reasons for exclusion. The rate for illegitimate births is very high. The rate for the nonresident is relatively low, but does not include all the deaths. The rate for cases where the mother was not found or had moved away from the city is considerably higher than the rate for the selected group, but obviously less than the true rate. No fair rates can be made for the group of infants where the birth was not registered, because practically all were found from death certificates. The rate for the excluded group as a whole, 160.2, means little unless taken in connection with the reasons for exclusion. The rate for all live births in the city, both included and excluded, was 110.5, but this rate, too, is not so significant in many ways as the rate for the group included in the study. If it could be assumed that all unregistered births to resident married mothers were discovered, the rate for this group

would be 105.9, a rate which would represent probably the maximum for this group, for every additional unregistered birth discovered would tend to lessen it. In case additional deaths had not been registered, the rate would depend upon the respective proportion of deaths and births unregistered.

**Stillbirth rates.**—Stillbirth rates were formed by dividing the number of stillbirths by the total number of births, live and stillbirths. A stillbirth is defined as a dead-born issue of 7 or more months' gestation. Miscarriages, or dead-born issues of less than 7 months' gestation, were excluded.

A policy of exclusions was followed similar to that for infant mortality. Stillbirths to nonresident mothers were excluded because of the possible effect of other conditions; likewise stillbirths to mothers who moved away prior to the visit of the agent. In the latter cases the information would have been difficult to obtain, and there was the same chance of omission of births as in calculating the infant mortality rate.

With reference to the accuracy of the data the registration of stillbirths has a peculiar margin of error of its own. Usually the stillbirths must be registered both as a "death," and as a "birth"; in some States the law is not clear whether stillbirths have to be registered at all; and in others miscarriages as well as stillbirths must be registered. It sometimes happens that a stillbirth is registered as a "death" but not as a "birth" where registration of both is required by law. It is obvious that such an omission is one of carelessness only, as ordinarily the same person, usually a physician, would register both.

The number of unregistered stillbirths would be difficult to determine. It would be much more difficult to find cases of omission of stillbirths by canvass or other inquiry than to find cases of omission of registration of live births. Omissions might be due to ignorance of the law or failure to observe it. Doctors are probably more conversant with the law than midwives. There is chance for confusion between stillbirths and infant deaths on the one hand, where it is difficult to determine whether or not the child was born alive; and between stillbirths and miscarriages on the other, where it is difficult to state accurately the number of months of gestation. If the law requires the reporting of miscarriages, the number of stillbirths is probably more complete than where they are not reported.

In the stillbirth rates presented in the infant mortality reports of the Children's Bureau, the stillbirths to resident married mothers that were registered either as births or deaths have been compared to the registered births to resident married mothers for Manchester, Brockton, and New Bedford; in other cities the figure for stillbirths is compared to the total of registered and known unregistered births to resident married mothers.

**Stillbirths excluded.**—There were 66 known stillbirths and miscarriages in Brockton; birth certificates were found for 60 of these. Fourteen were excluded because they were miscarriages of less than 7 months' gestation; 13 more were excluded because the mothers had moved out of the city or were nonresident or because information was lacking. In these cases it could not always be determined definitely whether the birth was a stillbirth or a miscarriage. There were 39 stillbirths to mothers resident in the city

both at the time of the birth of the child and at the agent's visit. Two of these were excluded on account of illegitimacy. The rate for the included group is formed by dividing 37 stillbirths by the 1,247 registered births included in the study, giving a rate of 3.0. No rate can be formed for the nonresident, not found, or removed groups, because it can not be determined from the records whether or not the birth was a stillbirth or miscarriage.

TABLE IV.—*Stillbirths and miscarriages in Brockton included in and excluded from detailed analysis, by reason for exclusion.*

Inclusions or exclusions and reason for exclusion.	Number.
Total known stillbirths and miscarriages.....	a 66
Total stillbirths included.....	37
Total stillbirths and miscarriages excluded.....	29
Reasons for exclusion:	
Nonresidence or lack of information.....	13
Not found.....	4
Data incomplete or unreliable.....	2
Nonresident.....	3
Removed.....	4
Miscarriages excluded.....	14
Stillbirths excluded on account of illegitimacy.....	2

a Includes 2 stillbirths and 4 miscarriages not registered as births, but which were found from death certificates. Compare statement on p. 12.

**Illegitimacy.**—Illegitimate children were excluded from the general tabulations for this study because of the relative incompleteness of the facts secured for this group, on account of nonresidence of the mother, and because the conditions were not those of the normal family. The discussion following includes the principal facts among the meager data secured.<sup>1</sup>

TABLE V.—*Illegitimate births during selected year, stillbirths, and status of live births at first birthday, according to nativity of mother.*

Nativity of mother.	Total births.	Stillbirths.	Live births.			
			Total.	Status at first birthday.		
				Alive.	Dead.	Not reported.
All mothers.....	39	3	36	17	7	12
Native mothers.....	24	1	23	11	4	8
Foreign-born mothers.....	15	2	13	6	3	4

During the year selected, 39 illegitimate births were registered in Brockton; this number comprises 2½ per cent of all births recorded in that period. Thirty-one of the mothers could not be located, and but partial data could be obtained for these cases from different social agencies in the city. Complete schedules were secured from mothers of eight infants.

<sup>1</sup> This discussion of illegitimacy is based not only on the births for which detailed information was secured but it also includes a few for whom the only information was that given on the birth certificate. In the preceding treatment of exclusions, illegitimate births to nonresident mothers are classed with those excluded on grounds of nonresidence of the mother rather than with those excluded on account of illegitimacy.

Birth certificates showed that 24 illegitimate babies were born to American mothers and 15 to foreign-born mothers. Thirty-six of these babies were live born, seven deaths under 1 year of age are known to have occurred; it is probable that some of the 12 children who could not be traced till their first birthday died outside the city. At least 19 per cent of the live-born infants died during their first year, indicating, though the basis for the figures is small, a tendency toward a rate twice as high as for legitimate children.

Thirty-seven of the mothers had physicians as attendants at birth, one a midwife, and one, whose child was stillborn, had no attendant.

Ten of the 35 children who lived at least two weeks were known to have lived with the mother; 12 were known to have lived away from the mother; 4 boarded in a private family, 3 at a baby farm, 2 were adopted, 1 was cared for in an infant asylum, 1 boarded out by the State board, the other with relatives. In 13 cases the place where the child lived was not reported.

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**GENERAL TABLES.**

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## GENERAL TABLES.

**TABLE 1.—Births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, by month of birth.**

Month of birth.	Total births.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
					Number.	Per cent of total births.
Total.....	1,247	1,210	117	96.7	37	3.0
November, 1912.....	99	96	8	83.3	3	3.0
December, 1912.....	103	97	7	72.2	6	5.8
January, 1913.....	83	79	6	76.0	4	4.8
February, 1913.....	103	101	9	89.1	2	1.9
March, 1913.....	108	108	12	111.1	-----	-----
April, 1913.....	119	115	11	95.7	4	3.4
May, 1913.....	109	105	14	133.3	4	3.7
June, 1913.....	116	113	9	79.6	3	2.6
July, 1913.....	103	100	11	110.0	3	2.9
August, 1913.....	89	85	11	129.4	4	4.5
September, 1913.....	86	85	6	70.6	1	1.2
October, 1913.....	129	126	13	103.2	3	2.3

**TABLE 2.—Number and per cent distribution of deaths among infants born in Brockton during selected year and of infant deaths in the registration area in 1913, by cause of death.**

Abridged International List No. <sup>a</sup>	Detailed International List No. <sup>a</sup>	Cause of death. <sup>b</sup>	Infant deaths in—			
			Brockton.		Registration area.	
			Number.	Percent distribution.	Number.	Per cent distribution.
		All causes.....	117	100.0	159,435	100.0
		Gastric and intestinal diseases c..	15	12.8	41,379	26.0
24.....	102, 103.....	Diseases of the stomach.....	3	2.6	2,924	1.8
25.....	104.....	Diarrhea and enteritis.....	12	10.3	38,455	24.1
		Respiratory diseases <sup>d</sup> .....	16	13.7	24,285	15.2
20.....	89.....	Acute bronchitis.....	5	4.3	3,665	2.3
Part of 23.....	91.....	Broncho-pneumonia.....	8	6.8	13,100	8.2
22.....	92.....	Pneumonia.....	3	2.6	7,520	4.7
Part of 33.....	150.....	Malformations.....	6	5.1	8,813	5.5
Part of 33.....	151(1).....	Early infancy.....	45	38.5	52,865	33.2
Part of 33.....	151(2), 152(2), 153.....	Premature birth.....	20	17.1	27,359	17.2
Part of 37.....	152(1).....	Congenital debility.....	18	15.4	20,375	12.8
Part of 37.....	152(1).....	Injuries at birth.....	7	6.0	5,131	3.2

<sup>a</sup> The numbers indicate the classification in the abridged and the detailed lists, respectively, of the Manual of the International List of Causes of Death.

<sup>b</sup> The causes of death included in this list are those used by the United States Bureau of the Census (see Mortality Statistics, 1913, p. 577) in classifying the deaths of infants under 1 year. They are those causes of death or groups of causes which are most important at this age. The numbers of the Detailed and Abridged International Lists will facilitate their identification. In order to make discussion of the figures easier, these causes of death have been grouped in eight main groups.

<sup>c</sup> The term "gastric and intestinal diseases" as used in the tables and discussion includes, as above shown, only the diseases of this type which are most important among infants, i. e., diseases of the stomach, diarrhea, and enteritis. It does not include all "diseases of the digestive system" as classified under this heading according to the Detailed International List.

<sup>d</sup> "Respiratory diseases" as used in the tables and discussion similarly includes only those of the respiratory diseases which are most important among infants, i. e., acute bronchitis, broncho-pneumonia, and pneumonia. It does not include all "diseases of the respiratory system" as classified under this heading according to the Detailed International List.

## INFANT MORTALITY.

TABLE 2.—Number and per cent distribution of deaths among infants born in Brockton during selected year and of infant deaths in the registration area in 1913, by cause of death—Continued.

Abridged International List No.	Detailed International List No. <sup>a</sup>	Cause of death. <sup>b</sup>	Infant deaths in—			
			Brockton.		Registration area.	
			Number.	Percent distribution.	Number.	Per cent distribution.
5.....	6.....	Epidemic diseases <sup>c</sup> .....	10	8.5	13,390	8.4
6.....	7.....	Measles.....			2,011	1.3
7.....	8.....	Scarlet fever.....			255	.2
8.....	9.....	Whooping cough.....	6	5.1	3,442	2.2
9.....	10.....	Diphtheria and croup.....	1	.9	913	.6
Part of 12.....	14.....	Influenza.....	1	.9	608	.4
Part of 12.....	18.....	Dysentery.....			651	.4
Part of 37.....	24.....	Erysipelas.....	2	1.7	756	.5
13.....	23, 29.....	Tetanus.....			369	.2
14.....	30.....	Tuberculosis of the lungs.....			848	.5
15.....	31, 32, 33, 34, 35.....	Tuberculous meningitis.....			1,230	.8
Part of 37.....	37.....	Other forms of tuberculosis.....			413	.3
35.....	155 to 188.....	Syphilis.....			1,894	1.2
38.....	187, 188, 189.....	External causes.....	1	.9	1,892	1.2
		Diseases ill defined or unknown.....	6	5.1	3,222	2.1
17.....	61.....	All other causes.....	18	15.4	13,519	8.5
Part of 37.....	71.....	Meningitis.....	1	.9	1,739	1.1
19.....	79.....	Convulsions.....	3	2.6	3,125	2.0
		Organic diseases of the heart.....			748	.5
		Other.....	14	12.0	7,907	5.0

<sup>a</sup> The numbers indicate the classification in the abridged and the detailed lists, respectively, of the Manual of the International List of Causes of Death.

<sup>b</sup> The causes of death included in this list are those used by the United States Bureau of the Census (see Mortality Statistics, 1913, p. 577) in classifying the deaths of infants under 1 year. They are those causes of death or groups of causes which are most important at this age. The numbers of the Detailed and Abridged International Lists will facilitate their identification. In order to make discussion of the figures easier, these causes of death have been grouped in eight main groups.

<sup>c</sup> "Epidemic diseases" as used in the tables and discussion includes only those of this group which are most important among infants.

TABLE 3.—Deaths of infants born during selected year occurring in specified month, by cause of death.

Cause of death.	Total deaths.	Month of death.											
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
All causes.....	117	10	14	12	15	7	6	7	15	10	12	3	6
Gastric and intestinal diseases.....	15		1						4	6	4		
Principal respiratory diseases.....	16	2	5	4	3				1		2		1
Malformations.....	6					1			1		1		1
Early infancy.....	45	1	6	3	3	3	3	6	3	3	1	1	1
Premature birth.....	29		4	3	3	3	3	6	3	3	1	1	1
Congenital debility.....	18	1	1	1	3	1	1	1	1	1	1	1	1
Injuries at birth.....	10	3	1	2	1	1							
Epidemic diseases.....	1								1				
External causes.....	6	1			1	2						1	1
Diseases ill defined or unknown.....	6					2						1	1
All other causes.....	18	3	1	2	1	3	3	1		1	1	1	1



TABLE 4.—Deaths of infants born during selected year in each ward of residence, by cause of death.

Cause of death.	Total deaths.	Ward of residence.						
		1	2	3	4	5	6	7
All causes.....	117	9	12	14	12	25	28	17
Gastric and intestinal diseases.....	15	1		2	4	4	4	
Principal respiratory diseases.....	16	1		1	1	5	6	2
Malformations.....	6		1			2	2	1
Early infancy.....	45	5	9		5	10	7	4
Premature birth.....	20	2	4	5	2	3	2	2
Congenital debility.....	18	2	2		2	6	5	1
Injuries at birth.....	7	1	3		1	1		1
Epidemic diseases.....	10			3	1		3	3
External causes.....	1							1
Diseases ill defined or unknown.....	6			1		2	2	1
All other causes.....	18	2	2	2	1	2	4	5

TABLE 5.—Births during selected year in each ward of residence, according to nationality of mother.

Nationality of mother.	Total births.	Ward of residence.						
		1	2	3	4	5	6	7
All mothers.....	1,247	128	126	149	156	226	300	162
Native mothers.....	613	83	82	79	75	98	109	87
Foreign-born mothers.....	634	45	44	70	81	128	191	75
Lithuanian.....	133						118	15
Italian.....	118	10	17	2	23	36	6	24
Irish.....	90	7	16	7	26	16	9	9
Scandinavian.....	62	1		35	16	3	4	3
Jewish.....	57	1		1	5	46	2	2
English, Scotch, and Welsh.....	33	5	3	3	2	8	6	6
French Canadian.....	22	2	1	5	1	5	6	2
Other Canadian.....	60	14	7	9	5	4	13	8
Polish.....	20	1		1	1	1	14	2
All other.....	39	4		7	2	9	13	4

## INFANT MORTALITY.

TABLE 6.—*Infants born during selected year to mothers of specified nativity and surviving at beginning of the month, number and per cent of infants dying subsequently in first year, and infant deaths in specified month of life, according to month of life and type of feeding in the month.*

Month of life and type of feeding.	Total infant survivors.	Subsequent infant deaths in—			Native mothers.				Foreign-born mothers.			
		First year.		Specified month.	Infant survivors.	Subsequent infant deaths in—			Infant survivors.	Subsequent infant deaths in—		
		Num. ber.	Per cent.			First year.		Specified month.		Num. ber.	Per cent.	Specified month.
						Num. ber.	Per cent.					
First month.....	1,210	117	9.7	57	601	61	10.1	34	609	56	9.2	23
Breast exclusively....	924	52	5.6	16	420	21	5.0	7	504	31	6.2	9
Mixed.....	20	3	.....	1	11	2	.....	1	9	1	.....	.....
Artificial exclusively.	233	29	12.4	7	149	17	11.4	5	84	12	.....	2
Not fed, died at once.	33	33	.....	33	21	21	.....	21	12	12	.....	12
Second month.....	1,153	60	5.2	9	567	27	4.8	3	586	33	5.6	6
Breast exclusively....	815	25	3.1	4	363	9	2.5	1	452	16	3.5	3
Mixed.....	31	2	.....	.....	15	1	.....	.....	16	1	.....	.....
Artificial exclusively.	307	33	10.7	5	189	17	9.0	2	118	18	13.6	3
Third month.....	1,144	51	4.5	10	564	24	4.3	5	580	27	4.7	5
Breast exclusively....	752	15	2.0	3	333	7	2.1	1	414	8	1.9	2
Mixed.....	38	2	.....	.....	16	1	.....	.....	22	1	.....	.....
Artificial exclusively.	354	34	9.6	7	210	16	7.6	4	144	18	12.5	3
Fourth month.....	1,134	41	3.6	6	559	19	3.4	3	575	22	3.8	3
Breast exclusively....	650	10	1.5	.....	281	5	1.8	.....	369	5	1.4	.....
Mixed.....	65	2	.....	.....	23	1	.....	.....	37	1	.....	.....
Artificial exclusively.	419	29	6.9	6	250	13	5.2	3	169	16	9.5	3
Fifth month.....	1,128	35	3.1	6	556	16	2.9	1	572	19	3.3	5
Breast exclusively....	608	8	1.3	1	264	4	1.5	.....	344	4	1.2	1
Mixed.....	83	2	.....	.....	35	1	.....	.....	48	1	.....	.....
Artificial exclusively.	437	25	5.7	5	257	11	4.3	1	180	14	7.8	4
Sixth month.....	1,122	29	2.6	5	555	15	2.7	2	567	14	2.5	3
Breast exclusively....	554	6	1.1	.....	239	4	1.7	.....	315	2	.6	.....
Mixed.....	111	1	.9	.....	45	.....	.....	.....	66	1	.....	.....
Artificial exclusively.	457	22	4.8	5	271	11	4.1	2	186	11	5.9	3
Seventh month.....	1,117	24	2.1	3	553	13	2.4	1	564	11	2.0	2
Breast exclusively....	467	6	1.3	1	195	4	2.1	1	272	2	.7	.....
Mixed.....	164	1	.6	1	74	.....	.....	.....	90	1	.....	1
Artificial exclusively.	486	17	3.5	1	284	9	3.2	.....	202	8	4.0	1
Eighth month.....	1,114	21	1.9	4	552	12	2.2	3	562	9	1.6	1
Breast exclusively....	424	4	.9	1	176	3	1.7	1	248	1	.4	.....
Mixed.....	189	1	.5	.....	86	.....	.....	.....	103	1	1.0	.....
Artificial exclusively.	501	16	3.2	3	290	9	3.1	2	211	7	3.3	1
Ninth month.....	1,110	17	1.5	5	549	9	1.6	3	561	8	1.4	2
Breast exclusively....	353	3	.8	.....	145	2	1.4	.....	223	1	.4	.....
Mixed.....	226	1	.4	.....	109	.....	.....	.....	117	1	.9	.....
Artificial exclusively.	516	13	2.5	5	295	7	2.4	3	221	6	2.7	2

TABLE 7.—Number and per cent distribution of births during selected year to gainfully employed mothers of specified nativity, according to earnings of mother during year following birth of infant.

Earnings of mother.	All mothers.		Native mothers.		Foreign-born mothers.	
	Total births.	Per cent distribution.	Births.	Per cent distribution.	Births.	Per cent distribution.
All classes.....	244	100.0	84	100.0	160	100.0
Under \$150.....	127	52.0	33	39.3	94	58.8
\$150 to \$249.....	42	17.2	18	21.4	24	15.0
\$250 to \$349.....	35	14.3	12	14.3	23	14.4
\$350 to \$549.....	19	7.8	11	13.1	8	5.0
\$550 and over.....	9	3.7	3	3.6	6	3.8
Not reported.....	12	4.9	7	8.3	5	3.1

TABLE 8.—Births during selected year in each father's earnings group, according to occupation of father.

Occupation of father.	Total births.	Earnings of father.								
		Under \$450.	\$450 to \$549.	\$550 to \$649.	\$650 to \$849.	\$850 to \$1,049.	\$1,050 to \$1,249.	\$1,250 and over.	No earnings.	Not reported.
All occupations.....	1,247	41	115	122	414	308	95	137	6	9
Manufacturing and mechanical.....	849	28	93	102	294	214	62	47	2	7
Bakers.....	11	1				8	2			
Blacksmiths.....	4				1	3				
Builders and contractors.....	7					2	1	4		
Compositors, linotypers, and pressmen.....	6					2	4			
Electricians and electrical engineers.....	7				1	2	2	2		
Engineers, firemen.....	10		1		2	4	3			
Factory operatives:										
Shoe and shoe findings industry.....	634	20	73	87	245	148	37	20	1	3
Other industries.....	34	2	10	3	9	10				
Laborers, helpers, and apprentices.....	22	2	5	4	6	3			1	1
Machinists.....	16			1	4	5	5	1		
Manufacturers, officials, managers.....	24				1	5	1	15		2
Shoemakers and cobblers.....	4		1	1	1			1		
Skilled mechanics, building trades.....	50	1	1	4	16	17	6	4		1
Tailors.....	11	1	2	1	4	3				
Other pursuits.....	9	1		1	4	2	1			
Trade.....	153	6	6	9	48	36	8	43		
Deliverymen.....	49	2	3	3	30	11				
Laborers.....	3		1		2					
Proprietors, officials, etc., mercantile establishments.....	55	3	1	5	4	13	5	24		
Real estate and insurance agents.....	8					2		6		
Salesmen, commercial travelers.....	39	1	1	1	11	9	3	13		
Other pursuits.....	5				1	1		3		
Transportation.....	69	2	4	3	30	21	4	5		
Chauffeurs, teamsters, expressmen.....	27	1	1	2	21	2				
Conductors, motormen, and trainmen.....	18			1	6	10	1			
Laborers.....	5	1	3		1					
Post and telephone employees.....	8					3	3	2		
Proprietors, officials, managers.....	4				1	2		1		
Other pursuits.....	7				1	4		2		
Clerical occupations, all industries.....	56	1	1	3	12	17	9	12		1



TABLE 10.—Live births in families of specified number of persons, according to earnings of father.

Earnings of father.	Total live births.	Number of persons in family. <sup>a</sup>												
		1	2	3	4	5	6	7	8	9	10	11	12	14
Total.....	1,210	4	439	277	202	109	70	51	25	19	8	3	2	1
Under \$550.....	149	1	49	31	20	19	15	6	3	4	1	1	.....	.....
\$550 to \$649.....	116	1	36	24	22	14	4	9	4	1	1	.....	.....	.....
\$650 to \$849.....	401	.....	152	80	61	44	29	14	12	5	2	1	1	.....
\$850 to \$1,049.....	301	1	118	66	63	19	10	3	6	2	1	1	1	1
\$1,050 to \$1,249.....	93	.....	28	36	11	7	3	4	2	1	1	.....	.....	.....
\$1,250 and over.....	136	.....	51	38	22	5	8	7	1	2	1	.....	.....	.....
No earnings.....	5	1	1	.....	1	1	.....	1	.....	.....	.....	.....	.....	.....
Not reported.....	9	.....	4	2	.....	.....	1	.....	.....	.....	.....	.....	.....	.....

<sup>a</sup> Excluding infant born during selected year.

TABLE 11.—Live births during selected year in dwellings of specified number of rooms, according to number of persons in dwelling.

Persons in dwelling.	Total live births.	Number of rooms in dwelling.									
		2	3	4	5	6	7	8	9	10 or more.	
Total.....	1,210	5	122	406	361	167	69	38	13	28	
Persons in dwelling:											
2.....	272	4	39	117	81	24	4	3	.....	.....	
3.....	272	.....	34	96	100	27	9	3	.....	3	
4.....	226	.....	24	87	58	25	12	11	3	5	
5.....	170	1	13	48	53	35	9	4	2	5	
6.....	100	.....	7	33	18	21	13	1	1	6	
7.....	64	.....	4	10	26	11	7	2	2	2	
8.....	52	.....	1	12	14	11	3	9	2	.....	
9.....	26	.....	.....	3	8	6	5	4	1	1	
10.....	16	.....	.....	.....	3	6	4	1	1	1	
11 or more.....	12	.....	.....	.....	.....	1	3	1	1	6	

TABLE 12.—Births from all pregnancies, infant deaths, infant mortality rate, and percent of stillbirths, according to order of pregnancy and age of mother.

Order of pregnancy and age of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate. <sup>a</sup>	Stillbirths.	
					Number.	Percent of total births. <sup>a</sup>
All pregnancies, all ages.....	3,703	3,608	389	107.8	95	2.6.
Under 20.....	268	262	38	145.0	6	2.2
20 to 24.....	1,206	1,181	133	112.6	25	2.1
25 to 29.....	1,135	1,114	109	97.8	21	1.9
30 to 34.....	677	658	72	109.4	19	2.8
35 to 39.....	332	312	30	96.2	20	6.0
40 and over.....	79	76	6	.....	3	.....
Not reported.....	6	5	1	.....	1	.....
First pregnancy, all ages.....	1,241	1,211	126	104.0	30	2.4
Under 20.....	211	206	23	111.7	5	2.4
20 to 24.....	617	601	66	109.8	16	2.6
25 to 29.....	300	294	24	81.6	6	2.0
30 to 34.....	88	87	11	.....	1	.....
35 to 39.....	20	19	2	.....	1	.....
40 and over.....	1	1	.....	.....	.....	.....
Not reported.....	4	3	.....	.....	1	.....
Second pregnancy, all ages.....	824	804	76	94.5	20	2.4
Under 20.....	47	46	10	.....	1	.....
20 to 24.....	358	354	40	113.0	4	1.1
25 to 29.....	267	260	17	65.4	7	2.6
30 to 34.....	110	107	4	37.4	3	2.7
35 to 39.....	40	35	4	.....	5	.....
Not reported.....	2	2	1	.....	.....	.....

<sup>a</sup> Not shown where base is less than 100.

TABLE 12.—*Births from all pregnancies, infant deaths, infant mortality rate, and per cent of stillbirths, according to order of pregnancy and age of mother—Continued.*

Order of pregnancy and age of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate, <sup>a</sup>	Stillbirths.	
					Number.	Per cent of total births, <sup>a</sup>
Third pregnancy, all ages.....	561	541	62	114.6	20	3.6
Under 20.....	8	8	4			
20 to 24.....	156	151	19	125.8	5	3.2
25 to 29.....	238	234	21	89.7	4	1.7
30 to 34.....	113	106	13	113.2	7	6.2
35 to 39.....	41	37	6		4	
40 and over.....	5	5				
Fourth pregnancy, all ages.....	378	367	43	117.2	11	2.9
Under 20.....	2	2	1			
20 to 24.....	57	57	6			
25 to 29.....	171	169	19	113.4	3	1.7
30 to 34.....	107	101	15	148.5	6	5.6
35 to 39.....	36	34	2		2	
40 and over.....	4	4				
Fifth pregnancy, all ages.....	252	248	29	116.9	4	1.6
20 to 24.....	15	15	2			
25 to 29.....	94	93	16		1	
30 to 34.....	100	100	7	70.0		
35 to 39.....	38	36	4		2	
40 and over.....	5	4			1	
Sixth pregnancy, all ages.....	173	169	16	94.7	4	2.3
20 to 24.....	3	3				
25 to 29.....	48	48	4			
30 to 34.....	68	67	7		1	
35 to 39.....	46	43	3		3	
40 and over.....	8	8	2			
Seventh pregnancy, all ages.....	116	114	16	140.4	2	1.7
25 to 29.....	13	13	6			
30 to 34.....	46	46	8			
35 to 39.....	41	39	2		2	
40 and over.....	16	16				
Eighth pregnancy, all ages.....	70	67	9		3	
25 to 29.....	2	2	2			
30 to 34.....	24	23	4		1	
35 to 39.....	29	29	3			
40 and over.....	15	13			2	
Ninth pregnancy, all ages.....	38	38	5			
25 to 29.....	1	1				
30 to 34.....	14	14	1			
35 to 39.....	17	17	2			
40 and over.....	6	6	2			
Tenth pregnancy, all ages.....	27	26	4		1	
30 to 40.....	5	5	2			
35 to 39.....	14	13	1		1	
40 and over.....	8	8	1			
Eleventh pregnancy, all ages.....	13	13	2			
30 to 34.....	1	1				
35 to 39.....	7	7	1			
40 and over.....	5	5	1			
Twelfth pregnancy, all ages.....	5	5	1			
30 to 34.....	1	1				
35 to 39.....	3	3				
40 and over.....	1	1				
Thirteenth pregnancy, all ages.....	4	4				
40 and over.....	4	4				
Fourteenth pregnancy, all ages.....	1	1				
40 and over.....	1	1				

<sup>a</sup> Not shown where base is less than 100

TABLE 13.—Births to mothers married specified number of years, stillbirths, and infant deaths, by number of births to mothers.

Number of births to mother.	Total.	Number of years of mother's married life.																											
		Less than 1.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
<b>Total:</b>																													
Total births.....	3,703	15	216	190	180	199	206	283	206	201	180	211	174	152	172	134	112	132	104	136	141	101	74	30	36	72	40	6	
Stillbirths.....	95	3	7	4	3	6	9	7	6	7	7	4	3	5	9	4	3	3	1	5	2	1	1	1	3	1	1	1	
Infant deaths.....	389	2	23	20	15	13	14	35	23	17	21	21	24	16	18	15	14	13	16	22	21	10	4	1	3	6	1	1	
<b>1 birth:</b>																													
Total births.....	410	15	208	111	34	14	6	7	4	3	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Stillbirths.....	8	3	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Infant deaths.....	37	2	21	8	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
<b>2 births:</b>																													
Total births.....	522	8	76	124	102	64	52	28	20	14	8	10	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
Stillbirths.....	12	3	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Infant deaths.....	42	2	12	8	5	3	3	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
<b>3 births:</b>																													
Total births.....	552	3	18	60	81	126	57	51	45	21	15	21	6	12	12	3	6	6	6	6	6	6	6	6	6	6	6	6	
Stillbirths.....	17	2	1	2	2	1	1	1	2	2	3	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Infant deaths.....	44	1	5	6	8	9	4	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
<b>4 births:</b>																													
Total births.....	484	4	12	40	68	70	68	40	56	48	16	16	4	12	8	4	8	8	8	8	8	8	8	8	8	8	8	8	
Stillbirths.....	14	1	4	2	2	1	1	1	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Infant deaths.....	49	3	14	7	4	2	2	2	2	2	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
<b>5 births:</b>																													
Total births.....	375	5	15	30	35	35	30	60	35	45	25	10	15	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Stillbirths.....	19	2	4	1	2	4	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Infant deaths.....	52	3	2	9	4	2	5	8	4	5	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
<b>6 births:</b>																													
Total births.....	372	6	24	42	42	42	48	30	24	18	12	24	6	12	6	12	6	12	6	12	6	12	6	12	6	12	6	6	
Stillbirths.....	6	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Infant deaths.....	49	2	5	9	3	6	9	3	6	9	3	6	9	3	6	9	3	6	9	3	6	9	3	6	9	3	6	6	
<b>7 births:</b>																													
Total births.....	336	7	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	
Stillbirths.....	10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Infant deaths.....	35	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1	
<b>8 births:</b>																													
Total births.....	256	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
Stillbirths.....	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Infant deaths.....	23	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1	1	
<b>9 births:</b>																													
Total births.....	99	18	9	18	9	18	9	18	9	18	9	18	9	18	9	18	9	18	9	18	9	18	9	18	9	18	9	9	
Stillbirths.....	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Infant deaths.....	14	1	3	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

BROCKTON, MASS.

TABLE 13.—Births to mothers married specified number of years, stillbirths, and infant deaths, by number of births to mothers—Continued.

Number of births to mother.	Total.	Number of years of mother's married life.																											
		Less than 1.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
10 births:																													
Total births.....	120														10		10	40		20	10	20					10		
Stillbirths.....	1													1															
Infant deaths.....	18													4				11		2		1							
11 births:																													
Total births.....	88																11		11	33	11					22			
Stillbirths.....																													
Infant deaths.....	15																2		2	4	3					4			
12 births:																													
Total births.....	36													12						21									
Stillbirths.....	2												1							1									
Infant deaths.....	8												3							5									
13 births:																													
Total births.....	39																								13		13		
Stillbirths.....																													
Infant deaths.....	3																									2	1		
14 births:																													
Total births.....	14																											14	
Stillbirths.....																													
Infant deaths.....																													



TABLE 14.—*Mothers reporting specified number of miscarriages, by number of pregnancies to mother.*

Pregnancies to mother.	Total mothers.	Mothers reporting specified number of miscarriages.							
		None.	1	2	3	4	5	6	7
All mothers.....	1,231	1,099	87	29	11	1	1	2	1
Pregnancies:									
1.....	392	392							
2.....	260	241	19						
3.....	179	164	13	2					
4.....	130	107	18	5					
5.....	74	61	10	1	2				
6.....	62	47	9	5	1				
7.....	47	35	5	5	2				
8.....	31	20	7	3	1				
9.....	18	9	3	4	2				
10.....	19	13	2	3	1				
11.....	8	6	1		1				
12.....	2	1							1
13.....	5	2		1	1		1		
14.....	3	1						2	
17.....	1					1			

TABLE 15.—*Mothers reporting specified number of stillbirths, by number of births to mother.*

Births to mother.	Total mothers.	Mothers reporting specified number of stillbirths.			
		None.	1	2	3
All mothers.....	1,231	1,147	76	5	3
Births:					
1.....	410	402	8		
2.....	261	250	10	1	
3.....	184	168	15	1	
4.....	121	108	12	1	
5.....	75	61	11	1	2
6.....	62	58	3		1
7.....	48	39	8	1	
8.....	32	27	5		
9.....	11	10	1		
10.....	12	11	1		
11.....	8	8			
12.....	3	1	2		
13.....	3	3			
14.....	1	1			

## INFANT MORTALITY.

TABLE 16.—*Mothers reporting specified number of infant deaths, by number of live births to mother.*

Live births to mother.	Total mothers.	Mothers reporting specified number of infant deaths.					
		None.	1.	2	3	4	5
All mothers.....	1,222	939	208	51	18	5	1
Live births:							
1.....	413	376	37				
2.....	268	226	39	3			
3.....	182	147	27	6	2		
4.....	119	76	31	11	1		
5.....	65	35	20	8	1	1	
6.....	66	32	19	11	4		
7.....	44	24	11	6	2	1	
8.....	28	12	13	2	1		
9.....	11	3	4		3	1	
10.....	11	4	5			1	1
11.....	10	2	1	2	4	1	
12.....	1			1			
13.....	3	1	1	1			
14.....	1						

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