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U. S. DEPARTMENT OF LABOR
CHILDREN'S BUREAU

JULIA C. LATHROP, Chief

INFANT MORTALITY

RESULTS OF A FIELD STUDY IN SAGINAW, MICH.
BASED ON BIRTHS IN ONE YEAR

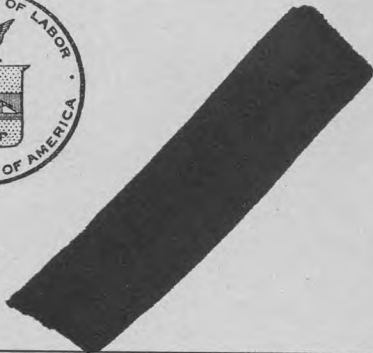
By

NILA F. ALLEN



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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF LABOR,
CHILDREN'S BUREAU,
Washington, April 14, 1919.

SIR: Herewith I transmit a report on infant mortality in Saginaw, Mich., a city with an infant mortality rate somewhat lower than that for the birth-registration area of the United States. The wide variations in death rates within the community revealed by this detailed study offer further evidence that every family must be able to maintain a fair standard of living and every expectant mother must be able to secure adequate care if every baby is to be given a fair chance to live.

The study has followed the same plan as the bureau's other studies of infant mortality in cities. The cooperation, without which the study could not have been made, was generously given by the Saginaw mothers and the various civic and other organizations in the city.

The field work for the study was directed and the report was written by Miss Nila F. Allen. The special agents at work with Miss Allen in the field were Misses Melissa Farrell, Roberta King, Elizabeth Moore, Etta F. Philbrook, Jessie Riall, and Mary Van Zile. Statistical and editorial revision was done by Miss Rena Rosenberg. Dr. Robert M. Woodbury wrote the appendix on method of procedure.

Respectfully submitted.

JULIA C. LATHROP, *Chief.*

Hon. W B. WILSON,
Secretary of Labor.

INFANT MORTALITY: SAGINAW, MICH.

INTRODUCTION.

SELECTION OF SAGINAW.

Saginaw, Mich., was the fourth city to be included in the Children's Bureau studies of the social conditions underlying infant mortality. Previous studies had been made in cities in the birth-registration States of Pennsylvania, Massachusetts, and New Hampshire. It seemed desirable to make a study in Michigan, the westernmost State in the provisional birth-registration area at the time the choice was made (1914), and Saginaw, a city of 50,000 population—not too large for the limited field force available—was selected.

An important consideration in the selection of Saginaw was its unlikeness to the cities previously visited. Saginaw is a city of widely diversified industrial life, located in a rich agricultural region. It possesses, therefore, few of the characteristics of Johnstown, Pa., Manchester, N. H., and Brockton, Mass., which are, respectively, iron and steel, textile-mill, and shoe-factory cities. A study of infant mortality in Saginaw would reveal, it was thought, interesting contrasts in conditions. Furthermore, Saginaw had a relatively small foreign-born population, only 23.2 per cent, mainly of German nationality. A difference which might prove of considerable importance was that comparatively few women were employed in industry in Saginaw, as contrasted with the large proportion at work in the textile mills of Manchester.

In spite of the striking differences in conditions, the infant mortality rate in Saginaw was apparently high (137.9¹) in 1910, not so high as either Johnstown (165) or Manchester (193), but considerably above the rate for Brockton (99).

¹ The latest figures available when the choice was made gave a rate of 145 (U. S. Bureau of the Census, Mortality Statistics 1910, Bulletin 109), based on the provisional figures for births. Even the figure given in the text is probably an exaggeration of the true rate, because birth registration was so defective. The apparent fall in the rate for 1910 to 1912 is due largely to improvement in birth registration, since the increase in number of births registered was much greater proportionally than the estimated increase of population. The study itself showed a large percentage of births unregistered even in 1913. See Appendix, p. 69. It

METHOD AND PLAN OF STUDY IN SAGINAW.

The method of procedure followed by the bureau in infant mortality studies is stated at length in the Appendix, pp. 63 to 69. Briefly, the study of infant mortality was based upon the births which occurred in Saginaw during the year ended November 30, 1913, and the deaths under 1 year of age occurring in this group. The plan was to visit the homes and by means of personal interviews with mothers, to collect data about the babies' lives to the end of their first year, or until death if death occurred under 1 year of age. Birth records were examined and in each case the facts necessary to identify the baby were transcribed to the schedule¹ later used for the collection of information from the mother. Death certificates were copied for infants whose age showed their births to have occurred in the selected year. At this stage of the work, even when both records existed, it was not always possible to determine whether they referred to the same child. In several cases the records were not matched until after the call on the parents, when it would be found, for instance, that the baby named "Zartsch" on the death record was the one called "Sage" on the birth certificate.

While these data were being taken from the records the general public was informed of the nature and purpose of the inquiry. The local press gave it wide publicity. The clergy, especially those serving congregations of non-English speaking peoples, stated the purpose of the work to their charges, and thus secured for the inquiry an earnest and intelligent response. The city officials, the civic league, the mothers' and other women's clubs were interested and most helpful. In fact, the city welcomed the inquiry heartily, and left nothing undone that would add to its success.

When the copying of the records had been completed, the agents of the bureau, who were all women, commenced their calls upon the mothers. An attempt was made to visit personally the mother of every one of the babies and to get directly from her the facts about her

is, therefore, not safe to compare figures for infant mortality shown in the study with the rates computed from the records of births and deaths, as shown in the following table:

Year.	Popula- tion. ^a	Live births. ^b	Deaths. ^b	Infant mortality rate.	Registered live births per 1,000 population.
1910.....	50,682	950	131	137.9	18.7
1911.....	51,508	942	113	120.0	18.3
1912.....	52,334	1,052	108	102.7	20.1
1913.....	53,161	1,076	123	114.3	20.2
1914.....	53,988	1,147	111	96.8	21.2
1915.....	54,815	1,108	108	97.5	20.2
1916.....	55,642	1,204	138	114.6	21.6

^a U. S. Bureau of the Census Bulletin 133, estimated population July 1.

^b From Annual Registration Reports of Michigan, containing vital statistics, for the years 1910 to 1913. For the years 1914 to 1916, by letter from the division of vital statistics, department of state, Michigan.

¹ See page 91.

baby's first year of life. The information asked was most freely and willingly given, and not one mother visited declined to be interviewed. Not all mothers could be interviewed, however, for many had moved out of the city and a few could not be located.

The number of registered births in Saginaw in the year ended November 30, 1913, was 1,113. In the course of the preliminary work it was learned that numerous births had not been registered. (See Appendix, p. 68.) Every effort short of a house-to-house canvass was made to discover all births in Saginaw during the selected year. The agents were instructed to inquire of every mother visited if she knew of other babies in the neighborhood, and the mothers of these babies were in turn called upon. Possibly because Saginaw, which is really three towns combined into a city, retains the small-town characteristic of acquaintanceship among neighbors, this method of locating unregistered babies proved the most effective and closely approached the thoroughness of a canvass in discovering the living child still resident in Saginaw. Death certificates revealed some unrecorded births for which data were obtained; lists of births which had occurred in all the hospitals were secured; the cards of entry of babies in a baby show held shortly before the work was begun furnished many names; and baptismal records were copied and checked with names obtained in other ways. By these means a total of one hundred and forty-seven unregistered births known to have occurred in Saginaw in the selected year were found. Three deaths which had not been registered were found also.¹

In addition to the cases excluded because the mother had moved away or could not be found, illegitimate births were rejected, the conditions in these cases not being those of the normal family. Births to mothers temporarily resident in the city were also excluded, since the environment previous to the birth of the baby may not have been typical of the city. Included in the study are the 1,015 births in the selected year to married mothers resident in the city at the birth of the child and living in the city during the infant's first year.

ANALYSIS OF MATERIAL.

INFANT MORTALITY RATE.

Of the 1,015 births included in the study, 34, or 3.3 per cent, were stillbirths. Eighty-three of the 981 live-born infants died, giving a mortality rate of 84.6 per 1,000.

¹ See Appendix, pp. 69-72 for a more complete discussion of method.

CAUSE OF DEATH.

Relative importance of causes of death.—Eighty-three deaths from various causes occurred before the babies included in the study were 1 year old. A distribution of these deaths according to cause shows the relative importance of each cause of death (Table I).

TABLE I.—*Number and per cent distribution of deaths among infants born in Saginaw during the selected year and infant mortality rate, by cause of death.*

Cause of death. ^a	Infant deaths.		Infant mortality rate.
	Number.	Per cent distribution.	
All causes.....	83	100.0	84.6
Gastric and intestinal diseases.....	8	9.6	8.2
Respiratory diseases.....	10	12.0	10.2
Early infancy and malformations.....	41	49.4	41.8
Epidemic diseases.....	5	6.0	5.1
External causes.....	1	1.2	1.0
Diseases ill defined or unknown.....	4	4.8	4.1
All other causes.....	14	16.9	14.3

^a For classification according to Detailed International List, see General Table 1.

Malformations and causes peculiar to early infancy resulted in 41 deaths, practically one-half of the total number; relatively few were found in any of the remaining six groups. In the registration area in 1913 the percentage of deaths from the same causes was 38.7; according to the bureau studies, in Manchester, with an infant mortality rate of 165, the percentage was only 29.4; and in Johnstown, with a rate of 134, it was 25.5. The percentage of deaths from these causes was much larger among the Saginaw infants than in any of the localities previously studied by the bureau which furnish the only comparable statistics.

Gastric and intestinal diseases were not an important factor in infant mortality in the group studied, these diseases causing only eight deaths, 9.6 per cent. In the registration area for 1913, deaths from this cause comprised 26 per cent, or slightly over one-fourth of the total number of deaths. In Saginaw, the prevalence of breast feeding may explain in part the small proportion of deaths from gastric and intestinal diseases. Six of the eight deaths ascribed to these causes occurred in the tenth or later months of the infant's first year, when exclusive breast feeding is not so commonly practiced. Only one occurred in the summer; of the rest two occurred in the winter and five in the spring and autumn (General Table 2).

TABLE II.—Deaths among infants born in Saginaw during selected year occurring in specified month of life, by cause of death.

Cause of death.	Total deaths.	Deaths in specified month of life.				
		First.			Second.	Third.
		Total.	Under 2 weeks.	2 weeks but under 1 month.		
All causes.....	83	47	34	13	10	2
Gastric and intestinal diseases.....	8				1	
Respiratory diseases.....	10	3	1	2	1	2
Early infancy and malformations.....	41	31	23	8	3	
Epidemic diseases.....	5				2	
External causes.....	1	1		1		
Diseases ill defined or unknown.....	4	4	4			
All other causes.....	14	8	6	2	3	

Cause of death.	Deaths in specified month of life.								
	Fourth.	Fifth.	Sixth.	Seventh.	Eighth.	Ninth.	Tenth.	Eleventh.	Twelfth.
All causes.....	6	1	3	2	3	1	2	4	2
Gastric and intestinal diseases.....	1						1	3	2
Respiratory diseases.....				1	2			1	
Early infancy and malformations.....	3	1	3						
Epidemic diseases.....	1				1		1		
External causes.....	1								
Diseases ill defined or unknown.....									
All other causes.....	1			1		1			

The deaths from respiratory diseases were 10 in number, or 12 per cent of the total, slightly more than those from gastric and intestinal diseases. Respiratory diseases, though ranking second in number of deaths, were not of great importance as a cause of mortality among the babies considered in this study. In the registration area, deaths from this cause comprised 15.2 per cent of deaths from all causes; in Manchester, which has practically the same latitude as Saginaw, 15.9 per cent; and in Johnstown, a few degrees farther south, 25.5 per cent. In Saginaw detached houses, adequate means of ventilation, and lack of overcrowding, together with appreciation on the part of mothers of the value of sunshine and fresh air made a combination unfavorable to the spread of respiratory diseases among the babies. It is possible that the insular climate of Saginaw may also account in part for the small percentage of deaths from respiratory diseases.

Deaths from "epidemic" diseases included one each from whooping cough, dysentery, and syphilis, and two from tuberculous meningitis. The one death from external causes was due to accidental asphyxiation. Deaths from ill-defined or unknown causes were of four

infants less than 24 hours old; no report of the cause of death was made by the physician. There were 14 deaths from various other causes.

The chief causes of death, therefore, were found in malformations and early infancy. Deaths in this group were caused by congenital defects, prematurity, injuries at birth, marasmus, inanition, lack of vitality, and other similar causes.

AGE AT DEATH.

The largest number of infant deaths occurred in the first three months of life, 71.1 per cent of the entire number occurring during this period. The age at death is shown in Table III.

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

Age at death.	Infant deaths.	
	Number.	Per cent distribution.
Total.....	83	100.0
Less than 1 week.....	26	31.3
1 week but less than 2.....	8	9.6
2 weeks but less than 1 month.....	13	15.7
1 month but less than 3.....	12	14.5
3 months but less than 6.....	10	12.0
6 months but less than 12.....	14	16.9

Twenty-six, or nearly one-third, of the total number of deaths among the babies of the selected group occurred in the first week after birth. In other words, more babies died in the first week than in the last nine months of the year; and 47 deaths, or 56.6 per cent of the total number, occurred in the first month. Compared with similar percentages for the death registration area for the four-year period 1910-1913,¹ where slightly over one-fourth of the deaths occurred in the first week after birth and two-fifths in the first month, the proportion in Saginaw at these periods of life was high. An unusual feature is that there were no deaths under 1 day among the foreign born (General Table 3)—a fact that suggests faulty registration. Both births and deaths were fairly equally distributed throughout the different seasons of the year, except that births were somewhat more numerous in the summer, and that a greater percentage of the babies born in the winter season failed to survive. (General Tables 4 and 5.)

The cause of death of an infant in the first week or so reaches back into conditions that were exerting their influence before or at the

¹ U. S. Bureau of the Census, Mortality Statistics, 1910, 1911, 1912, and 1913.

time of birth. A normal infant, endowed with health and strength, will survive for a considerably longer period, even when subjected to the stress of disease or other adverse circumstances. If a baby has only a small endowment of vitality or is prenatally handicapped in some other way, its early death can not be rightfully attributed to conditions encountered in its few days of life.

The stillbirths and deaths under 2 weeks have been grouped to show more clearly the number of losses among the births studied which have been affected by prenatal conditions. This group is designated as "fetal losses" by Dr. J. Whitridge Williams in an address on prenatal care.¹ With the exception of deaths from respiratory diseases,² of which a single one occurred in Saginaw under 2 weeks of age, these losses may generally be ascribed to prenatal and natal influences or conditions.

The relative importance of the losses among the Saginaw babies due to prenatal causes is shown in Table IV.

TABLE IV.—*Number and per cent distribution of stillbirths and infant deaths, by age at death.*

Age at death.	Stillbirths and infant deaths.	
	Number.	Per cent distribution.
Total losses.....	117	100.0
Stillbirths and deaths under 2 weeks.....	68	58.1
Stillbirths.....	34	29.1
Deaths under 2 weeks.....	34	29.1
Infant deaths 2 weeks and over.....	49	41.9
Early infancy and malformations.....	18	15.4
All other causes.....	31	26.5

Sixty-eight, or 58 per cent of the total infant losses, were stillbirths and infant deaths under 2 weeks.

The true importance of these prenatal causes is more fully revealed by adding the stillbirths to the deaths due to prenatal causes and conditions. Of the deaths occurring after the second week of life, 18 were ascribed to causes peculiar to early infancy and malformations and 23 of the 34 under 2 weeks were definitely certified as due to these causes; in addition, 4 deaths that occurred on the first day of life, the causes of which were not reported, should be included—

¹ Williams, J. Whitridge. American Association for Study and Prevention of Infant Mortality, 1914, p. 33.

² In a report made by Dr. L. Emmett Holt and Ellen C. Babbitt on 10,000 consecutive births at the Sloane Hospital in New York, it was stated that the only important disease developing after birth was pneumonia and that the great number of stillbirths and deaths in the first 2 weeks of life can be reduced by care of the mother during pregnancy and by good obstetrics. (Holt, L. Emmett, and Babbitt, Ellen C. American Association for Study and Prevention of Infant Mortality, 1914, pp. 151, 160, 161.)

a total of 79, or 67.5 per cent of the total losses, due probably to prenatal causes.

In order to reduce infant mortality, therefore, measures must obviously be directed toward providing adequate prenatal care.

The proportion that the group of stillbirths and deaths under 2 weeks formed of the total losses is shown in Chart I for certain cities studied by the bureau.

In Saginaw this proportion was greater than in any of the other cities shown, though it had the lowest infant mortality rate and, except New Bedford, the lowest percentage of stillbirths. Many of these stillbirths and deaths in early infancy may be ascribed to such indirect causes as lack of prenatal care, overwork, poverty, alcoholism,¹ and venereal diseases.² For a determination of the underlying causes of stillbirths and of many of the deaths under two weeks proper care and supervision of mothers during pregnancy, either by private physician or by hospitals or similar institution equipped for scientific diagnoses, are necessary, together with a careful study of family and social conditions surrounding the mother. Such close analyses are given apparently only in a few of the large city hospitals. In Saginaw these underlying causes were not known with scientific accuracy and could not therefore be stated. The immediate causes of stillbirths were certified when known, but on account of the practical difficulties of securing accurate diagnoses, no analysis of the causes of these losses can be made.

STILLBIRTHS.

For the purpose of this study, stillbirths are defined as dead-born issues of seven or more months' gestation. To issues of lesser periods the term "miscarriage" is applied. There were 34 stillbirths in the selected group of 1,015 births.

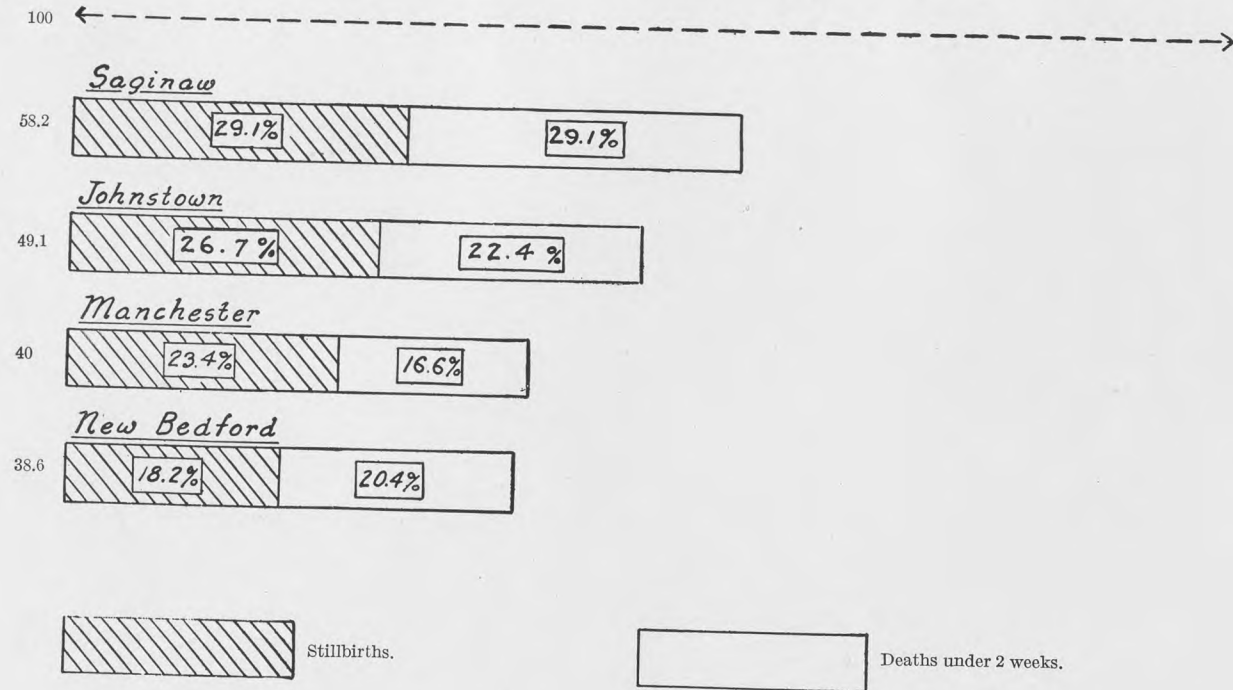
It is possible that a very considerable number of stillbirths were not registered. The methods used to discover unregistered births were most effective in finding living children, but might easily fail to find unregistered stillbirths. Not a single stillbirth was reported in the selected year by a midwife, all those reported having been attended by physicians except one, where there was no attendant at birth. In a difficult case, however, a midwife probably called in a physician. No cause of the stillbirth was stated on the certificates except in two cases, where premature birth was specified.

¹ For seven months of the selected year, Saginaw had 158 saloons, and for the last five months, 134. Several clubs also dispensed liquor to their members. Shortly afterwards the number of saloons was reduced by State law to 101, or one to every 500 population. On May 1, 1918, a State prohibition law closed all saloons.

² Dr. J. Whitridge Williams says " * * * it has long been known that this disease (syphilis) plays an important part in the causation of fetal deaths * * *." American Association for Study and Prevention of Infant Mortality, 1914, p. 35.

CHART I.—PER CENT OF STILLBIRTHS AND DEATHS UNDER TWO WEEKS TO TOTAL STILLBIRTHS AND INFANT DEATHS IN SAGINAW, MICH., JOHNSTOWN, PA., MANCHESTER, N. H., AND NEW BEDFORD, MASS.

Per cent.



Of the 1,015 births in the selected group, 34, or 3.3 per cent, were stillbirths. The percentage of all stillbirths to the mothers included in the study was somewhat greater, 3.8 per cent. The per cent of stillbirths for the selected year was less than in the cities previously studied by the Children's Bureau with the exception of Brockton. These rates ranged from 3 per cent for Brockton to 4.5 per cent for Manchester.¹

The stillbirth rate was 3.7 per cent for births to native mothers and only 2.4 per cent for births to foreign-born mothers. There were more stillbirths of the male than of the female sex.

TABLE V.—Total births and number and per cent of stillbirths, according to sex of infant and nativity of mother.

Sex of infant and nativity of mother.	Total births.	Stillbirths.	
		Number.	Per cent.
All mothers.....	1,015	34	3.3
Males.....	527	20	3.8
Females.....	488	14	2.9
Native mothers.....	766	28	3.7
Males.....	391	17	4.3
Females.....	375	11	2.9
Foreign-born mothers.....	249	6	2.4
Males.....	136	3	2.2
Females.....	113	3	2.7

Of the stillbirths, 38.2 per cent (13 out of 34) were from first pregnancies, whereas only 30.7 per cent of the live births resulted from that pregnancy, indicating that the percentage of stillbirths was high for first births. The percentage of stillbirths was highest for sixth and later in order of birth for births both to native and to foreign-born mothers. (See Table XVII, p. 28.)

If the births are classified on the basis of the age of the mother, the stillbirth rate was highest for births to mothers under 20; it was next highest for mothers over 30. (See Table XVI, p. 27.) If classified on the basis of father's earnings, the stillbirth rate was greater in the higher than in the lower earnings groups. (See Table XVIII, p. 30.)

Although the number of stillbirths is shown in several of the tables of the report, it is difficult to draw sound conclusions from a further analysis of the material because the data are meager and incomplete.

¹ Figures for stillbirths in the report for Johnstown, previously published, include miscarriages.

ATTENDANT AT BIRTH.

In Saginaw the attendant at birth was usually a physician; only occasionally was a midwife employed. The native mother, with few exceptions, secured the services of a physician, and likewise the foreign-born mother who had lived in this country for a number of years—the latter more especially because one of her own nationality was available. Four women physicians practiced in Saginaw, one of whom attended numerous births in the selected year. The mother who desired could have a physician of her own sex in attendance.

The data secured from mothers whose babies' births had not been registered revealed the fact that at least 14 persons were practicing as midwives in Saginaw during the selected year; 2 of the 14 had regularly made returns to the city hall of the births they attended. Little could be learned about midwives, since there was neither State nor local supervision or registration, nor any restrictions upon the practice of midwifery.¹ One midwife who had lived in this country several years and could speak English was well qualified by training and previous licensed practice in Germany. Midwives were in demand among the poorer families, and chiefly among the recently arrived Poles, Russians, and Hungarians.

The attendant at birth according to nativity of the mother is shown in Table VI.

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

Attendant at birth.	Total births.		Births to—			
			Native mothers.		Foreign-born mothers.	
	Number.	Per cent distribution.	Number.	Per cent distribution.	Number.	Per cent distribution.
Total.....	1,015	100.0	766	100.0	249	100.0
Physician.....	930	91.6	735	96.0	195	78.3
Midwife.....	66	6.5	20	2.6	46	18.5
Other or none.....	19	1.9	11	1.4	8	3.2

A physician was employed as attendant for 91.6 per cent of all of the births in the group studied; a midwife was the attendant at only 6.5 per cent of the births; and the mothers of 1.9 per cent of the infants were unattended by either physician or midwife. There were 19 births in this latter group; in one case a practical nurse attended, in another—a stillbirth—the mother had no attendant, and in the re-

¹ One midwife registered only 2 out of 21 births which she was known to have attended in the selected year.

maining cases the father or some other relative or a nonprofessional person took the place of a qualified attendant.

Midwives attended only 2.6 per cent of the births to native mothers, but 18.5 per cent of those to foreign-born mothers. This shows the greater tendency of the foreign-born mothers to employ midwives, though over three-fourths of them preferred to employ physicians.

SEX.

The Saginaw study included 1,015 births, of which 527 were male and 488 were female.

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

Sex of infant and nativity of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
					Number.	Per cent of total births.
Total.....	1,015	981	83	84.6	34	3.3
Males.....	527	507	47	92.7	20	3.8
Females.....	488	474	36	75.9	14	2.9
Native mothers.....	766	738	52	70.5	28	3.7
Males.....	391	374	29	77.5	17	4.3
Females.....	375	364	23	63.2	11	2.9
Foreign-born mothers.....	249	243	31	127.6	6	2.4
Males.....	136	133	18	135.3	3	2.2
Females.....	113	110	13	118.2	3	2.7

The mortality rate for male infants was greater than for female, not only for total births but for each of the nativity groups, though there was a very considerable difference in rates for the infants of native and foreign-born mothers.

FEEDING.

The importance of the kind of feeding as a factor in infant health can scarcely be overestimated. Authorities are agreed that exclusive breast feeding is safest and that mother's milk is the best food for young infants.

Feeding is a changing process, difficult to express in tabular statement for a group through the period of infancy. An infant who was receiving artificial food at the sixth month, for instance, might have received another type of feeding for a considerable part of the time; another infant who was breast fed exclusively at the sixth month probably had the same type of feeding from birth.

Among the Saginaw babies each month of life showed a number of infants who were changed from one type of feeding to another—usually from breast to mixed or to artificial feeding. A small pro-

portion of infants was fed artificially from birth. These proportions and changes are shown in Table VIII, in which the number of infants breast fed and artificially fed is given month by month. The term "exclusively breast fed" means that the infant received no food except breast milk during the greater part or all of the month in question; "artificially fed," that he received no breast milk; and "mixed," that he was given some breast milk in addition to other food.

TABLE VIII.—*Infants surviving at end of specified month and number and per cent fed in specified way during the month.*

Month of life.	Total infants surviving at end of month.	Exclusively breast fed.		Artificially fed.	
		Number.	Per cent.	Number.	Per cent.
First.....	934	821	87.9	85	9.1
Second.....	924	742	80.3	119	12.9
Third.....	922	684	74.2	148	16.1
Fourth.....	916	599	65.4	187	20.4
Fifth.....	915	546	59.7	206	22.5
Sixth.....	912	487	53.4	223	24.5
Seventh.....	910	375	41.2	242	26.6
Eighth.....	907	312	34.4	251	27.7
Ninth.....	906	251	27.7	270	29.8

Of the babies surviving at the end of the first month, 87.9 per cent were exclusively breast fed from birth. This percentage slowly decreased from month to month at about the same rate until the seventh, when a marked decrease, twice as great as in most of the preceding months, took place. The change was to mixed feeding, apparently in preparation for weaning. The reduction thereafter in the proportion of babies exclusively breast fed was at about the same rate as before, but the proportion exclusively artificially fed did not increase in a corresponding ratio, a large number of infants being given mixed feeding. In the ninth month the exclusively breast fed and the artificially fed infants were about equal in number.

Artificial feeding is necessary in some cases because infants are unable to nurse, mothers are ill, or other conditions exist which make breast feeding either unhealthful or impossible. In Saginaw only 85, or 9.1 per cent, of the babies surviving at the end of the first month were artificially fed during that month. Ninety-five infants had been given artificial food exclusively; 10 of these had died. (General Table 6.) The percentage of exclusively artificially fed babies was low from the beginning, however, and increased but little from month to month.

The difference in mortality by type of feeding during the month is shown in Table IX.

TABLE IX.—Deaths in the month per 1,000 survivors at beginning of month and monthly death rate per 1,000 infants fed in specified way, by month of life.^a

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.....	633.1	24.9	105.3
Second.....	10.7	6.7	24.6
Third.....	2.2	.....	6.7
Fourth.....	6.5	3.3	10.6
Fifth.....	1.1	.....	4.8
Sixth.....	3.3	2.0	8.9
Seventh.....	2.2	.....	8.2
Eighth.....	3.3	3.2	7.9
Ninth.....	1.1	.....	3.7

^a Derived from General Table 6.^b The rate is per 1,000 infants who lived to be fed. The rate per 1,000 live births is 47.9; 15 infants died not fed.

In the first column is given the number of infants that died in the month per 1,000 survivors at the beginning of the same month; the mortality, though subject to fluctuations, shows a decided fall after the first and second months. In the second and third columns are presented the monthly death rates per 1,000 infants breast fed and artificially fed. There is a very considerable difference in favor of the breast-fed infants.

Much of the difference which appears in the first month of life is doubtless due to other causes than type of feeding. Fifteen infants died without having been fed; 19 others died in the first two weeks, and their deaths, as stated previously, were probably due to some prenatal cause or condition rather than to feeding.

TABLE X.—Number and per cent distribution of infants born during selected year and surviving at end of specified month, by type of feeding during specified month, 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 classes.....	922	100.0	912	100.0	906	100.0
Breast exclusively.....	684	74.2	487	53.4	251	27.7
Mixed.....	90	9.8	202	22.1	385	42.5
Artificial exclusively.....	148	16.1	223	24.5	270	29.8
Native mothers.....	703	100.0	695	100.0	691	100.0
Breast exclusively.....	517	73.5	364	52.4	192	27.8
Mixed.....	71	10.1	151	21.7	286	41.4
Artificial exclusively.....	115	16.4	180	25.9	213	30.8
Foreign-born mothers.....	219	100.0	217	100.0	215	100.0
Breast exclusively.....	167	76.3	123	56.7	59	27.4
Mixed.....	19	8.7	51	23.5	99	46.0
Artificial exclusively.....	33	15.1	43	19.8	57	26.5

Feeding and mother's nativity.—In the third month a slightly larger percentage of the infants of native than of foreign-born mothers were artificially fed. This difference was somewhat greater in the sixth and ninth months. The value of exclusive breast feeding was evidently well understood by the Saginaw mothers, over half of whom gave this type of feeding for the first six months. This percentage applies not only to the group of foreign-born mothers but also to the native mothers, who are popularly believed less ready than the former to assume this duty.

A comparison of the proportion of breast and artificially fed infants in Saginaw and in cities previously studied by the Children's Bureau shows, with one exception, a striking difference in favor of Saginaw. Exclusive breast feeding was given to nearly three-fourths of the Saginaw babies who survived the third month of life, to over one-half of those who survived the sixth month, and to more than one-fourth of those who survived the ninth month.

In Manchester, artificial feeding was much more prevalent than in Johnstown or Saginaw, owing perhaps to the large proportion of mothers employed away from home. The percentage of infants exclusively breast fed was higher in Johnstown than in Saginaw during the nine months for which information on feeding was secured. In Johnstown, however, about one-half of the mothers, compared with less than one-fourth in Saginaw, were foreign-born.

The kind of feeding was no doubt primarily responsible for the relatively large number of infant deaths from gastric and intestinal diseases in Manchester,¹ where artificial feeding was general, and the relatively small number of deaths from these causes in Saginaw where breast feeding was commonly practiced. The specific mortality rate from gastric and intestinal diseases was 63.3 in Manchester compared with 8.2 in Saginaw. In other words, relatively to the number of infants, but one death occurred from this cause in Saginaw to 8 in Manchester.

NATIONALITY.

Nativity of population.—The native white population of Saginaw in 1910 was 76.2 per cent of the whole population, 42 per cent being of foreign or mixed parentage and 34.2 per cent of native parentage. The foreign-born white comprised 23.2 per cent of the total population; but of the population over 20, 33.8 per cent were of this group. Only 0.6 of 1 per cent of the population were colored.

Nativity of mother.—In the group of mothers of infants studied the nativity groups were represented in approximately the same proportions as in the total population. There was one birth to an Indian mother and seven to Negro mothers.

¹ In Manchester, infants dying from gastric and intestinal disease, 99; artificially fed during month of death, 62; mixed fed, 19; and breast fed, 18. All but 3 of these deaths were from diarrhea and enteritis.

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

Nativity of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
					Number.	Per cent of total births.
Total.....	1,015	981	83	84.6	34	3.3
Native mothers.....	766	738	52	70.5	28	3.7
Foreign-born mothers.....	249	243	31	127.6	6	2.4

The infant mortality rate of 70.5 for the children of native mothers is markedly lower than the rate of 127.6 for infants of foreign-born mothers. Of the live births scarcely one-fourth were to foreign-born mothers, yet three-eighths of all the infant deaths occurred in this nativity group.

A distribution of the births to foreign-born mothers according to the nationality of the mother shows that the German, with 35.7 per cent of the births, was the principal nationality represented. This is in harmony with the fact that the largest nationality group in the foreign-born population of Saginaw was the German.

TABLE XII.—*Births to foreign-born mothers, infant deaths, and stillbirths, according to nationality of mother.*

Nationality of foreign-born mothers.	Total births.	Live births.	Infant deaths.	Stillbirths.
Foreign-born mothers.....	249	243	31	6
German.....	89	86	12	3
Polish.....	50	49	9	1
Italian.....	17	17	2	.....
French Canadian.....	12	12	1	.....
Other Canadian.....	29	28	3	1
English, Scotch, Irish, and Welsh.....	21	20	1	1
All other ^a	30	30	3	.....
Not reported.....	1	1	.....	.....

^a Including 12 Lithuanian, 6 Russian, 3 Jewish, 2 Magyar, and 1 each of Danish, Dutch, Flemish, French, Greek, Slovak, and Slavic not otherwise specified.

The births to Polish mothers were second in number, though the Canadian group is second in population. The numbers of births in the separate nationality groups were so small that mortality rates for them are of little significance. It appears, however, that the mortality of infants of Polish and of German mothers exceeded that for the other groups.

The foreign-born residents were distributed throughout the city. According to the distribution of births by ward and nationality of mothers, as shown in General Table 7, the native mothers far outnumbered the foreign-born mothers in every section. In scarcely

a ward was the number of births to foreign-born mothers over one-third of the whole.

Most of the German mothers of the infants studied lived on the West Side and especially in the nineteenth and twentieth wards, though the German families in Saginaw show no especial tendency to group together. Among the families visited no differences in social customs were noticed between the German and native mothers.

The Polish families were for the most part permanent residents, owning their own homes. While they had not congregated in any strictly defined area, most of them lived on the East Side in the tenth, eleventh, and twelfth wards. Many of the recent immigrants of this nationality lived just outside the city limits and consequently were not included in this study.

Italian families were few in number and were scattered throughout the city.

There were several families of Russian Germans in Saginaw among which births occurred in the selected year. In the winter time most of these families lived in the city, but when the farming season opened, they moved to the sugar-beet fields, where the whole family worked from spring to late autumn. Owing to these changes of residence, most of the infants of this group were excluded.

Years of residence in the United States.—A study of births to foreign-born mothers, by length of the mother's residence in the United States, may be of some significance in connection with the rapidity of assimilation and its effect upon infant welfare. The principal foreign nationality represented in Saginaw is the German, and English-speaking Canadian and British come next. Nearly three-fifths of the births to foreign-born mothers were to mothers of these nationalities. These groups for the most part either have customs similar to those of native mothers or have been here so long that they have acquired them. The other nationalities where assimilation is slower and more difficult are of less numerical importance.

Practically half of the births (121) were to mothers who had lived in the United States 10 years or over. For this group the mortality rate was 102.6, as contrasted with 155.7 for those whose mothers had lived here for less than 10 years. It is possible that differences in customs or characteristics or differences in economic status may play a larger part than the length of residence in the United States.

TABLE XIII.—*Births to foreign-born mothers, infant deaths, and stillbirths, according to length of residence of mother in the United States.*

Length of residence of mother in the United States.	Births.	Live births.	Infant deaths.	Stillbirths.
All foreign-born mothers.....	249	243	31	6
Under 1 year.....	2	2	1	
1 to 2 years.....	13	13	2	
2 to 3 years.....	15	14	3	1
3 to 4 years.....	16	16	3	
4 to 5 years.....	14	14	4	
5 to 10 years.....	64	63	9	1
10 years and over.....	121	117	12	4
Not reported.....	4	4		

Mother's ability to speak English.—A distribution of births according to the ability of the mother to speak English is shown in Table XIV.

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

Ability of mother to speak English.	Total births.	Live births.	Infant deaths.	Infant mortality rate. ^a	Stillbirths.	
					Number.	Per cent of total births.
All mothers.....	1,015	981	83	84.6	34	3.3
Able to speak English.....	940	907	71	78.3	33	3.5
Unable to speak English.....	75	74	12	162.2	1	1.3
Foreign-born mothers.....	249	243	31	127.6	6	2.4
English-speaking nationalities.....	50	48	4	.....	2	4.0
Non-English-speaking nationalities.....	199	195	27	138.5	4	2.0
Able to speak English.....	124	121	15	124.0	3	2.4
Unable to speak English.....	75	74	12	162.2	1	1.3

^a Not shown where base is less than 50.

Of the total births, 92.6 per cent were to mothers who were able to speak English. In no other city in which an infant mortality study has been previously undertaken by the bureau has the proportion of English-speaking mothers been nearly so large. While the percentage speaking the language was very high and the mortality rate for their infants was low, 78.3, it was not so low as that for infants of native mothers only, 70.5. Of the births to foreign-born mothers, one-fifth were to those of English-speaking nationalities and need, therefore, no further consideration. Of the remainder, over three-fifths were to mothers who had acquired a speaking knowledge of English. Less than two-fifths were to mothers unable to speak English. The rate for this group was highest; but since it was composed largely of recent immigrants poverty and its attendant evils are factors probably more important than the inability of the mother to speak English.

LITERACY.

Illiteracy is a handicap to a mother because it closes to her so many avenues of knowledge. The percentage of literacy among the mothers of infants included in this study was very high; mothers of 949 babies, or 93.5 per cent of the whole number, were able to read and write. In Johnstown and Manchester the mothers of only 84 and 83 per cent of the babies, respectively, were literate.

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

Literacy of mother. ^a	Total births.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
					Number.	Per cent of total births.
All mothers.....	1,015	981	83	84.6	34	3.3
Literate.....	949	919	71	77.3	30	3.2
Illiterate ^b	63	59	12	203.4	4	6.3
Not reported.....	3	3				

^a Persons who can read and write in any language are reported literate.

^b Including 4 births to illiterate native mothers.

In Saginaw only four, or one-half of 1 per cent, of the native mothers were illiterate, illiteracy being confined practically to the foreign-born group. Fifty-nine, or less than a fourth of the births to foreign-born mothers, were to mothers who were illiterate. But of the 63 births to illiterate mothers 4 were stillbirths and 12 of the live-born infants did not survive the first year. The mortality rate for these infants was excessively high—203.4. Illiteracy of the mother, however, is often accompanied by poverty and ignorance, and it is therefore difficult to determine how much importance should be ascribed to illiteracy alone.

AGE OF MOTHER.

The age of the mother at the time her child is born appears to have some influence on his chance of survival. Whether this influence is traceable to physical causes, coincident with the degree of the mother's maturity, can not be definitely stated. Inexperience, failure to observe or ignorance of simple hygienic measures may affect the mortality and stillbirth rates of first births or births to young mothers.

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

Age and nativity of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate. ^a	Stillbirths.	
					Number.	Per cent of total births. ^a
All mothers.....	1,015	981	83	84.6	34	3.3
Under 20.....	55	52	6	115.4	3	5.5
20 to 24.....	302	294	31	105.4	8	2.6
25 to 29.....	307	298	22	73.8	9	2.9
30 to 39.....	310	298	21	70.5	12	3.9
40 and over.....	41	39	3		2	
Native mothers.....	766	738	52	70.5	28	3.7
Under 20.....	49	46	5		3	
20 to 24.....	244	236	20	84.7	8	3.3
25 to 29.....	245	236	14	59.3	9	3.7
30 to 39.....	202	195	10	51.3	7	3.5
40 and over.....	26	25	3		1	
Foreign-born mothers.....	249	243	31	127.6	6	2.4
Under 20.....	6	6	1			
20 to 24.....	58	58	11	189.7		
25 to 29.....	62	62	8	129.0		
30 to 39.....	108	103	11	106.8	5	4.6
40 and over.....	15	14			1	

^a Not shown where base is less than 50.

The highest mortality was found among infants of mothers under 20 years of age, the rate being 115.4; the next highest rate, 105.4, was among infants whose mothers were from 20 to 24 years old. The mortality among infants of mothers who were 25 to 29 was materially less, 73.8, and the rate was about the same for the group aged from 30 to 39.

The mortality rate for the infants of the foreign-born mothers, 127.6, very much exceeded that for infants of the native mothers, 70.5, with corresponding differences in the mortality of the several age groups for each nativity. For each nativity group, however, the mortality among the children of the youngest mothers was the highest.

In the group of infants born to native mothers, the rate (51.3)—the lowest rate for any age group—is lowest for mothers aged 30 to 39. This result may be attributed partly to the fact that the native mother is in her physical prime during these years; partly to her experience in motherhood; and also to the relatively easy financial circumstances that characterize this period for the native group.

ORDER OF BIRTH.

Some relation apparently exists between infant mortality and the number of children to whom the mother has previously given birth. The mother of a first child is often unacquainted with the essentials of prenatal care. A later-born child profits from the mother's

physical maturity and the knowledge and experience she has gained with her previous children. In large families these advantages may be counteracted by overwork of the mother, home overcrowding, or poverty.

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

Number in order of birth and nativity of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate. ^a	Stillbirths.	
					Number.	Per cent of total births. ^a
All mothers.....	1,015	981	83	84.6	34	3.3
First.....	314	301	36	119.6	13	4.1
Second.....	219	213	12	56.3	6	2.7
Third.....	164	159	12	75.5	5	3.0
Fourth and fifth.....	172	169	12	71.0	3	1.7
Sixth and later.....	146	139	11	79.1	7	4.8
Native mothers.....	766	738	52	70.5	28	3.7
First.....	273	262	26	99.2	11	4.0
Second.....	172	166	8	48.2	6	3.5
Third.....	120	115	8	69.6	5	4.2
Fourth and fifth.....	115	113	5	44.2	2	1.7
Sixth and later.....	86	82	5	61.0	4	4.7
Foreign-born mothers.....	249	243	31	127.6	6	2.4
First.....	41	39	10	.....	2	.....
Second.....	47	47	4	.....	.....	.....
Third.....	44	44	4	.....	.....	.....
Fourth and fifth.....	57	56	7	125.0	1	1.8
Sixth and later.....	60	57	6	105.3	3	5.0

^a Not shown where base is less than 50.

The first born, 301 in number, comprised three-tenths of the whole number of live births, but included over four-tenths of the deaths. The infant mortality rate for first-born babies was 119.6—the highest for any order of birth, and high in comparison with the rate of 84.6 for all infants included in the study. The second born had the most favorable infant mortality rate, 56.3, a low one. The rate of 75.5 for third-born children was considerably above that for the second in order of birth. There was little difference between the rate for third and the rates for later-born children. Very few mothers had had a large number of children. Only 68 infants born during the selected year were from eighth to fourteenth in order of birth.

These findings, confirmed in general by those for previous births to the Saginaw mothers visited, have certain interesting points of difference from the findings of other studies. For all births to the mothers included in these studies, the rate for Saginaw is highest for first births, contrary to the showing for Manchester and Johnstown. The rates for the first and the second born, however—those rates which are based on the largest number of cases—show the same relative positions in Manchester as in Saginaw; the rate for the

second is much more favorable. But in both Manchester and Johnstown the tendency for the rate to increase with the later orders of birth was much more marked than in Saginaw; indeed the highest rates appeared for fourth and for ninth and later in Manchester, and for tenth and later in Johnstown. Figures presented by Hibbs¹ in a chapter on Infant Mortality and Size of Family also show a much higher rate for the later-born children.

For infants born in the selected year, rates by order of birth to native and foreign-born mothers show in general the same differences. The first births in both groups have the highest mortality. The proportion of first born is much higher in the group of births to native mothers than among births to foreign-born—one-third instead of only one-sixth. The large proportion of births where the rate is high among the native group tends, therefore, to minimize the true difference between the infant mortality rates for infants of native and of foreign-born mothers.

ECONOMIC FACTORS.

Father's earnings.—The term "father's earnings" means the recompense received for services during the year after the baby's birth. Income from rents or from capital invested or other sources, as well as earnings or income of other members of the family are excluded, but the earnings and other income of each member of the family for the same year were ascertained. No inquiries were made concerning the family expenses or budget except in regard to rent.

Fathers of babies included in this study were employed in a variety of industries. One-half were engaged in manufacturing and mechanical pursuits, over one-fourth in trade and transportation, and the remainder as miners, clerks, farmers, laborers, etc. Their occupations (General Table 8) reveal a great diversity of employment, and show a large number of business executives, professional men, skilled workmen, and others whose earnings were ample for the support of a family.

The father's earnings are assumed to be the best obtainable index of the economic status and the standard of living of the family. In some cases the father's earnings are supplemented by earnings of the mother or an older child or by income from rents or from other investments. In other cases items like pensions, insurance, workmen's compensation, savings, or charity figure in the family income. But income from these sources is often temporary or uncertain, and in some cases it is impossible to separate net from gross income. For these reasons father's earnings for the year following the baby's birth have been used as a basis for classifying births and computing mortality rates. In case of stillbirths the earnings for the year preceding

¹ Hibbs, Henry H., jr. *Infant Mortality: Its Relation to Social and Industrial Conditions*, p. 39. Russell Sage Foundation, New York, 1916.

the birth were used. The total family income¹ is presented in connection with the size of the family.

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

Earnings of father and nativity of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate. ^a	Stillbirths.	
					Number.	Per cent. of total births. ^a
All mothers.....	1,015	981	83	84.6	34	3.3
Under \$450.....	79	78	14	179.5	1	1.3
\$450 to \$549.....	103	98	11	112.2	5	4.9
\$550 to \$649.....	151	145	15	103.4	6	4.0
\$650 to \$849.....	255	246	26	105.7	9	3.5
\$850 to \$1,049.....	159	157	7	44.6	2	1.3
\$1,050 to \$1,249.....	94	91	3	33.0	3	3.2
\$1,250 and over.....	143	135	3	22.2	8	5.6
No earnings.....	7	7	1			
Not reported.....	24	24	3			
Native mothers.....	766	738	52	70.5	28	3.7
Under \$450.....	38	38	9			
\$450 to \$549.....	67	63	8	127.0	4	6.0
\$550 to \$649.....	106	102	8	78.4	4	3.8
\$650 to \$849.....	206	197	14	71.1	9	4.4
\$850 to \$1,049.....	123	121	5	41.3	2	1.6
\$1,050 to \$1,249.....	79	76	3	39.5	3	3.8
\$1,250 and over.....	125	119	2	16.8	6	4.8
No earnings.....	6	6				
Not reported.....	16	16	3			
Foreign-born mothers.....	249	243	31	127.6	6	2.4
Under \$450.....	41	40	5		1	
\$450 to \$549.....	36	35	3		1	
\$550 to \$649.....	45	43	7		2	
\$650 to \$849.....	49	49	12			
\$850 to \$1,049.....	36	36	2			
\$1,050 to \$1,249.....	15	15				
\$1,250 and over.....	18	16	1		2	
No earnings.....	1	1	1			
Not reported.....	8	8				

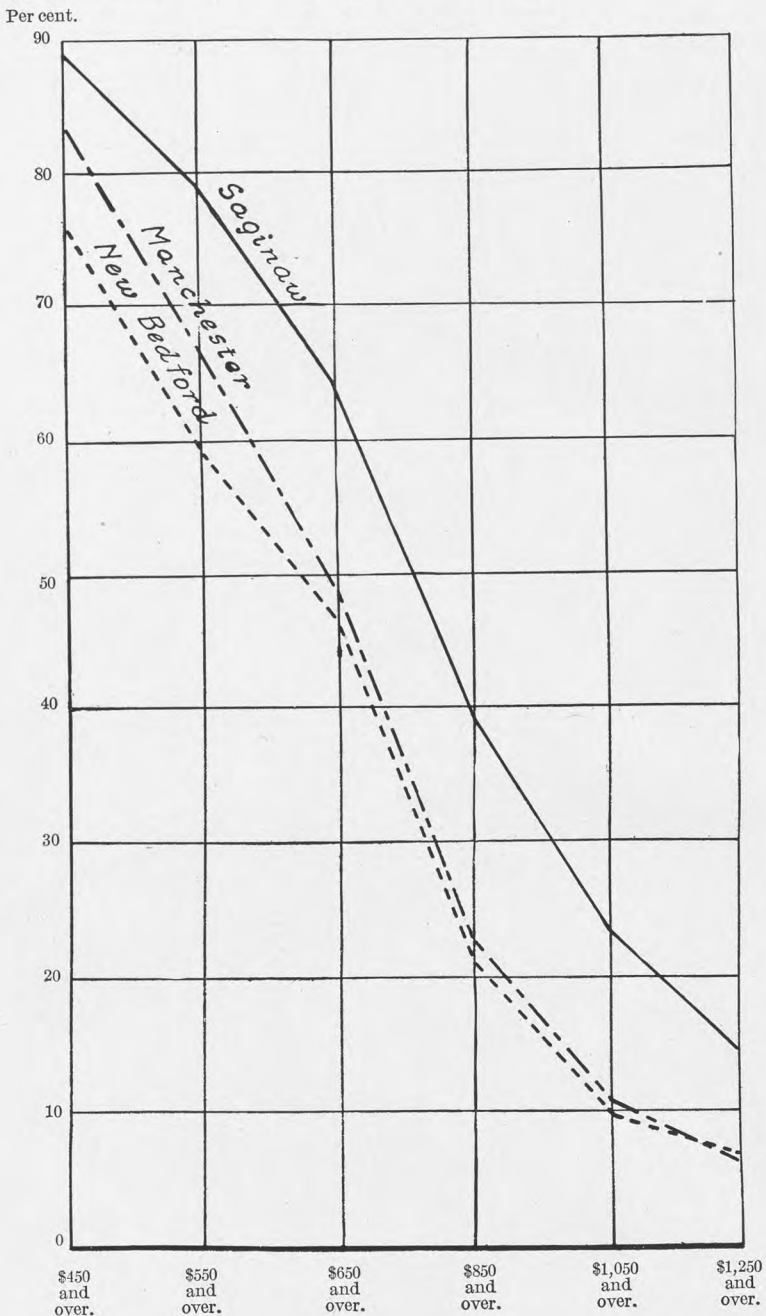
^a Not shown where base is less than 50.

A striking relationship between the infant mortality rate and the father's earnings is shown in Table XVIII. The highest rate, 179.5, is for infants whose fathers are in the lowest earnings group, and the lowest rate, 22.2, is for those whose fathers are in the highest group. The mortality rate, with but a single exception, falls consistently as the father's earnings increase, but the rate does not fall below 100 until the group \$850 to \$1,049 is reached; from this point the fall in the rate is very marked. In other words, the babies in families where the earnings of the father are low die at a much higher rate than do those whose fathers are able to provide sufficient care for them. Poverty with its concomitants is an important factor in infant mortality.

In New Bedford and Manchester the mortality rates for infants in the lowest father's earnings group were respectively 201.9 and 242.9, or three and four times as great as for those in the highest group, 59.9

¹ General Table 9.

CHART II.—GRAPHS SHOWING FOR SAGINAW, MICH., MANCHESTER, N. H., AND NEW BEDFORD, MASS., THE CUMULATIVE PER CENT OF BIRTHS OCCURRING IN FAMILIES WHERE THE FATHER EARNED MORE THAN AMOUNT SPECIFIED.



and 58.3. In Saginaw, in spite of the much lower rate for infants in the low earnings group, the relative percentage difference in range is even greater than in these other cities, owing to the extraordinarily low rate of 22.2 for infants in the highest earnings group.

Saginaw is in the center of a rich farming country and prices of food products are relatively low, with no commission, storage, or transportation charges to be paid. Beet sugar is made in a factory just outside the city limits. Rents are low, nearly one-half of the families visited owned their own homes. In many cases the home is set in a small plot of ground, with a few fruit trees, a wired inclosure for chickens, and a thriftily cultivated vegetable garden. The cost of fuel is low, partly on account of the presence of coal mines in the city, some of which are cooperatively owned. With these advantages, the small family of Saginaw can live in simple comfort on earnings that would spell poverty for the tenement-housed families in other or larger cities.

The economic status of the Saginaw families visited is uniformly superior to that of the Manchester or New Bedford families, as shown in Chart II, which presents in the form of graphs the per cent of births that occurred in families where the father earned over each amount. In connection with the relatively high economic status, the small size of families, and the low cost of living in Saginaw as compared with other cities studied by the bureau, the significant fact may be noted that the infant mortality rate is comparatively low.

Analysis of the rates by earnings of father and nativity of mother (Table XVIII) shows that for native mothers the rates consistently decline as the earnings increase, a condition to be expected since births to native mothers constituted over three-fourths of the whole number. For infants of foreign-born mothers no rates are presented, because the numbers are too small. For the father's earnings group under \$550 the rate for infants of native mothers was 168.3 in contrast to only 106.7 for those of foreign-born mothers. This difference is especially noteworthy in view of the excess in the average rate for the infants of foreign-born mothers, 127.6 as contrasted with 70.5 for infants of native mothers.

A special study of the families in which the father's earnings were less than \$550, shows that three-fourths either had no other income, or if they had income from supplementary sources, it was not enough to raise the total above \$550. Among the remaining one-fourth the father's earnings were supplemented in various ways. In 12 cases the family had an income between \$550 and \$649; in 14, between \$650 and \$849; in 9, between \$850 and \$1,049; in 3, between \$1,050 and \$1,249; and in 2, over \$1,250. The infant mortality rate in families in which the total income was under \$550 was 125.

The classifications "No earnings" and "Not reported" apply only to the earnings of the father. They do not mean that no information

was obtained concerning the standard of living of these families, for in most cases the amount available for the support of the family during the year was known. In the seven cases of "No earnings," three fathers died prior to and one six weeks after the baby's birth, one was sick, and two deserted their wives. Four of these families had less than \$450 to live on, and the others had incomes of \$630, \$950, and \$3,500, respectively.

The "Not reported" earnings class contained 24 families. No definite income was ascertained for three of the families—one apparently in straitened circumstances; five had incomes of less than \$450 during the year; seven, from \$500 to \$800; and nine had \$1,000 or more or were obviously prosperous.

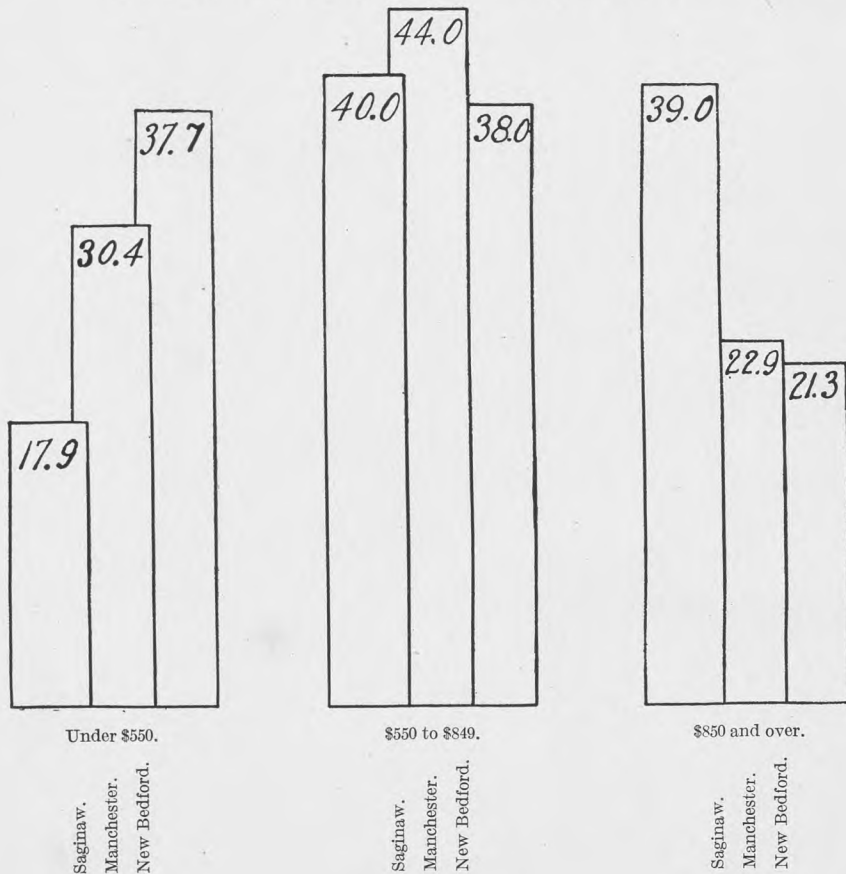
TABLE XIX.—*Number and per cent distribution of births during selected year to mothers of specified nativity, according to earnings of father.*

Earnings of father.	Births to—					
	All mothers.		Native mothers.		Foreign-born mothers.	
	Number.	Per cent distribution.	Number.	Per cent distribution.	Number.	Per cent distribution.
All classes.....	1,015	100.0	766	100.0	249	100.0
Less than \$450.....	79	7.8	38	5.0	41	16.5
\$450 to \$549.....	103	10.1	67	8.7	36	14.5
\$550 to \$649.....	151	14.9	106	13.8	45	18.1
\$650 to \$849.....	255	25.1	206	26.9	49	19.7
\$850 to \$1,049.....	159	15.7	123	16.1	36	14.5
\$1,050 to \$1,249.....	94	9.3	79	10.3	15	6.0
\$1,250 and over.....	143	14.1	125	16.3	18	7.2
No earnings.....	7	.7	6	.8	1	.4
Not reported.....	24	2.4	16	2.1	8	3.2

The per cent distribution of births according to father's earnings (Table XIX) shows that the fathers of nearly one-third of the babies (32.8 per cent) earned less than \$650; of one-fourth (25.1 per cent) from \$650 to \$849; and of two-fifths (39.1 per cent) \$850 and over. Almost twice as many were in the highest class, \$1,250 and over, as in the lowest earnings class, under \$450.

A like distribution of the births to native mothers shows a tendency to larger proportions in the higher earnings groups. Instead of one-third, slightly over one-fourth of the births were in families where the father earned less than \$650. The highest earnings class contained over three times the number in the lowest earnings class. On the other hand, the distribution of births to foreign-born mothers shows father's earnings to be generally lower, with twice as many in the lowest as in the highest earnings group. Practically one-half of the births were in the group where the father's earnings were less than \$650, not quite one-fifth in the group \$650 to \$849, and slightly over one-fourth in the group \$850 and over.

CHART III.—PER CENT DISTRIBUTION OF BIRTHS IN SAGINAW, MICH., MANCHESTER, N. H., AND NEW BEDFORD, MASS., BY FATHER'S EARNINGS GROUPS.



In Chart III the per cent distribution of births by father's earnings in the three broad classes of less than \$550 (low), \$550 to \$849 (medium), and \$850 and over (high) is presented for Saginaw, Manchester, and New Bedford. It shows not only the relatively high economic status of the Saginaw group, but reveals interesting differences in the distributions for the different cities. Of the Saginaw births, slightly over one-sixth were in the father's earnings class of less than \$550, while three-tenths of the births in Manchester and over three-eighths of those in New Bedford were in the same low earnings group. The percentage of births in the medium earnings class, from \$550 to \$849, was about the same in all three cities. In the highest earnings class, \$850 and over, the great difference between these cities stands out sharply. Only a little over one-fifth of the births in both Manchester and New Bedford, but practically two-fifths of the Saginaw births, were in this class.

Gainful employment of mother.—The economic status of most of the families visited in Saginaw was such that the mothers did not have to engage in gainful employment. The industries of the city were not of a character to draw women and girls in any considerable number out of the home into the business world, and therefore enjoyment of economic independence previous to marriage played no part in influencing mothers to take up extra-domestic employment afterward. Few women were engaged in industrial pursuits in Saginaw.

Employment of mother during year preceding birth of infant.—Employment of the mothers during the year before the baby's birth is shown in Table XX.

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

Employment of mother during year preceding birth of infant and nativity of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate, ^a	Stillbirths.	
					Number.	Percent of total births, ^a
All mothers.....	1,015	981	83	84.6	34	3.3
Not gainfully employed.....	901	868	68	78.3	33	3.7
Gainfully employed.....	114	113	15	132.7	1	.9
At home.....	74	74	7	94.6	.....	.....
Away from home.....	40	39	8	.....	1	.....
Native mothers.....	766	738	52	70.5	28	3.7
Not gainfully employed.....	704	676	48	71.0	28	4.0
Gainfully employed.....	62	62	4	64.5	.....	.....
At home.....	40	40	1	.....	.....	.....
Away from home.....	22	22	3	.....	.....	.....
Foreign-born mothers.....	249	243	31	127.6	6	2.4
Not gainfully employed.....	197	192	20	104.2	5	2.5
Gainfully employed.....	52	51	11	215.7	1	1.9
At home.....	34	34	6	.....	.....	.....
Away from home.....	18	17	5	.....	1	.....

^a Not shown where base is less than 50.

Of the 1,015 babies included in this report, only 114, or slightly over 11 per cent, had mothers who were gainfully employed at any time in the year prior to the baby's birth. By "gainful employment" is meant labor for which a money recompense is usually given. Mothers of 40 infants were employed away from home, and mothers of 74 had occupations which they carried on in their homes. The mothers of 45 of this latter group kept lodgers. Usually the mother had but one or two lodgers and frequently these were relatives, so that this occupation in Saginaw was not so laborious as in some towns, where, housed in congested quarters, the women cook, wash, and care for rooms for a large number of lodgers. Keeping lodgers, therefore, was not a material tax on the health and strength of the Saginaw mothers, and was not a factor in infant mortality. The gainful employment at the home of mothers of the remaining 29 infants consisted of sewing, washing, baking, and like occupations.

Mothers of 40 infants worked away from home in the year before childbirth and 11 reported their occupations as domestic service, cooking, or day's work. The latter in Saginaw usually meant doing the washing and weekly cleaning in an employer's home. The one stillbirth in the group of gainfully employed mothers occurred to a mother who performed day's work of any kind, and who, prior to the baby's birth in June, had been employed hoeing sugar beets. Her physician stated that the stillbirth was caused by overexertion. The mothers of the remaining 29 infants were engaged in a dozen different occupations.

All but seven of the mothers working away from home had ceased their work at least two months, most of them five months, and some as much as 10 months prior to the birth of the infant. Eight of the babies born to this group died in infancy. Judging from the certified cause and the age at death, prenatal causes not related to the mother's work were probably responsible for four of the eight deaths. In no case did the mother resume her extra-domestic employment before the death of her child.

The effect upon infant mortality of employment of the mother during the year before the baby's birth is shown in Table XX. The mortality rate for the infants of working mothers was 132.7 as contrasted with 78.3 for infants of mothers not gainfully employed. The excess mortality was among infants of the foreign-born mothers, the group showing a rate of 215.7. Although only one-fifth of the foreign-born mothers were employed, one-third of the infant deaths in this nativity group occurred among their babies.

¹ Two foreign-born mothers, who worked with their families in the sugar-beet field during the summer and who were not separated from their babies on account of work, were classed as mothers at work at home. Neither of the infants died.

TABLE XXI.—*Live births, 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.	Total live births.	Survived one year.	Infant deaths.	Infant mortality rate.
All mothers.....	981	898	83	84.6
No gainful work.....	858	794	64	74.6
Gainful work.....	123	104	19	154.5
Resumed after infant's death.....	14	.....	14	.....
Resumed during infant's life.....	109	104	5	(a)
At home.....	97	91	6	(a)
Away from home.....	25	12	13	(a)
Not reported.....	1	1	.....	.....

a Rate not shown because not comparable with preceding rates.

Employment of mother during year following birth of infant.—Mothers of 123 live-born infants (12.5 per cent) were gainfully employed during the year after the baby was born. The mortality rates, 154.5 for infants whose mothers worked and 74.6 for those of mothers not gainfully employed, may be significant as an index of the difference in conditions in families where the mother was at work and in those where she was not employed. But these rates do not show the direct effect of the employment of the mother, since in 14 cases the mother did not resume work till after the baby died. Obviously the death could not then be ascribed to the employment of the mother. For the rest, only 5 deaths occurred among the 109 infants whose mothers resumed work during the infant's lifetime.

The postnatal gainful employments of mothers were of the same general character as the prenatal—keeping lodgers for the most part, and washing, sewing, or performing other domestic labor more or less intermittently during the year. Extra-domestic employment of any character was exceptional.

In conclusion, only a relatively small proportion of the mothers in the Saginaw study were gainfully employed in the years preceding or following the birth of the infant. Practically all who worked in the year preceding confinement discontinued work several months before the birth of the infant. Very few of those who worked during the baby's lifetime did work that entailed absence from the baby which deprived him of breast feeding and other maternal care. Although in one or two cases the employment of the mother may be shown to have been a primary cause of a stillbirth or an infant death, in most cases the high mortality for infants of the mothers gainfully employed may be ascribed to the general conditions associated with low economic status found in these families.

Mother's earnings.—The distribution of births to mothers gainfully employed during the year following the birth of the infant, according to the earnings of the mother, is shown in Table XXII.

TABLE XXII.—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 during year following birth of infant.	All mothers.		Native mothers.		Foreign-born mothers.	
	Total births.	Per cent distribution.	Births.	Per cent distribution.	Births.	Per cent distribution.
All classes.....	125	100.0	69	100.0	56	100.0
Under \$150.....	64	51.2	34	49.3	30	53.6
\$150 to \$249.....	31	24.8	18	26.1	13	23.2
\$250 to \$349.....	14	11.2	10	14.5	4	7.1
\$350 to \$549.....	1	.8	1	1.4	—	—
\$550 and over.....	6	4.8	1	1.4	5	8.9
Not reported.....	9	7.2	5	7.2	4	7.1

The earnings of the mother were occasionally a material contribution to the family income, but for the most part the sums were not large. The gross earnings of one-half of the mothers who were engaged in gainful employment during the year following the infant's birth were less than \$150, practically one-fourth earned from \$150 to \$249, and one-sixth earned sums ranging from \$250 to \$550 and over. Over one-half of the mothers earned their money by keeping lodgers. Five of the six mothers who are credited with having earned \$550 or over kept lodgers; the sum represents gross receipts and not a clear gain. In addition one kept a small store. All but one were foreign born.

The percentage of infants in each father's earnings class whose mothers were gainfully employed during the year following the birth of the baby is shown in General Table 10. Mothers of only 12.3 per cent of the infants were so employed; the figures indicate that as the earnings of the fathers increase the proportion of mothers working decreases. In over half the instances (54.4 per cent) where a mother was gainfully employed the father's earnings were less than \$650. In each earnings class proportionately more of the foreign-born than of the native mothers were employed, the difference being marked when the father's earnings were less than \$850.

MATERNAL HISTORIES.

In addition to the facts about the Saginaw infants born during the year ended November 30, 1913, a history of the earlier pregnancies of each mother was secured. Among other details this history included the duration and result of each pregnancy, the order and number of births, the sex, whether or not the infant survived,¹ and if not, the age at death. Many statements based on data for the selected group are strengthened or confirmed by analysis of the data furnished by the maternity record of the mothers.

¹ See schedule form, p. 9.

The maternal histories number 997, or 18 less than the births (1,015), in the detailed study, because the births included 10 sets of twins and because a few of the mothers' histories were excluded.¹

The histories of these 997 mothers show a total of 3,081² births, of which 2,965 were live-born infants and 116 were stillbirths; in addition there were 140 miscarriages. Of the 2,965 live-born babies, 271 died within the year after birth, constituting a mortality rate of 91.4 for all the babies born to these mothers. This rate is somewhat higher than that for the babies born in the selected year (84.6), probably because the complete reproductive histories include all the first births, among which the mortality is especially high.

The 116 stillbirths comprised 3.8 per cent of the total births, compared with 3.3 per cent found in the selected group. It is reasonably certain, however, that the selected group contained less than the actual number of stillbirths occurring in Saginaw in the year studied. The highest stillbirth rate, 7.7 per cent, was found for births to mothers 40 years old and over, and the lowest, 3 per cent, for the age group 20 to 24. The stillbirth rate among first-born children was 4.7 per cent, a rate that decreased for each later order of birth until the sixth and later born, for whom the per cent was 5.9 (General Table 11).

Stillbirths and deaths at two weeks of age or less numbered 216, or 55.8 per cent of the whole number (387) of stillbirths and infant deaths. This figure may be compared with the 58.1 per cent for stillbirths and deaths under two weeks among the babies born in the selected year. Of the total number of infant deaths, 36.9 per cent occurred within the first two weeks after birth, compared with 41 per cent in the selected group. One set of figures confirms the findings of the other.

The mortality rate for all babies of the native mothers visited was 86.4, compared with 70.5 for babies born in the selected year; the rate for those of the foreign-born mothers was 102.3, compared with 127.6, the rate for the selected year. The very divergent rates of the infants in the selected year (70.5 and 127.6) tend to approach each other (86.4 and 102.3) when all children of the selected mothers are considered. This relation may be more nearly the true one, since the larger number of infants and the longer period covered would subordinate those factors only temporarily important.

Families were usually small, three births being the average among the mothers visited. Only 27 mothers reported ten or more births and the largest number of children born to any mother was 14, of whom 13 survived the first year.

¹ If a mother's reproductive record was not complete or if an illegitimate birth was reported the history was omitted from consideration.

² General Table 11.

For the groups large enough to be significant the mortality in the first year of life was highest for first births while the rate for second-born babies was low; the rates for seventh and eighth pregnancies were even lower though based on fewer cases. The mortality was least among infants of mothers between the ages of 35 to 39 and greatest among babies whose mothers were under 20. The mortality of first-born children was practically the same for all infants of the mothers visited as for the selected group.

HOUSING.

Saginaw is not wholly without a housing problem, though the city creates a most favorable first impression with its detached residences surrounded by lawns or grassplots and gardens, while trim walks lead out to the excellent sidewalks flanking the wide, tree-bordered streets. It appears to be a city in which the residents own their own homes and where housing congestion and room overcrowding do not exist. This lack of congestion is undoubtedly due to three circumstances: The factories of Saginaw are not confined to one district but are scattered over the city; Saginaw has four business centers; and the city has no natural barriers, such as lakes and hills, to prevent expansion in any direction.

The one-family detached house prevails; the infrequent two-family house is also detached, and the rows of houses so common in large cities and factory towns are unknown. A workingman's home is almost invariably a well-kept cottage or bungalow, one or two stories high, which, being centered in its own plot of ground, has excellent light and ventilation. Tenements and apartment houses being few in number, there is practically no lot congestion; but as a result of the lack of both State¹ and city building codes, and of municipal health regulations, a few tenements in the business sections and a few detached houses in the residential sections are in a very insanitary condition.

An example of the results of the lack of building and sanitary laws is found in one 3-story apartment and store block erected in one of the business sections shortly before this study was made. This has windows in front and rear only, the building having absolutely blank walls on both sides. There are two stories of apartments above the four long and narrow stores occupying the first floor, each story containing 12 apartments arranged three deep over each store. The middle apartments (8 in all) depend in each case for light and ventilation upon an inadequate air shaft. Such conditions are very unusual, however. In 854 of the houses visited the means of ventilation were reported good; in 128, fair; and in only 22, poor.

¹ The Housing Law of Michigan applying to cities of 10,000 population and over was passed May 2, 1917. Michigan Public Acts 1917, No. 167.

TABLE XXIII.—*Dwellings of infants included in the study having mothers of specified nativity, according to specified sanitary conditions.*

Sanitary condition of dwelling.	Dwellings occupied by—		
	All mothers.	Native mothers.	Foreign-born mothers.
Total dwellings ^a	1,005	757	248
Drinking water:			
One source.....	977	732	245
City ^b	2	2	.....
Dug well.....	616	443	173
Driven well.....	339	270	69
Purchased.....	20	17	3
More than one source.....	27	25	2
Not reported.....	1	.....	1
Type of toilet:			
Water-closet.....	490	402	88
Privy.....	515	355	160
Sink:			
Sewer connected.....	394	326	68
Sewer not connected.....	611	431	180
Means of ventilation:			
Good.....	854	684	170
Fair.....	128	66	62
Poor.....	22	6	16
Not reported.....	1	1	.....
Rooms:			
Clean.....	585	474	111
Medium.....	302	216	86
Dirty.....	113	63	50
Not reported.....	5	4	1

^a The difference between total births shown in other tables and total dwellings, shown in this table, is due to the fact that there were 10 sets of twins, 9 to native mothers and 1 to a foreign-born mother.

^b In one case, water purified by private filtration plant.

If the housing standard adopted by Robert Chapin¹ of not more than 1½ persons per room is applied to the Saginaw families visited, only 30 out of the 1,015 births included in the study occurred in overcrowded homes. Lack of overcrowding is further indicated by the fact that 897 of the 1,015 births occurred in families who lived in homes having five or more rooms; 54 in homes of four rooms; and only 56 in homes of less than four rooms. In 8 instances the number of rooms was not reported. (General Table 16.)

TABLE XXIV.—*Births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, according to average number of persons per room.*

Persons ^a per room.	Total births.	Live births.	Infant deaths.	Infant mortality rate. ^b	Stillbirths.	
					Number.	Per cent of total births. ^b
Total.....	1,015	981	83	84.6	34	3.3
Less than 1.....	771	748	58	77.5	23	3.0
1 but less than 2.....	222	213	22	103.3	9	4.1
2 or more.....	13	12	3	.....	1	.....
Not reported.....	9	8	.....	.....	1	.....

^a Excluding infant born during selected year.

^b Not shown where base is less than 50.

¹ Chapin, Robert Coit. *The Standard of Living Among Workingmen's Families in New York City*, p. 80. Russell Sage Foundation.

Three-fourths of the births occurred in homes where the number of persons per room was less than one, and slightly over one-fifth where the number of persons per room was one but less than two. The infant mortality rate and the percentage of stillbirths are both higher in the latter group. Only 13 births were reported in families in which there were two or more persons per room. The worst instance of overcrowding reported, as measured by this index, was eight persons in one room; this room was about 24 feet wide by 36 feet long. It was the single room of a one-room detached house, situated on the outskirts of the city, and had plenty of air and sunlight, with about an acre of lawn and garden surrounding it. This seemed to be rather a case of freak construction than of overcrowding.

Bad housing conditions existed in spots, here and there in the factory, business, and residential sections and especially on the outskirts of the city and along the river. (See Plates I-XVI.) Poor natural drainage, shallow wells, and yard privies frequently accompanied bad housing. The chief items of the sanitary condition of the dwellings studied are set forth in Table XXIII, p. 39.

In 616 of the 1,005 dwellings visited, the supply of drinking water was secured solely from surface or dug wells, and in 339 homes, from driven wells. Less than half (490) the dwellings were provided with water-closets connected with the sewer; the remainder (515) had privies with no sewer connections. Only 394 of the homes contained sewer-connected sinks. As 490 toilets and only 394 sinks were sewer connected, it would appear that in 96 households, after connection had been made with water main and sewer for the toilet, it was not deemed worth while to connect the sink, on account of the poor quality of the city water.

Although 611 homes lacked sewer-connected sinks, many of them had sinks drained in some other way. The drainage pipes sometimes emptied a few feet from the house or led out to a roadside ditch. One mother told of moving into a very attractive cottage in a good residence section in the spring, after being assured by the landlord that the sink drain was connected with the sewer. During the summer all the family except the father became ill, two of the children having typhoid fever. Investigation proved that the sink pipe simply drained under the house.

The means of ventilation, largely on account of the type of housing prevalent, were in almost all cases ample or sufficient, and bad ventilation as a factor in infant mortality was practically nonexistent. Furthermore, the mothers were usually well informed as to the value of fresh air. A division of the homes visited into three classes according to the degree of cleanliness showed almost nine-tenths of them to be satisfactory. The less satisfactory sanitary conditions

were found in a greater proportion of the dwellings occupied by the foreign-born mothers than of those occupied by native mothers.

Dwellings in all parts of the city are affected by dampness. Houses are usually built on a foundation 3 to 5 feet or more above the surface level with provision for ventilating this space; but many of the cheaper or older houses, without basement or cellar, have little, or perhaps no foundation to lift them above the level of the ground and no provision for the ventilation of the space between earth and floor. Many houses are banked up tightly during much of the year as a protection against cold. Often the owners of inexpensive houses have had hardwood floors put in to keep out dampness. While dampness is prevalent in all sections of the city, it is especially so in southern Saginaw, where the land is so low that after a heavy rain or a melting snow many houses are to be seen surrounded by pools of water, which may not disappear for a week or more.

A few families whose infants are included in this study lived on houseboats. (See Plates I and II.) In summer these boats ply up and down the river; in winter they are anchored along the banks of the river or in some landlocked bayou. One houseboat dweller pointed out that the ownership of a houseboat did not entail the payment of taxes that the ownership of a house did. The mothers living in houseboats invariably complained of the dampness and of the hopelessness of keeping their homes free from the mold caused by it, which attacked the floor coverings, clothing, and bedding. They also spoke of the insanitary conditions prevalent during the winter and frequently in summer also. While some parents lived the year round on their houseboats, others used them for residences only in summer, seeking employment which would keep them ashore in winter.

class
e-tenth

TABLE XXV.—*Births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, according to tenure and rental of home and nativity of mother.*

Tenure and rental of home and nativity of mother.	Total births.	Live births.	Infant deaths.	Infant mortality rate. ^a	Stillbirths.	
					Number.	Per cent of total births. ^a
All mothers.....	1,015	981	83	84.6	34	3.3
Home owned.....	451	434	30	69.1	17	3.8
Home not owned.....	529	512	49	95.7	17	3.2
Monthly rental:						
Under \$7.50.....	163	161	22	136.6	2	1.2
\$7.50 to \$12.49.....	238	230	19	82.6	8	3.4
\$12.50 to \$17.49.....	61	59	1	16.9	2	3.3
\$17.50 and over.....	33	36	1		2	
Free.....	5	5	2			
Boarding.....	24	21	4		3	
Not reported.....	35	35	4			
Native mothers.....	766	738	52	70.5	28	3.7
Home owned.....	326	313	15	47.9	13	4.0
Home not owned.....	413	398	33	82.9	15	3.6
Monthly rental:						
Under \$7.50.....	108	106	13	122.6	2	1.9
\$7.50 to \$12.49.....	193	187	13	69.5	6	3.1
\$12.50 to \$17.49.....	52	50	1	20.0	2	3.8
\$17.50 and over.....	32	30			2	
Free.....	5	5	2			
Boarding.....	23	20	4		3	
Not reported.....	27	27	4			
Foreign-born mothers.....	249	243	31	127.6	6	2.4
Home owned.....	125	121	15	124.0	4	3.2
Home not owned.....	116	114	16	140.4	2	1.7
Monthly rental:						
Under \$7.50.....	55	55	9	163.6		
\$7.50 to \$12.49.....	45	43	6		2	
\$12.50 to \$17.49.....	9	9				
\$17.50 and over.....	6	6	1			
Boarding.....	1	1				
Not reported.....	8	8				

^a Not shown where base is less than 50.

Births to parents who owned their own homes numbered 451, or 44.4 per cent of the total number; to parents not owning their homes, the number was 529, or 52.1 per cent. Among the whole population of Saginaw in 1910 the percentage of homes owned was 57.2,¹ or considerably greater than the 44.4 per cent found among the families selected for study. In Manchester, less than 12 per cent of the families visited owned their homes, the majority living in dwellings containing three or more families. Rents were not high in Saginaw. Of those who rented, nearly one-third paid less than \$7.50 a month and four-fifths paid less than \$12.50.

The mortality rate for infants in home-owning families was considerably less than for those in families in which the home was not owned; among infants of native mothers, the rate was almost twice as high when the home was not owned, but the difference between the two groups is relatively slight for infants of foreign-born mothers. The infants in families paying less than \$7.50 per month for rent

¹ U. S. Bureau of the Census, 1910, Vol. 1, p. 1359.

had a mortality rate of 136.6, which dropped in the next higher rental group to 82.6. The infant mortality rate in all families paying a rent of \$7.50 or over was only 64.6.

The Saginaw health department had power to prevent houses unsuitable for habitation from being reoccupied after they had once become vacant. (See Plate III.) The sanitary inspectors were instructed to place a quarantine placard upon each dwelling of this character as soon as vacated; and no house so placarded might be reoccupied until put into a condition pronounced sanitary by the health officer.¹ Here and there about the city was evidence of the department's activity in the shape of an old house lapsing into ruin with the quarantine placard still affixed.

In the newer sections of the city many bungalows and small cottages of attractive types had been built in recent years. These houses of five, six, or seven rooms offered much better housing at low rentals than did the older dwellings.

WARD CONDITIONS.

The city.—Saginaw is divided into 20 wards—12 on the East Side, 8 on the West Side. The map at the end of this report shows that 14 of them (7 on each side) border on the river and consequently contain an area of unreclaimed flats and bayous. Railroads parallel the river on both sides for much of the distance, and main tracks, sidings, freight houses, elevators, lumberyards, and warehouses are located along the water front. Next the railroad tracks is a border of dingy, cheap dwellings. Paralleling this section—for the most part not more than two or three squares away—and extending the length of the city on both the East and West Sides are streets on which are located the best residences in Saginaw. Beyond these are neighborhoods of more humble structures, comprising the bulk of the city. About one-third of the wards show, however, in the sections farthest from the river, stretches of open land with only an occasional dwelling. Wards bordering on the river show all these features and present, therefore, varying grades of city sanitation and development. Six wards do not adjoin the river; of these, five are thickly populated residence wards on the East Side, and the other on the West Side, is rural in character.

Certain conditions were uniform in all the wards. Detached dwellings with a generous measure of ground space and excellent sidewalks prevailed in all parts of the city. In each ward the proportion of foreign-born mothers included in the study rarely exceeded the proportion of foreign born for the city; one or two exceptions were

¹ Under the 1917 Housing Law of Michigan, the health officer may cause a dwelling to be vacated. Michigan Public Acts 1917, No. 167, art. 1, sec. 4.

noted. The water supply,¹ on the contrary, and the economic, sanitary, and other civic conditions were quite dissimilar in different sections of the city. For purposes of discussion, ward groups as shown in Table XXVI are formed, each group containing wards usually adjacent and most nearly alike in physical characteristics and in the economic status of their residents.

TABLE XXVI.—Population in 1910, births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, according to ward of residence.

Ward of residence.	Population in 1910.	Total births.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
						Number.	Per cent of total births.
The city.....	50,510	1,015	981	83	84.6	34	3.3
East Side.....	30,742	565	548	37	67.5	17	3.0
Ward:							
1.....	3,280	66	65	5	76.9	1	1.5
2, 3, 4, and 5.....	9,885	118	114	4	35.0	4	3.4
6 and 9.....	5,305	103	99	3	30.3	4	3.9
7 and 8.....	4,950	69	66	2	30.3	3	4.3
10.....	2,643	59	59	7	118.6	-----	-----
11 and 12.....	4,679	150	145	16	110.3	5	3.3
West Side.....	19,768	450	433	46	106.2	17	3.8
Ward:							
13, 14, and 18.....	6,836	186	179	15	83.8	7	3.8
15, 16, and 17.....	5,479	66	64	6	93.8	2	3.0
19.....	3,843	121	115	21	182.6	6	5.0
20.....	3,610	77	75	4	53.3	2	2.6

The most striking point shown in Table XXVI is the disparity between the infant mortality rates of the two parts of the city—67.5 for the East Side and 106.2 for the West Side. The greater number (56 per cent) of the infants included in the study lived on the East Side; the lesser number, 44 per cent, were subjected to conditions on the West Side where the death rate was so much higher. The infant mortality rates for the separate ward groups ranged from 30.3 to 182.6. Although only small numbers are involved, such wide divergence in rates for different sections of the same city directs attention to the difference in economic, physical, sanitary, and other neighborhood conditions, and the possible degree of their influence upon infant mortality.

The West Side.—As might be expected from its high average mortality, the West Side included the nineteenth ward,² which had the highest rate in the city, 182.6. This ward, in the southernmost part of the West Side, has the Tittibawassee River on the south and the Saginaw on the east, very poor natural drainage, and more than its share of low ground and dampness. Only two or three of the streets are paved, the rest resembling graded country roads. Several factories and coal mines are located near its outer limits.

¹ General Table 17.

² See map at end of report.

The ward contains, for the most part, inexpensive one and two story cottages and bungalows. They were usually new, clean, and in good repair, but the housewives complained of dampness. Many of the families owned their own homes, and rents were comparatively low. About one-sixth of the homes visited were provided with sewer-connected toilets, the yard privy being conspicuous throughout the ward. (See Plate IV.) Ten out of every 11 families visited relied wholly on shallow-well water for drinking purposes.

Of the 121 births in the nineteenth ward, 82¹ were to native mothers and 39 to foreign-born mothers, the majority of the latter being German. Fifteen of the 21 deaths and five of the six stillbirths were of infants of native mothers. The proportion of foreign-born mothers among those visited in this ward was comparatively small—about one-third—and the excessive infant mortality rate, as well as the large per cent of stillbirths, in contrast to the low rates for the city, was primarily for infants of native mothers.

Many of the fathers were employed by railroads or worked in the mines and factories in the neighborhood; during the period covered by the inquiry they had had fairly steady employment. Of the 21 deaths which occurred among the infants in this ward, 18 were of babies whose fathers earned less than \$850.

The thirteenth and fourteenth, the two northernmost wards of the West Side, and the eighteenth, which is directly north of the nineteenth, had an infant mortality rate of 83.8, some 22 points below the rate for the West Side, but about the same as that for the city. The business section of the thirteenth and fourteenth wards, the "North End," is surrounded by a well built-up residence section, in which paved streets, sewers, driven wells, and other municipal advantages prevailed. Approximately three-fourths of the thirteenth ward and the western half of the eighteenth were purely farming country. The infants included in the study were found, however, in the urban section which lies between the farms and the river waste lands. A creek spreading out in semistagnant pools flows from Weiss Street south near Eddy Street to the river. (See Plates V, VI, and VII.) Sanitary and housing conditions along this creek and in the immediate vicinity of the city dump near the Johnson Street bridge, where refuse was being used to reclaim the land, were probably worse than anywhere else in the city. Most of the residents in this group of wards owned their own homes, and the general economic condition of the families visited was slightly above the average.

The fifteenth, sixteenth, and seventeenth wards, comprising the central part of the West Side, had an infant mortality rate of 93.8. The residents of these wards had a high economic rank, and, for the

¹ General Table 7.

most part, other conditions were relatively good. All three wards border on the river but lack the usual waste spaces, as this part of the city, especially the West Side business section in the sixteenth ward, is on unusually high ground. These wards were closely built up, however, and in some parts garbage and refuse were commonly thrown on the unpaved streets.

The twentieth ward, the only ward on the West Side not bordering on the river, had an infant mortality rate of 53.3, the lowest rate on the West Side and one of the lowest in the city. This ward was largely rural in character. In the closely built-up part the houses were sewer connected and deep wells furnished the drinking water. In the rural section, where homes were scattered and sewers and water mains were not yet laid, shallow wells and outdoor toilets prevailed to such an extent that three-fourths of the homes visited in the ward were thus equipped. The economic status of the families visited, as shown by father's earnings, was practically the same as in the nineteenth ward, which had the highest infant mortality rate in the city.

The East Side.—On the East Side two groups of wards—the seventh and eighth, and the sixth and ninth—had the extremely low infant mortality rate of 30.3. The best residence section in the city is included in the seventh and eighth wards. Part of this residence section is very fittingly called “The Grove.” Most of the space near the river, formerly unsightly sloughs and wastes, is now transformed into attractive lakes and parks. The sanitary conditions in these wards were not surpassed elsewhere in the city, and the families in general enjoyed freedom from economic pressure. Several mothers employed servants, and a few mothers secured occasional assistance. The sixth and ninth wards, for the most part, resembled the seventh and eighth, but they did not have so high an economic rank and in certain places did not attain the same standard of sanitary excellence. These two wards had no frontage on the river but bordered on the “Big Ditch.” They had some open fields and small areas devoted to railroad tracks and factories.

The second, third, fourth, and fifth wards, lying to the north of the residential wards just described, had a rate of 35, the second lowest reported. In 1910 these wards contained about one-fifth of the city's population, slightly over one-fourth of whom were foreign-born.

The second ward, as a whole, was classed with the best residence wards, but it presents the variety that practically every river-bordering ward shows. The third ward contains the leading business section of the city extending to the retaining wall at the river bank; the fourth and fifth wards, located some distance back from the river, were closely built-up residence wards. The whole section had paved or

rock-surfaced streets, excellent sidewalks, good street car facilities, uniformly sewer-connected dwellings, and drainage and sanitary conditions above the average. There were few non-English speaking families among its residents. About one-fifth of the mothers visited were of foreign birth, mostly German and Canadian. A large proportion of the residents of these wards owned their own homes, the men either being in business for themselves or making a salary or wages ample for the comfortable support of a family. The civic and economic conditions were favorable to a low infant mortality.

The rate of the first ward, the northernmost ward on the East Side, was 76.9, which, though lower than the rate for the city, was above that for the East Side. Semirural in general character, the small closely built-up section in the center of the ward was flanked on the side toward the river by factories, waste lands, and bayous, and on the other by open fields with a few scattering farmhouses. This ward is located on the lowest ground in the city. About half the homes visited had sewer connections, and more than half the families drank shallow-well water. The economic status of the families of this ward included in the present study was lower than the average. As a whole the ward most resembled ward 20, but had a somewhat higher mortality rate.

The infant mortality rate for the tenth ward was 118.6. Its economic and civic features were somewhat less favorable than the sections of the city previously described, except the first and nineteenth wards.

The eleventh and twelfth wards, locally referred to as the "South Side," had an infant mortality rate of 110.3. Both wards border the river and have the usual variety of flats, railroad tracks, and poor housing merging into a narrow business district. The remainder of the South Side is sparsely built up but is not rural. Numerous comfortable houses exist, but there are small shacks and tar-paper shanties to be found in the open fields. This section is of lower elevation and not so well drained as most of the East Side, and melting snows or a heavy rainfall often turns the greater part of it into a series of shallow pools. Eighty-four per cent of the families visited drank water from shallow wells, and only one-twelfth of the homes were sewer connected. Over one-third of the births included in the study were to foreign-born mothers. The economic position of the families visited was the lowest for any section of the city. In both economic and sanitary conditions the eleventh and twelfth wards closely resembled the nineteenth ward on the West Side.

The very evident relation existing between the infant mortality rates for different parts of the city and the social, civic, and economic conditions may perhaps in each case be ascribed more to one than to another of these conditions. The highest infant mortality rates

were coexistent with poor drainage, insanitary disposition of garbage and refuse, outdoor toilets, shallow-well drinking water, dwellings which lacked sewer connection, and a low economic level. It is evident that, among other disadvantages, a low economic status compels the family to live where rents are cheapest—that is, in the localities where all the above conditions are most likely to prevail. Coincident with good drainage, better garbage and refuse disposal, well-built sewer-connected houses, and an average or high economic status was a low infant mortality rate. The only exception was in the "rural" wards, where rural conditions favor a low infant mortality; but even here the rate was not so low as in those urban wards where conditions were most favorable.

CIVIC AND SOCIAL CONDITIONS.

DESCRIPTION OF THE CITY.

History.—The history of Saginaw begins with the advent of a French fur trader who, in 1816, settled on the bank of the Saginaw River about 20 miles inland from Saginaw Bay. A United States fort and military post was established in 1822, but it was abandoned in the autumn of the following year because of serious endemic diseases among the soldiers, consequent upon the flooding of the river in the spring.

In 1848 the first of the lumbermen came, attracted by the wealth in the forests of the region and by the excellent facilities for transportation. The Saginaw River drained a forest-covered area of some 6,300 square miles, and was navigable for all the steam and sailing vessels, except the very largest, which plied upon the Great Lakes. Tens of thousands of logs were floated down the tributary streams to the Saginaw, sawmills sprang up on both sides of the river, and millions of feet of white pine, hemlock, and hardwoods were loaded at the wharves for shipment direct to domestic and foreign ports. In 1860 the first successful salt well was sunk and large shipments of salt were added to the lumber exports. As a lumber-producing center Saginaw had a thriving existence until about a quarter of a century ago. By that time the timber of the river basin was exhausted, the logging activities had passed on to the northwest, and the city's industrial life was changed accordingly.

Climate.—Saginaw has a very equable climate, due to the proximity of the Great Lakes. The moisture from the lakes produces a comparatively even temperature during the warmest summer months, retards the advance of the early cold, and mitigates the severity of the winters. The winter days are prevailingly cloudy. Long heated periods in summer or abnormally protracted cold ones in winter are very unusual. The country rarely suffers from drought.

The summer of 1913 was exceptional in having a longer hot spell than usual.

Population.—The Federal Census of 1910 reported Saginaw the third largest city in Michigan, with a population of 50,510. Of this number, 50,183 were white and 327 colored. The native white of native parentage numbered 17,257, or 34.2 per cent; the native white of foreign or mixed parentage, the largest group, 21,225, or 42 per cent; and the foreign-born white, 11,701, or 23.2 per cent. The foreign countries having the largest representation were Germany, 4,408; Canada, 4,020, including 729 French Canadian; British Isles, 1,528; and Russia, 762.

Political characteristics.—The city, formerly two distinct political units, has had a single government since 1899, when East Saginaw and West Saginaw were consolidated. A new city charter went into effect on January 1, 1914, when the common council was superseded by the commission form of government.

In some respects Saginaw is still two cities. The railroads maintain stations on both sides of the river and each side has a post office of the first class, a separate school system, and its own rate of municipal taxation. Public buildings and improvements are more or less impartially distributed. Neither side appears to have forgotten wholly its former independence, and each seeks to secure for itself the advantage in proposed improvements. A worthy proposition, therefore, may be defeated by the inability of the two sections of the city to agree on the question of location, for instance, though other advantages to be derived are common. The West Side is the older, but the East Side has outgrown it, and now has the greater voting strength; but neither can pass a proposition without help from the other.

Industries.—Saginaw industries to-day retain the impress of its bygone greatness as a lumber town. A thousand and one articles, ranging in size from ready-to-put-up houses down to toothpicks, are made from all kinds of domestic and imported lumber. Other industries and business activities have also been developed, among which are coal mining, foundries and machine shops, railroad shops, sugar manufacture (tons of sugar beets are grown in the surrounding country), the production of graphite, plate glass, leather, canned goods, knit goods, and clothing. In 1918, war activities had added shipbuilding and the manufacture of munitions and of iron and steel to this list.

As there is no larger city nearer than 90 miles, Saginaw is the distributing and shipping center for the rich agricultural region surrounding it. Railroad and other transportation facilities are excellent, comprising lines of the Grand Trunk, Michigan Central, and Pere Marquette Railroads, electric railways to Bay City and Detroit, and the Saginaw River, navigable for lake traffic.

Physical characteristics.—The city comprises 8,935 acres (about 12 square miles) of which the land area includes 8,750 acres and the water area, 185. A ridge 25 feet above low-water mark extends for a short distance along the western bank of the Saginaw River, otherwise the city is flat. It is rectangular in shape and the Saginaw River flows north through the center, spreading out on each side over flats into shallows, lakes, and bayous. On the southwest is the Tittibawassee River, which empties into the Saginaw and likewise spreads out over the adjacent low-lying lands. Local energy and capital have in some instances turned the defects caused by the Saginaw into advantages. An island park has been developed, a public natatorium built, and several acres in a low oval-shaped tract have been drained, forming an attractive natural amphitheater which is used for an athletic field. The numerous parks of the city contain 220 acres of land. Eleven bridges, four for railroad use only, connect the two parts of the city.

On each side of the Saginaw transportation lines parallel the river. Warehouses, bean and grain elevators, gas works, lumber and coal yards, a few of the manufacturing plants, and the shipping industries are located along the transportation lines and riverside. There are four distinct business centers. Parts of the city are rural in character, but even in the closely built-up portions there are no slum districts.

SANITATION.

Sewerage and surface drainage.—Saginaw has the combined sanitary and storm sewerage system, with 117 miles of mains and laterals and 27 outlets into the river or its adjoining bayous. Twelve miles of streets in which sewers had been laid still lacked water mains at the time of the inquiry, and consequently these sewers could not be used. The sewage was discharged into the river untreated.

The city is situated in flat, low country, and there is no appreciable slope toward the river. Natural surface drainage is, therefore, very poor. In case of excessive rains, or of rapidly melting snow, it frequently happens that the sewers and roadside ditches and gutters can not dispose of the water properly and then the surface of the poorly drained sections of the city is under water for a week or two at a time. When the river overflows it causes the sewers to "back up," floods basements and cellars and sometimes the streets, and spreads out over the flats.

Besides the sewer mains, an open sewer known as the Big Ditch¹ carried off kitchen sewage and surface drainage along a greater part of the eastern boundary of Saginaw. A similar but much shorter ditch performed a like service for a small part of North Saginaw.

¹ The city has recently made an appropriation for substituting an underground drain for the Big Ditch, though in June, 1918, work upon it had not yet commenced.

The dwellings in "The Grove," an exclusive residential section bordering the river for nearly a mile between Holland Street and Rust Avenue, had private sewers. Most of the residence streets are located a considerable distance from the river and but few dwellings, therefore, except the houseboats which anchor along the shore near the bridges, were affected by proximity to the sewer outlets.

The excess cost of trunk sewers over estimated cost of 12-inch laterals is paid by the city; the cost of lateral sewers 12 inches and under is assessed against the property benefited, and the property owner pays for the connection from the curb to the house. Since connection with sewers is not compulsory, the mileage of sewers laid is not an accurate index of the extent of their service to the public. In the outlying sections of the city many yard privies were in use. Each year property owners in one or two selected districts were served with notices to install inside toilets, but if in a given case the attendant expense was shown to constitute a hardship, the owner might be granted an extension of time in which to make the improvement. In 1913 there were 321 such sewer connections made, and 272 in 1914.

No estimate of the total number of yard privies in use could be obtained. The sanitary inspectors ordered them cleaned when it was thought necessary. The frequency of cleaning varied from two or three times a year to once in three or four years. Night soil had to be removed and taken outside the city limits at the expense of the householder. The city ordinance relating to privies required that the vaults "shall be walled up with 2-inch plank, brick, or stone." Cemented or tight vaults were not required and there were practically none connected with the homes visited in this study.

Of the families visited, 51.2 per cent lived in houses having no sewer connection whatever, and 19.6 per cent of those whose houses had sewer connections for toilets had none for sinks. (See Table XXIII, p. 39.) The last-mentioned condition was due principally to the fact that the city water, which supplied the toilet, was so unfit for household use that it was not considered worth the expense of having it piped into the kitchen. Many homes provided with sinks had cistern or well water, instead of city water, piped into them.

WATER SUPPLY.

Four kinds of water were in common use for domestic purposes in Saginaw: (1) Water from the city main, (2) rain water from the cisterns, (3) shallow-well water, and (4) deep-well water. The last two only were used for drinking. Numbers of well-to-do people bought bottled drinking water, either spring or distilled.

In many households four kinds of water were used—city water for flushing the toilets, cistern water for bathing and washing, shallow-

well water for cooking and part of the laundry work, and either deep-well or bottled water for drinking. Practically every household used at least two kinds of water—cistern water and either deep or shallow well water. City water was not used for drinking.

The primary cause of this diversity in the water supply was the amazingly bad quality of the water furnished by the city. This water is taken from the Saginaw River, a sluggish, muddy stream, which carried the drainage from a rather sparsely settled, flat basin of approximately 6,300 square miles. A number of towns of considerable size, however, among them the city of Flint, drain into the tributaries of the Saginaw River above the city, and in a few instances not so very far from it.

The intake of the Saginaw East Side waterworks is well above the city itself, though a new cemetery is located just above the intake. The West Side intake is centrally located below the outlets of eleven of the city sewers, the municipality itself polluting the source from which it secures its water.¹

Chemical analyses² of the river water have shown that its bacterial condition was frequently bad. The water was dirty, dark colored, very hard, frequently offensive in odor, and tasted of salt and other minerals, and was rightly considered fit only for flushing toilets, sprinkling lawns, and other similar uses. Nevertheless, as one mother said, it was sometimes impossible to keep small children from drinking the water when it was accessible.

Rain water is collected in cisterns or in large wooden casks sunk in the ground. For convenience, the cisterns are frequently located under the house or in a back shed, and rain water more than any other kind is directly available in the kitchen, often from an inside pump. The soft water supplied by the cisterns is used only for washing and cleansing; the roofs of the houses in the closely built-up sections of the city are, unfortunately, so sooty from soft-coal smoke that the rain water is too dirty to be entirely satisfactory for these purposes.

Over 95 per cent of the families visited drank well water only. (See Table XXIII, p. 39.) A sharp distinction is drawn, however, between deep and shallow wells. Deep wells are usually from 100 to 200 feet deep. They are driven and maintained in working order by the city for public use. There are 145 such wells located on street corners about the town. (See Plates VIII and IX.) In addition, some families and a number of hotels and industrial establishments have driven wells of their own.

¹ Disastrous fires having occurred recently in Saginaw, water is now (June, 1918) pumped directly from the river into the city mains of the East Side.

² Heim, William. Project for Saginaw Bay Water, Auspices Saginaw Board of Trade, 1912. University of Michigan, Laboratory of Hygiene Records, 1906.

The water from these wells is very hard and more or less impregnated with salt, which makes it most disagreeable in taste to those unaccustomed to it. But it is normally safe from pollution and is usually found on analysis to be in good condition. Contamination, however, arises from two sources: First, the openings of the many abandoned salt wells "permit the ingress of highly contaminated surface waters" into the water-bearing strata,¹ and, second, corroded and defective iron well casings—some over 20 years old—allow leakage into them of sewage and badly polluted surface water.²

Shallow or surface wells in Saginaw are dug wells, usually between 12 and 20 feet in depth. A "good, deep well" commonly turns out to be 15 or 16 feet deep. A very considerable proportion of the residents of Saginaw drinks this kind of water, finding it more convenient to procure and more agreeable in taste than that from the deep wells. Over 60 per cent of the families visited drank it exclusively. (See Table XXIII, p. 39.) In a letter relating to the Saginaw water supply, R. C. Allen, director of the Michigan Geological and Biological Survey, says:

* * * water is obtained from open or dug wells rarely more than 30 feet in depth, which reach down to the thin water-bearing strata. These wells are so shallow that direct contamination from the surface may take place through open channels made by roots, burrowing animals, and earthworms. On the other hand the impervious character of the surface materials together with the flat nature of the region causes the country to be flooded in times of heavy rainfall. During such periods surface waters nearly always make their way into these wells increasing the contamination. Under the best of conditions such shallow wells are a source of danger, but in the vicinity of villages and cities the danger is so great that the use of such wells for drinking purposes should not be permitted under any circumstances.

To make matters worse throughout the city of Saginaw, and especially in the outlying sections where shallow wells are most prevalent, yard privies were still in use. (See Plate X.) These privies were built over mere holes in the ground, or, at best, wooden boxes; water-tight cement vaults were almost unknown. This condition means, of course, that the contents of the privy seep into the surrounding soil. Shallow wells, fed from what is practically surface water, were commonly found on the same lot

¹ Letter from R. C. Allen, director of Michigan Geological and Biological Survey.

² "There are hundreds of cases of diarrhea produced each year in Saginaw by drinking water. * * * In one particular locality on South Washington Avenue near the Auditorium the water from a well was the cause of dozens of cases of this kind of trouble of a severe type, all because the well was polluted by an adjacent sewer, and on analyses the State bacteriologist found the water to contain dangerous numbers of colon bacilli, which caused it all. * * * This was during flood time in May while the sewers were full with no outlet, and as the water in the river subsided that in this particular well cleared up, and subsequent analyses proved negative. * * * This condition is by no means constant * * * [the wells] depend too much upon good sewage drainage for their safety. Just as soon as the river raises they show signs of sewage pollution and very frequently at other times." (Alger, Dr. G. L., Prospectus Saginaw Bay Water Association.)

In April, 1917, analyses of the water of the deep wells of the city showed nine to be "dangerously polluted and unfit for drinking or domestic use," but samples taken from them in May of the same year showed no unhealthful condition. (Records of Saginaw Department of Health.)

with such privies and supplied the family drinking water—"the best water in Saginaw," to quote the users.

Obviously, the perils of this situation were intensified in flood time—an annual spring event in parts of Saginaw—when sewers back up and the ground water level is raised to or above the surface, uniting sewers, privies, and wells in a common morass. It is probable that the water supply was primarily responsible for the prevalence of typhoid fever in Saginaw. Eighteen deaths from this cause occurred in Saginaw in 1913,¹ giving a rate of 33.9 per 100,000 population, from typhoid fever. The rate for the State as a whole was only 18.3. In the same year the death rate from typhoid fever was 18.2 in Grand Rapids, 17 in Flint, and 15 in Bay City.

Aside from the question of the transmission of infectious diseases, another aspect of the unsatisfactory water situation affected family well-being in Saginaw—the needless increase of household work. Not only were the housewives obliged to have at hand three or four kinds of water for different uses, but two or three of these had to be pumped and carried by hand.

Campaigns for better water have been frequent in Saginaw, and agitation of the question is almost chronic. Some have advocated chemical treatment and filtration of the river water; others have proposed the use of water from Saginaw Bay. The former plan was more in favor at the time of this study (1913-14). Three times in 1914 and 1915 the city voted on a bond issue for new water-works, but each time it failed of the three-fifths vote necessary to authorize the issuance of bonds. One difficulty in securing the necessary majority was the opposition of some adherents of the policy of a good water supply to the use of river water under any circumstances, water from the Saginaw Bay being preferred. A second difficulty was the rivalry between the two sections of the city for the location of the filtration and chemical plants.

MILK SUPPLY.

Character of supply.—Approximately 69 licensed dealers sold milk (at retail) in Saginaw during the period² covered by the study. Most of them did business on a small scale, either selling milk from their own herds only or collecting the milk from several farms for retail delivery. Two dealers handled the milk from as many as 30 or more farms each. Many of the residents of the outlying wards kept one or two cows and sold milk to the neighbors.

The number of farms supplying the city with milk was variously estimated at from 200 to 300. On these farms dairying was secondary and the herds were small—probably less than 10 cows. With

¹ Forty-seventh Annual Report of Births and Deaths in Michigan, 1913, p. 209.

² Dec. 1, 1912, to Nov. 30, 1914.

such small herds it is difficult to secure adequate control of the conditions of milk production. There are more farms to be inspected; and the farmer with only a few cows has less interest in improved dairy construction and sanitary methods than the producer of milk on a large scale.

One important advantage which Saginaw owes to its favorable northern location is that the farmers have an abundance of ice with which to cool the milk. Another advantage is that the milk is delivered fresh. Prompt delivery is possible, since the great bulk of the supply comes from within a radius of 5 miles and but little from over 10 miles.

The milk-handling equipment of the small dealer is of the simplest description. Few have arrangements for sterilization of the bottles, though most of them bottle part of the milk, and have bottling and bottle-washing apparatus of a kind. The dealers' places of business were under better control than the farms, since they were fewer and more centrally located, and those visited were in good condition as to cleanliness. In a few cases, complaints were made, however, of insanitary practices.

The two large milk plants in the city at the time of the study pasteurized their milk. The apparatus used was a cream-ripening tank—an apparatus not designed for pasteurization and lacking a temperature-regulating device. The only method of testing the temperature of the milk in the "cream ripener" was by inserting a thermometer in the water jacket surrounding the milk; the temperature of the milk was judged by that of the water. The results of pasteurization were, therefore, often unsatisfactory. One company claimed to have made monthly sediment tests of each farmer's milk, and no complaints were heard of its pasteurized milk product. In the case of the other company, numerous complaints stated that the milk sold was sour, scalded, or filthy in taste. In the few tests made, pasteurized milk gave higher bacterial counts than most of the raw milk, a condition due to inefficient pasteurization.

Two dairymen sold milk at prices above the local standard, claiming that it was richer and cleaner than ordinary milk and especially suitable for babies. These claims may have been justified, but the claim made by one that he sold "certified milk only" could hardly have been true, since there was no certification commission in Saginaw.

Ordinances.—Prior to October 20, 1914, the ordinances of the city (December 11, 1911, and September 8, 1913) required that—

(1) All dairies where milk was produced for sale must score at least 40 per cent on the United States score card.

(2) All cows must be proved to be free from tuberculosis, as shown by the tuberculin test, and must be retested annually; and all additions to the herds must be tested.

(3) The bacteriological count must not exceed 100,000 per cubic centimeter.

So far as could be learned no systematic attempt was made to enforce these requirements. Some dairies were scored, but not all; some dairymen were induced to have their herds tested for tuberculosis, but none was obliged to; and the retesting was not carried out. If any bacterial counts were made, no records of such work were to be found, and certainly the bacterial standard was not enforced.

All these requirements were abolished by the ordinance of October 20, 1914, affecting the last six weeks of the period of the study. In place of the minimum standard set by ordinances which were not enforced a system of official grades was established. The grades were three in number; for grade A, the highest, the requirements specified that the bacterial count should not exceed 200,000 per cubic centimeter at the time of delivery. The tuberculin test was required for this grade. Grade B was established for pasteurized milk, and the bacterial count should not exceed 1,000,000 before pasteurization and after pasteurization not more than 50,000 at time of delivery. For grade C a maximum of 1,000,000 per cubic centimeter at time of delivery was prescribed. Milk containing over 1,000,000 bacteria per cubic centimeter was classed "insanitary" and could not be sold.

The low standard of milk production prevailing in Saginaw is shown by the fact that during the first three months of the operation of the ordinance no certificate was issued for any but grade C. Popular indifference is partly to blame for these conditions. As one man said: "The public has not yet learned to look at the *bottom* of a bottle of milk instead of at the *top*." Opposition on the part of dealers to some of the requirements is also a factor in the situation. An ordinance requiring all milk to be bottled was defeated by the opposition of the milk dealers.

Inspection.—Prior to October 20, 1914, the inspection of food, as well as of weights and measures, was in the hands of two inspectors, neither of whom was required to give his whole time to his official duties. The assistant inspector, who had to be a veterinary surgeon, included in his duties the inspection of dairies and slaughterhouses and their products. His salary was only \$1,000 per annum, and he naturally kept up his private practice. After October, 1914, a single inspector was charged with the inspection of dairies, slaughterhouses and groceries, meat markets, fruit stores, and all other places where food was sold. He had to make all the laboratory tests. He had to be a veterinarian, and his salary was \$1,200 a year, though he was not expected or required to give all his time to his official duties. There are obvious disadvantages in having an

inspector partially dependent upon a professional practice among patrons whose business it is his official duty to inspect.

During the period of the study, according to the milk inspectors, few dairy herds were given the tuberculin test, although this was one of the requirements of the ordinances, in force during the greater part of that period. In no case was an annual test made. During these two years the only recorded bacterial tests were made by the city milk inspector in November, 1914. These were abandoned at the end of six weeks because of the pressure of other duties. Of the 19 tests then made, with counts ranging from 6,000 to 223,000, nine showed less than 50,000 bacteria per cubic centimeter; five showed between 50,000 and 100,000; and five over 100,000. The counts for raw milk were surprisingly low, due probably to the freshness of the milk and to cold weather.

In a series of samples tested in 1913-14 by students of chemistry in the high school, a great deal of filthy sediment was found; besides this, gelatin was discovered in a considerable number of the samples first tested. The addition of gelatin to milk which has been diluted with water or is poor in butter fat thickens it and gives it a deceptively rich appearance. After the results of the tests were made public no more gelatin was found in the samples.

GARBAGE AND REFUSE DISPOSAL.

The disposition of garbage and refuse was left mainly in the hands of the individual householders. The city had no scavenger system whatever, except that in winter it collected ashes, chiefly from the paved-street sections. In the unpaved sections refuse of all kinds was commonly thrown into the streets and the roadside drainage ditches. (See Plate XI.) Garbage was sometimes collected by farmers to feed swine, but in some sections it was often thrown with other refuse into the streets or on the dumps.

There were two city dumps near the river where land was being filled in. During the summer months two sanitary inspectors under the direction of the health officer were supposed to spend one day each week at the dumps to see that the regulations in regard to them were complied with, but the duties of these officers were so numerous that they visited the dumps only occasionally. Formerly waste from fish and meat markets had been deposited at these dumps, but at the time of the study this practice was forbidden by the department of health. Decayed fruit and vegetables, however, might still be deposited there, provided they were covered by a sufficient depth of earth or water.

Besides these two city dumps there were 16 others of lesser importance scattered over the city where depressions furnished a convenient dumping ground for the neighborhood. Even the best

residential wards of the city had these dumps, some very close to dwellings. The largest, and perhaps the worst, of these places was in the first ward, many yards from any dwelling, on the road to the Sixth Street Bridge.¹ (See Plate XII.) It was a constant menace to health. Children often played there. Rats were numerous and in summer flies abounded.

CIVIC AND SOCIAL AGENCIES.

There is in Saginaw no special agency that has for its purpose the reduction of infant mortality or that exercises more than a very indirect influence upon infant welfare.

Department of health and safety.—In any community the department of health should logically be the leading and most active agency in reducing morbidity and mortality. The health department of Saginaw, however, at the time of this study did not regard infant mortality as a distinct problem and had taken no special action for its reduction.

The commissioner of health and safety is one of the five commissioners composing the city council. Upon his recommendation the council appoints a market and food inspector, a health officer, plumbing, building, and other inspectors, and the other employees of the health department. The duties of the market and food inspector have been already mentioned.² The health officer at the time of the study regularly gave about one hour a day to his official duties and received therefor a salary of \$50 a month. With no larger recompense, the city certainly could not expect him to give much of his time to its service. Two sanitary inspectors were detailed from the police force and gave only part time to health-department duties.

The equipment and facilities provided for the health department were limited. There was no laboratory and no vital statistics service beyond that given and required by the State. The publication of the annual report setting forth the department's activities and needs was discontinued in 1910. The expenditures of the health department for the fiscal year ended June 30, 1914, were less than \$9,500 and the appropriation for the following year, save for a sum for the use and expansion of the tuberculosis hospital, was no larger. A health department thus handicapped by inadequate financial support and by the lack of a full-time executive, full-time assistants, and adequate scientific equipment could not be expected to give satisfactory service.

Hospitals.—The four hospitals of the city are general in character, except the one which treats patients suffering from tuberculosis.

¹ In June, 1918, probably because of proximity to a recently established shipyard, this dump had been cleaned up and showed no signs of use.

² See p. 56.

This was erected by the city and is under the direction and control of the department of health. None of the hospitals has a special ward for children. In one there are 14 beds for infants and another has 6 cots for the babies of private obstetrical cases. In all the hospitals of the city there is a total of only five free beds which may be used for babies or older children. Contagious diseases are cared for in the annex of one hospital and in a cottage on the grounds of another. The old tuberculosis hospital is used as a pesthouse.

Visiting nurses.—Saginaw has three visiting nurses, each working independently in entirely different fields. One nurse, whose salary is paid out of a bequest to one of the hospitals, does home visiting for that institution. She cares for about 30 maternity cases in a year, but answers only those calls, usually sent in by physicians, that come through the hospital.

A second nurse is employed by an insurance company to care for its industrial policyholders. Each normal maternity case is given eight visits after confinement, and the nurse averages about 20 such cases in the course of a year. As infants are not accepted as policyholders, they are not attended by the nurse.

A third nurse, who is given an office in the quarters of the department of health, attends only patients suffering from tuberculosis. The city made no appropriation for public-health nursing.

In relation to the problem of infant mortality the activities of the visiting nurses are limited to the care and instruction, usually after confinement, of about 50 mothers, or approximately 4 per cent of the number to whom babies were born in the selected year.

Charities.—The Saginaw Charity Association was not affiliated with the charity organizations of other cities and employed no paid workers.¹ It distributed relief largely through the local branch of the Salvation Army. The association included representatives from all social agencies of the city.² The churches of the city were represented by several members on the advisory board.

In the meetings of this organization, to which the public was invited, cases requiring relief were discussed and referred to the society or member deemed best able to manage it. Funds were raised by each society for its own needs. Aid was usually given temporarily to tide over a period of unemployment or illness. The churches, clubs, and societies were very active through the medium of the charities association, which seemed to be quite successful in directing charity into the proper channels and in protecting the public against

¹ This policy has since been changed and the association now (1918) has a full-time salaried agent.

² To wit, the captain of police, the director of the poor, three visiting nurses, the truant officer, probation officers, the superintendent of the Homestead (a detention home and refuge for girls), the secretaries of the Y. M. C. A. and Y. W. C. A., the health officer, a woman physician, and representatives of the Rescue Mission, Salvation Army, Saginaw General Hospital, St. Mary's Hospital, Civic League, Ministers' Association, Soldiers and Sailors' Relief Commission, and the Antituberculosis Society.

imposition. Less than half a dozen families included in this study had received public aid—i. e., aid from this organization or from the city—within the selected year.

Mother's pensions.—In 1913 a law was enacted providing for pensions to mothers of dependent children under 17. To be eligible, a mother must be financially unable to care for her child but otherwise a proper guardian. The pension, not to exceed \$3 per week for each child, is granted through the probate court and paid to the mother by the county treasurer out of the general fund of the county. The probation officer from time to time inspects the home. Two mothers of infants included in this study received such pensions.

The Homestead.—This detention home and refuge was organized by the civic league to care for girls, and receives chiefly those who are homeless and in trouble or those detained while awaiting trial. When able to do so they were expected to pay \$2.50 a week for board and rent, as well as the doctor's bill in cases of confinement. The city and county paid at the rate of \$4 per week for cases committed.

The homeless mother of an illegitimate infant was cared for in the woman's hospital during confinement. She was expected to remain at the Homestead at least three months and to keep her child one or two months, after which she was encouraged to place him in another home, preferably a private one. An attempt was made to force the father of the child to assist in its support, but this was usually unsuccessful.

The Home for the Friendless.—This institution cared especially for children under 14, but also admitted girls seeking work and aged women. It accepted babies under 3 months only in emergencies and until other arrangements could be made, and rarely had cases for day-nursery care. During the year 1913 it cared for 12 adults and for approximately 60 children, of whom about one-third were under three months of age. One infant included in this study spent a part of his first year in this institution.

SUMMARY AND CONCLUSION.

Saginaw is a city of diversified industries located in the midst of an agricultural region in the Middle West. The natural severity of its northern climate is lessened by proximity to the Great Lakes. Three-fourths of its population were native, and of its foreign-born residents few were recent immigrants. Housing congestion did not exist in the city, though there were certain housing disadvantages resulting from a poor water supply. Many homes suffered from dampness on account of poor surface drainage. Families included in the study had a high economic status compared with those in other cities studied by the bureau.

Registration of births.—In the year ended November 30, 1913, there were 1,260 known births and miscarriages in Saginaw; 147, or 11.7 per cent, had not been registered. Had a house-to-house canvass for births been undertaken more would probably have been discovered.

Infant mortality rate.—A selected group of 1,015 births occurring in Saginaw in the year ended November 30, 1913, formed the basis for this study. Of the 981 live-born infants in the group, 83 died, giving an infant mortality rate of 84.6, a rate lower than that found in any of the cities previously studied by the bureau. For the East Side the rate was only 67.5, compared with 106.2 for the West Side. Infant mortality rates were very low in sections of the city where municipal sanitation was relatively good and the economic status of the residents high.

Nativity of mother.—Three-fourths of the births included in this study were to native mothers. The mortality rate among the infants of native mothers was only 70.5, very much lower than for the infants of foreign-born mothers, 127.6. Of the live births, less than one-fourth were to foreign-born mothers, yet three-eighths of all the infant deaths occurred in this nativity group. The foreign-born mothers were chiefly German, Polish, and Canadian. Of the births to foreign-born mothers practically half were to mothers who had lived in the United States for 10 years or more. Of the total births, 92.6 per cent were to mothers who spoke English.

Type of feeding.—Of the infants surviving at the end of the first month, 87.9 per cent were exclusively breast fed. A very large proportion continued to be so fed during the following months. When a change was made from exclusive breast feeding it was usually to mixed rather than to artificial feeding. The large proportion of breast-fed infants gave little chance for gastro-intestinal diseases; only a very small percentage of deaths resulted from that cause. The mortality among artificially fed infants, however, was much greater than among breast-fed infants; throughout the first nine months the rate was at least twice as high.

Father's earnings.—Seventeen and nine-tenths per cent of the births occurred in families where the father earned less than \$550, and 39 per cent in families where the earnings exceeded \$850. In comparison with Manchester and New Bedford, the proportion in the lower earnings group was much smaller and in the higher earnings group much larger. The mortality rate was highest, 179.5, for the infants whose fathers were in the lowest earnings group, under \$450. It decreased as the earnings increased with but a single irregularity to a minimum of 22.2 for the group with father's earnings \$1,250 and over. For the group of births in families where the father earned under \$850 the mortality rate was 116.4; for the group over \$850,

the rate was only 33.9. A somewhat larger proportion of the infants of the foreign-born mothers than of the native mothers were in the low-earnings groups.

Certified cause of death and infant losses.—According to the certified causes of deaths the most important group was deaths from causes peculiar to early infancy and malformations. Of the total losses¹ (117) in the group studied over one-half were stillbirths (34) and deaths under two weeks of age (34). Eighteen of the deaths at later ages were due to causes peculiar to early infancy and malformations. Prenatal causes were responsible for over two-thirds of the total losses.

Attendant at birth.—Physicians attended 96 per cent of the births to native mothers and 78.3 per cent of those to foreign-born mothers. Only 6.5 per cent of the total births were attended by midwives.

Conclusion.—Any successful effort to reduce infant mortality in Saginaw must be accompanied by a more complete birth registration than existed in 1913. Complete and prompt registration is a necessity before the city can ascertain its infant mortality rate and correctly determine its infant welfare problems. The provisions of the State law on birth registration are excellent, but they were not all locally enforced; local registration of births was far from complete, chiefly because the people of Saginaw were not interested. The first step, therefore, is to awaken the public to the value of birth statistics and the need for better registration.

Since two-thirds of the infant losses in the selected group were primarily due to prenatal causes, adequate prenatal care seems essential if this class of losses is to be materially reduced. Such care is especially needed for the inexperienced young mother and in families in which the father's earnings are low, judging from the high mortality among the first-born babies and in the lower earnings groups. Prenatal care should include regular examinations of the prospective mother during pregnancy by the family physician or at clinics, and nurses' visits during the same period. Instructive visiting nurses who would call upon and instruct a mother in the proper care of herself during pregnancy and confinement doubtless would prove an effective means of reducing losses from prenatal causes. The work of the three public-health nurses in Saginaw only rarely touched the neglected fields of prenatal, postnatal, and maternal care.

How great an influence the defects of municipal sanitation have upon the welfare of Saginaw infants can not be definitely stated. The installation of a supply of pure city water, ample for all household purposes, is perhaps of the highest importance for the general public

¹ Total losses include 83 deaths and 34 stillbirths.

health and comfort. A housing code¹ abolishing the yard privies except in the distinctly rural sections, requiring sewer connections for both sinks and water-closets, and guaranteeing also to the city the advantages it at present enjoys in respect to light and ventilation, would remove two grave dangers to the general public—if not distinctly to infant welfare. The proper collection and disposal of refuse and garbage, and the abolition of the dumps with their menace of flies and rats would still further contribute to general healthfulness.

The inspection and control of the milk supply is also important. The tuberculin test should be given to all herds supplying milk to the city.² Milk is tested for dirt by filtering through gauze; it should also be analyzed for bacteria and for solid content, water, milk solids, and butter fat. The findings should be published at intervals to make the results available to the public.

It is evident that, to secure these improvements, the health department should be provided with adequate machinery for enforcing and carrying out the necessary measures. The health officer who administers these measures should be sufficiently well paid to give his entire time to the city's work. There should be a sufficiently large corps of assistants, also with full-time pay, to perform all the necessary work of inspection, testing, and analysis. With pure city water installed, a proper system for garbage disposal once established, and the yard privies abolished, the problems of sanitation should be greatly simplified. The city would then be in a position to give intensive study to the special problems of infancy and early childhood, in the confident expectation that an already rather favorable showing under present conditions can be so bettered by wise civic action as to place Saginaw permanently among the cities of the United States showing the lowest infant mortality rates.

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 studied. 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 1910 for every 1,000 live births registered in the death registration States, there were 124 deaths under 1 year of

¹ The Housing Law of Michigan (Public Acts No. 167), passed May 2, 1917, provides for all changes suggested in this paragraph.

² A bill to compel the tuberculin testing of all dairy cattle in the State is to be introduced in the next session of the State legislature. If the object were sought by means of a city ordinance, it would result, in the opinion of the city milk inspector (June, 1918), in a local milk famine, since farmers would ship their milk to Bay City and Flint instead of complying with Saginaw requirements.

age.¹ In 1915, in the birth registration area, including the New England States, New York, Pennsylvania, Michigan, Minnesota, and the District of Columbia, for every 1,000 live births registered there were 100 infant deaths. In these States the infant mortality rate varied from 70 to 120 for the State as a whole, while for cities in these States having in 1910 a population of 25,000 or over 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.*^a

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

^a U. S. Bureau of the Census, Birth Statistics, 1915, p. 10.

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 deaths under one 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 accepted birth registration, on account of the facilities afforded by the birth 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.

¹ The rate is too high since the registration of births was incomplete in these States; in many of them it was very deficient. Figures are shown for the death registration States of 1911 and are for 1910, except in Kentucky and Missouri, where births and deaths are for 1911.

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

City.	Population in 1910.	Infant mortality rates.		Percentage of adult population over 20 foreign born, 1910.	Principal foreign nationality. ^a	Principal industry.
		^b 1910.	^c 1915.			
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	5145	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.

^a Principal foreign nationality of mothers of infants included in the infant mortality studies.

^b 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. For rate for Saginaw based on State (final) figures for births, see discussion, p. —.

^c U. S. Bureau of the Census, Birth Statistics, 1915. Washington, 1917.

^d 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 1 year per 1,000 live births.¹ 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 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

¹ Stillbirths are omitted from both births and deaths.

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 representative of the city. An alternative policy is so to supplement the original data that the figures used include all the evidence applicable to the group studied in the 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 data 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, 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 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 coming to the city 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 afterwards, a few births were excluded if the mother had moved away from the city prior to the agent's visit and could not be found at this time.¹

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 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 were 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 selection 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

¹ The ruling in one special case might be mentioned. 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.

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 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, as explained in the report (p. 11), many sources of information were used to find cases of unregistered births to add to those registered. Baptismal records of the various churches, lists of patients in hospitals receiving maternity cases, and cards of entry of babies in a baby show were examined for information as to additional births in the selected year. From death records several births were added to the number. The agents were instructed to inquire of every mother visited if she knew of other babies in the neighborhood. This neighborhood inquiry proved an especially effective means of finding additional births. In all 116 births to resident married mothers were added. Death registration in Saginaw was found to be by no means perfect. Three deaths that had not been registered that occurred in the city in the selected group were discovered and added to the 113 registered deaths that occurred in the city and to the 80 registered deaths that occurred among the births included in the study.

With the general plan of the investigation determined, the more important points in the detailed procedure were as follows. The first step was to transfer to the schedule the birth certificate data for the year selected. Then the infant death certificates for the year selected and the year following were copied, and the facts as to 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 or other sources 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. Since the bureau has no power 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 occur in the same year. In rates for the bureau 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.¹ The death rate for illegitimate births is usually considerably higher than the average rate.

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 excludes, of course, infant deaths in foundling asylums, if the birth did not occur in the city.

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 or by other means. In these cases it is easy to show from the incompleteness of the records that the rates computed in the usual way on the basis of these records are much less accurate than the rates given in these studies for the included groups.

Birth and death registration in Saginaw.—Michigan has a good birth-registration law, and was one of the first States admitted to the registration area for births. But the enforcement of the law in Saginaw leaves much to be desired. Early in course of the inquiry it was found that certain physicians were lax in registering births; that few of the midwives reported the births they attended; and that a number of German and Polish mothers did not employ any qualified attendant, but depended upon assistance at confinement given by husbands, relatives, or neighbors, none of whom registered

¹ Except for Johnstown, where illegitimate births were included.

the birth. The law provides for a payment of \$0.50 for each certificate to the physician, midwife, or other person whose duty it is to register births. Penalties for noncompliance are provided and enforcement of the law is placed in the hands of the local registrars under the direction and supervision of the secretary of state. The office of the secretary of state is charged with ordering prosecutions for failure to register births, but, except in obstinate cases, efforts are made to secure complete returns without resorting to prosecution. No prosecution for nonregistration of births has ever taken place in Saginaw.

From the figures secured light may be thrown upon the completeness of registration of live births in Saginaw. Two methods are available—one giving a maximum estimate and the other a minimum statement. If the deaths where the births had not been registered are compared to the total deaths in the city among births in the selected year, the figure of 25.9 per cent is obtained as an index of the proportion of live births not registered. This index gives the true percentage of births not registered only in case the mortality in the groups where registration is faulty is the same as the average. The mortality rates are usually high in the foreign-born and low-earnings groups, among which the registration is probably least complete. The percentage thus found is therefore an overstatement.

Another method of determining the percentage of live births not registered is by comparing with the total number of births the unregistered births discovered. There were 141 unregistered live births that were definitely known to have occurred in the selected year. If compared with the total of 1,206 live births, 11.7 per cent were not registered. If the 115 live births that occurred to mothers known to have been resident in the city both at the time of the infant's birth and throughout the selected year are compared with the 981 in the same group the same percentage is secured. This percentage represents a minimum statement of live births unregistered, since it includes only those cases where unregistered live births were known to have occurred.

Obviously a neighborhood inquiry might fail to find births in the city of infants who had moved away prior to the inquiry. The true per cent would be somewhat above this figure, depending upon the number of additional unregistered births that occurred in the city. Neither of these methods gives a satisfactory estimate for the percentage of stillbirths that were not registered.

The registration of infant deaths also was not perfect. Three deaths were discovered for which no death certificates were on file. In all three instances the births had been properly registered; the infants died when less than a month old, and physicians were in attendance during illness. Obviously, it is especially difficult to dis-

cover cases of omission of death certificates, especially in those cases where both birth and death certificates were omitted.

Live births excluded in Saginaw.—With the foregoing explanation of the method of procedure in mind, the significance of the exclusions and the rates for the excluded groups can be more easily grasped. During the selected year the total number of live births known to have occurred in Saginaw was 1,206. Of these, 23 were illegitimate—18 registered and 5 unregistered. No schedules were taken for these births on account of the abnormal conditions in the family group nor was any systematic attempt made to learn whether the infants were resident in Saginaw throughout the first year of life or had lived elsewhere during a part of the year. Seven, or nearly one-third, of these infants died.

The remainder of the exclusions (202) were made on grounds of nonresidence or lack of information. One infant was excluded because the information was incomplete or unreliable. Forty births were to mothers who were not residents of the city. Nine deaths were known to have occurred among them. An indication of the mortality in this group, somewhat fairer than that found by dividing the 9 deaths by the 40 births, could be secured by comparing the 4 deaths of infants whose births were registered to the 31 births registered of the "nonresident" group.

The mothers of 149 infants had moved away from the city prior to the visit of the agent. In 11 cases the birth had not been registered, and of these, 6 were found through death certificates. For the rest, 10 deaths occurred among 138 infants. The rate, 72.5, is obviously too low to characterize the group, since other deaths under 1 year of age may have occurred outside the city.

In 12 cases the mothers could not be found. One of these infants died and in this case the birth was discovered through the death certificate.

The rate for the births included in the study is 84.6. For the excluded group the rate varies with the reasons for exclusion. The rate for illegitimate births is high. The rate for the nonresident group is relatively high; the rate for the "removed group" is relatively high, but obviously less than the true rate, for not all the deaths were included. No fair rates can be made for the infants excluded for the groups where the births had not been registered, since, owing to the difficulty of securing information where the mother had moved away, the number of births is probably not complete. The rate for the excluded group as a whole, 146.7, 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 96.2, but this rate, too, is not so significant in many ways as the rate for the group included in the study.

The rate of 84.6 for births to resident married mothers is based upon known deaths and known births. The true rate for this group

would be the ratio of total deaths and total births and would be equal to this rate or above or below it, depending upon the ratio of the unregistered deaths and unregistered births that were not found. If additional births and deaths occurred, then, if for each death there were 12 and only 12 unregistered births of infants who lived in the city for the first year of life or till death and which were not discovered by the methods adopted to locate unregistered births, the rate of 84.6 of the study would be correct. If there were fewer than 12 such unregistered and not found births for each such unregistered death the rate would be too low, and if more than 12, too high. The rate of 84.6, based upon all the available information, may be accepted with these reservations as typical of the groups studied.

TABLE III.—Registered and unregistered live births in Saginaw, infant deaths, and infant mortality rates, for each class of exclusions.

Reasons for exclusion.	Live births.			Infant deaths.			Infant mortality rate. ^a		
	Total	Registered.	Unregistered.	Total	Births registered.	Births unregistered.	Total	Births registered.	Births unregistered.
Total known live births.....	1,206	1,065	141	116	86	30	96.2	80.8	212.8
Total live births included.....	981	866	115	83	66	17	84.6	76.2	147.8
Total live births excluded.....	225	199	26	33	20	13	146.7	100.5	.....
Reasons for exclusion:									
Illegitimacy.....	23	18	5	7	6	1	.....	.....	.....
Nonresidence and lack of information—									
Total.....	202	181	21	26	14	12	128.7	77.3	.....
Not found.....	12	11	1	1	.....	1	.....	.....	.....
Data incomplete or unreliable.....	1	1	.....	.....	.....	.....	.....	.....	.....
Nonresident.....	40	31	9	9	4	5	.....	.....	.....
Removed.....	149	138	11	16	10	6	107.4	72.5	.....

^a Not shown where base is less than 50.

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

A policy of exclusions similar to that for infant mortality was followed. Stillbirths to nonresident mothers were excluded because of the possible effect of conditions different from those of Saginaw; likewise stillbirths to mothers who moved away prior to the end of the selected year. In the latter case 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 a stillbirth must be registered both as a "death" and as a "birth"; in some States the law is not clear whether stillbirths have to be regis-

tered 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.

How many stillbirths escape registration would be difficult to determine. It would be much more difficult to find by canvass or other inquiry cases of omission of registration of stillbirths than to find cases of similar omissions for 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 Saginaw and other cities the figure for stillbirths is compared to the total of registered and known unregistered births to resident married mothers.

Stillbirths and miscarriages excluded in Saginaw.—The total number of stillbirths and miscarriages known to have occurred in the selected year in Saginaw was 54. Nine were excluded because they were of less than seven months' gestation (see p. 16 for definition of stillbirth). In 11 cases the birth had to be excluded on the ground of removal or nonresidence. No stillbirths were excluded on the ground of illegitimacy.

The stillbirth rate for resident married mothers is formed by dividing the 34 stillbirths by the total of 1,015 births in the same group, giving a rate of 3.3. It is impossible to form comparable rates for the excluded groups, because the proportion of miscarriages is not known.

TABLE IV.—*Stillbirths and miscarriages in Saginaw in year selected and number excluded for specified reasons.*

Reasons for exclusion.	Number.
Total known stillbirths and miscarriages.....	54
Stillbirths included.....	34
Stillbirths and miscarriages excluded.....	20
Nonresident.....	4
Removed.....	7
Miscarriages.....	9

GENERAL TABLES

TABLE 1.—Number and per cent distribution of deaths of infants, born in Saginaw during selected year, by cause of death.

Abridged International ^a List No.	Detailed International ^a List No.	Cause of death. ^b	Infant deaths.	
			Number.	Per cent distribution.
		All causes.....	83	100.0
		Gastric and intestinal diseases ^c	8	9.6
		Diseases of the stomach.....	1	1.2
		Diarrhea and enteritis.....	7	8.4
24.....	102, 103.....	Respiratory diseases ^d	10	12.0
25.....	104.....	Acute bronchitis.....	3	3.6
		Broncho-pneumonia.....	3	3.6
20.....	89.....	Pneumonia.....	4	4.8
Part of 23.....	91.....	Malformations.....	4	4.8
22.....	92.....	Early infancy.....	37	44.6
Part of 33.....	150.....	Premature birth.....	12	14.5
		Congenital debility.....	24	28.9
Part of 33.....	151 (1).....	Injuries at birth.....	1	1.2
		Epidemic diseases ^e	5	6.0
Part of 33; part of 37.....	151 (2), 152 (2), 153.....	Whooping cough.....	1	1.2
Part of 37.....	152 (1).....	Dysentery.....	1	1.2
		Tuberculous meningitis.....	2	2.4
7.....	8.....	Syphilis.....	1	1.2
Part of 12.....	14.....	External causes.....	1	1.2
14.....	30.....	Diseases ill defined or unknown.....	4	4.8
Part of 37.....	37.....	All other causes.....	14	16.9
35.....	155 to 186.....	Meningitis.....	1	1.2
38.....	187, 188, 189.....	Convulsions.....	7	8.4
		Organic diseases of the heart.....	1	1.2
17.....	61.....	Other.....	5	6.0
Part of 37.....	71.....			
19.....	79.....			

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

^b The causes of death included in this list are those used by the United States Bureau of the Census (see Mortality Statistics, 1914, p. 660), 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 8 main groups.

^c 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.

^d "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.

^e "Epidemic diseases" as used in the tables and discussion includes only those of this group which are most important among infants.

TABLE 2.—Deaths of infants born during selected year occurring in specified calendar month, by cause of death.

Cause of death.	Total deaths.	Deaths occurring in specified calendar month.				
		January.	February.	March.	April.	May.
All causes.....	83	7	14	5	6	8
Gastric and intestinal diseases.....	8	1	.....	.....	2	.....
Respiratory diseases.....	10	2	5	.....	.....	.....
Malformations.....	4	1	1	.....	.....	1
Early infancy.....	37	2	7	3	4	3
Premature birth.....	12	1	3	1	1	.....
Congenital debility.....	24	1	4	2	2	3
Injuries at birth.....	1	.....	.....	.....	1	.....
Epidemic diseases.....	5	1	.....	.....	.....	1
External causes.....	1	.....	.....	.....	.....	.....
Diseases ill defined or unknown.....	4	.....	.....	.....	.....	.....
All other causes.....	14	1	1	1	.....	3

TABLE 2.—Deaths of infants born during selected year occurring in specified calendar month, by cause of death—Continued.

Cause of death.	Deaths occurring in specified calendar month.						
	June.	July.	August.	Sep-tember.	October.	Novem-ber.	Decem-ber.
All causes.....	10	3	6	6	6	6	6
Gastric and intestinal diseases.....	1			2	1		1
Respiratory diseases.....	1			1			1
Malformations.....						1	
Early infancy.....	4	1	4	3	3	2	1
Premature birth.....	2	1		1		2	
Congenital debility.....	2		4	2	3		1
Injuries at birth.....							
Epidemic diseases.....	1		1			1	
External causes.....						1	
Diseases ill defined or unknown.....	1	1	1		1		1
All other causes.....	2	1			1	1	3

TABLE 3.—Number and per cent distribution of deaths of infants born during selected year to mothers of specified nativity, by age at death.

Age at death.	Deaths among infants born during selected year to—					
	All mothers.		Native mothers.		Foreign-born mothers.	
	Number.	Per cent distribution.	Number.	Per cent distribution.	Number.	Per cent distribution.
All ages.....	83	100.0	52	100.0	31	100.0
Less than 1 month.....	47	56.6	28	53.8	19	61.3
Less than 1 day.....	7	8.4	7	13.5		
1 day but less than 2.....	10	12.0	6	11.5	4	12.9
2 days but less than 3.....	2	2.4	1	1.9	1	3.2
3 days but less than 7.....	7	8.4	5	9.6	2	6.5
1 week but less than 2.....	8	9.6	3	5.8	5	16.1
2 weeks but less than 1 month.....	13	15.7	6	11.5	7	22.6
1 month but less than 2.....	9	10.8	6	11.5	3	9.7
2 months but less than 3.....	3	3.6	1	1.9	2	6.5
3 months but less than 6.....	10	12.0	8	15.4	2	6.5
6 months but less than 9.....	6	7.2	4	7.7	2	6.5
9 months but less than 12.....	8	9.6	5	9.6	3	9.7

TABLE 4.—Births during selected year, infant deaths, infant mortality rate, and per cent of stillbirths, according to month and year of birth.

Month of birth.	Total births.	Live births.	Infant deaths.	Infant mortality rate.	Stillbirths.	
					Number.	Per cent of total births.
The year.....	1,015	981	83	84.6	34	3.3
December, 1912, and January and February, 1913.....	251	246	28	113.8	5	2.0
March, April, and May, 1913.....	254	242	17	70.2	12	4.7
June, July, and August, 1913.....	280	273	20	73.3	7	2.5
September, October, and November, 1913.....	230	220	18	81.8	10	4.3

TABLE 5.—Deaths of infants born during selected year occurring in specified month and year, according to month and year of birth.

Month of birth.	Total deaths.	Deaths occurring in—																							
		1912	1913											1914											
		Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
The year.....	83	2	4	12	4	4	7	7	3	6	6	6	6	4	3	2	1	2	1	3	.....	.....	.....	.....	.....
December, 1912.....	9	2	1	1	.....	.....	2	.....	1	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
January, 1913.....	14	.....	3	10	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
February, 1913.....	5	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
March, 1913.....	3	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....
April, 1913.....	8	.....	.....	.....	.....	4	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
May, 1913.....	6	.....	.....	.....	.....	.....	1	4	.....	1	.....	.....	.....	.....	.....	2	1	.....	.....	.....	.....	.....	.....	.....	.....
June, 1913.....	8	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
July, 1913.....	7	.....	.....	.....	.....	.....	.....	.....	2	2	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
August, 1913.....	5	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
September, 1913.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
October, 1913.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
November, 1913.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
														2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE 6.—Infants born during selected year to mothers of specified nativity and surviving at beginning of specified month of life, 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.	All mothers.				Native mothers.			Foreign-born mothers.				
	Total infant survivors.	Subsequent infant deaths in—			Infant survivors.	Subsequent infant deaths in—			Infant survivors.	Subsequent infant deaths in—		
		First year.		Specified month.		First year.		Specified month.		First year.		Specified month.
		Number.	Per cent. ^a			Number.	Per cent. ^a			Number.	Per cent. ^a	
First month.....	981	83	8.5	47	738	52	7.0	28	243	31	12.8	19
Breast exclusively.....	842	44	5.2	21	638	25	3.9	12	204	19	9.3	9
Mixed.....	29	4	13.8	1	22	3	13.6	1	7	1	14.3	1
Artificial exclusively.....	95	20	21.1	10	67	13	19.4	5	28	7	25.0	5
Not fed, died at once.....	15	15	100.0	15	11	11	100.0	11	4	4	100.0	4
Second month.....	934	36	3.9	10	710	24	3.4	6	224	12	5.4	4
Breast exclusively.....	747	19	2.5	5	568	11	1.9	2	179	8	4.5	3
Mixed.....	65	6	9.2	2	49	4	8.2	2	16	2	12.5	1
Artificial exclusively.....	122	11	9.0	3	93	9	9.7	3	29	2	6.9	1
Third month.....	924	26	2.8	2	704	18	2.6	1	220	8	3.6	1
Breast exclusively.....	684	14	2.0	1	517	9	1.7	1	167	5	3.0	1
Mixed.....	91	3	3.3	1	72	2	2.8	1	19	1	5.3	1
Artificial exclusively.....	149	9	6.0	1	115	7	6.1	1	34	2	5.9	1
Fourth month.....	922	24	2.6	6	703	17	2.4	5	219	7	3.2	1
Breast exclusively.....	601	11	1.8	2	448	7	1.6	2	153	4	2.6	1
Mixed.....	132	3	2.3	2	104	2	1.9	1	28	1	3.6	1
Artificial exclusively.....	189	10	5.3	2	151	8	5.3	2	38	2	5.3	1
Fifth month.....	916	18	2.0	1	698	12	1.7	1	218	6	2.8	1
Breast exclusively.....	546	9	1.6	1	408	5	1.2	1	138	4	2.9	1
Mixed.....	163	1	.6	1	122	1	.8	1	41	1	2.4	1
Artificial exclusively.....	207	8	3.9	1	168	6	3.6	1	39	2	5.1	1
Sixth month.....	915	17	1.9	3	697	11	1.6	2	218	6	2.8	1
Breast exclusively.....	488	8	1.6	1	364	4	1.1	1	124	4	3.2	1
Mixed.....	202	1	.5	1	151	1	.7	1	51	1	1.9	1
Artificial exclusively.....	225	8	3.6	2	182	6	3.3	2	43	2	4.7	1
Seventh month.....	912	14	1.5	2	695	9	1.3	2	217	5	2.3	1
Breast exclusively.....	375	5	1.3	1	283	3	1.1	1	92	2	2.2	1
Mixed.....	293	3	1.0	1	217	2	.9	1	76	1	1.3	1
Artificial exclusively.....	244	6	2.5	2	195	4	2.1	2	49	2	4.1	1
Eighth month.....	910	12	1.3	3	693	7	1.0	1	217	5	2.3	2
Breast exclusively.....	313	4	1.3	1	235	2	.9	1	78	2	2.6	1
Mixed.....	344	4	1.2	2	257	3	1.2	1	87	1	1.1	1
Artificial exclusively.....	253	4	1.6	2	201	2	1.0	1	52	2	3.8	1
Ninth month.....	907	9	1.0	1	692	6	.9	1	215	3	1.4	1
Breast exclusively.....	251	2	.8	1	192	1	.5	1	59	1	1.7	1
Mixed.....	385	5	1.3	1	286	4	1.4	1	99	1	1.0	1
Artificial exclusively.....	271	2	.7	1	214	1	.5	1	57	1	1.8	1

^a Not shown where base is less than 50.

TABLE 7.—Births during selected year in each ward of residence, according to nationality of mother.

Nationality of mother.	Total births.	Ward of residence (East Side).											Ward of residence (West Side).								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
All mothers.....	1,015	66	19	15	38	46	52	13	56	51	59	73	77	83	51	26	21	19	52	121	77
Native mothers.....	766	50	16	7	28	42	43	12	50	44	48	46	46	59	40	21	19	14	43	82	56
Foreign-born mothers.....	249	16	3	8	10	4	9	1	6	7	11	27	31	24	11	5	2	5	9	39	21
German.....	89	7	.....	2	4	3	3	.....	2	1	2	2	3	4	1	3	1	4	6	25	16
Polish.....	50	3	.....	1	.....	.....	2	.....	.....	.....	5	19	13	6	.....	.....	.....	.....	.....	1	.....
English, Irish, Scotch, and Welsh.....	21	1	.....	.....	1	.....	.....	.....	2	3	2	.....	2	.....	1	2	1	.....	.....	6	.....
Italian.....	17	2	1	3	1	.....	.....	1	1	.....	.....	.....	1	7	.....	.....	.....	.....	.....	.....	.....
French Canadian.....	12	.....	1	.....	.....	1	.....	.....	.....	1	.....	2	.....	1	2	.....	.....	.....	.....	1	.....
English Canadian.....	10	.....	.....	.....	.....	1	.....	.....	.....	2	.....	.....	2	2	2	.....	.....	.....	.....	1	.....
Other Canadian.....	19	2	.....	1	4	.....	2	.....	1	.....	1	1	2	2	5	.....	.....	1	.....	2	.....
All other ^a	30	1	1	1	.....	.....	1	.....	1	.....	1	2	11	2	.....	.....	.....	.....	.....	2	4
Not reported.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1

^a Including 12 Lithuanian, 6 Russian, 3 Jewish, 2 Magyar, and 1 each of Danish, Dutch, Flemish, French, Greek, Slovak, and Slavic not otherwise specified.

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.							No earnings and not reported.
		Under \$450	\$450 to \$549	\$550 to \$649	\$650 to \$849	\$850 to \$1,049	\$1,050 to \$1,249	\$1,250 and over.	
All occupations.....	1,015	79	103	151	255	159	94	143	31
Manufacturing and mechanical industries.....	514	33	62	84	130	96	42	57	10
Blacksmiths.....	12			1	6	3	1	1	
Boilermakers.....	14		2	4	2	5	1		
Builders and contractors.....	27			2	2	4	2	14	3
Compositors, linotype operators, and pressmen.....	9		1				4	3	1
Electricians.....	14	1		2	5	3	2	1	
Engineers and firemen.....	22	1		4	4	5	3	4	1
Factory operatives ^a	197	17	34	41	62	32	4	6	1
Glass.....	28	3	3	5	9	7	1		
Lumber, furniture, and wood-ware.....	74	10	15	16	24	8	1		
Metal.....	45	2	9	8	11	9	2	4	
Other industries.....	50	2	7	12	18	8		2	1
Laborers, helpers, and apprentices.....	38	11	10	12	4				1
Machinists, millwrights, and toolmakers.....	71		3	6	26	22	10	4	
Manufacturers, officials, and managers.....	27					2	2	22	1
Skilled mechanics, building trades.....	64	1	9	10	16	14	11	1	2
Other pursuits.....	19	2	1	4	3	6	2	1	
Trade.....	150	11	6	14	28	20	16	48	7
Bankers, brokers, real estate and insurance agents.....	8						3	5	
Commercial travelers and salesmen.....	55		1	5	12	12	10	14	1
Deliverymen.....	18	2	1	5	7	2			1
Proprietors, officials, etc., mercantile establishments.....	57	4	2	3	6	6	3	28	5
Other pursuits.....	12	5	2	1	3			1	
Transportation.....	128	8	20	23	35	16	14	10	2
Chauffeurs, teamsters, and expressmen.....	30	1	7	12	6	3			1
Conductors, motormen, and trainmen.....	53	1	1	6	20	9	8	7	1
Express, post, telegraph, and telephone employees.....	11			1	4	3	3		
Laborers.....	25	6	12	4	3				
Proprietors, officials, and managers.....	5						2	3	
Other pursuits.....	4				2	1	1		
Extraction of minerals.....	74	19	8	9	24	10	2		2
Mineworkers.....	74	19	8	9	24	10	2		2
Clerical occupations, all industries.....	55	1		9	19	10	12	4	
Domestic and personal service.....	36	1	4	8	12	4	3	4	
Barbers.....	6			2	2	1		1	
Saloonkeepers and bartenders.....	12	1		1	5	1	2	2	
Servants.....	6		1	2	3				
Other pursuits.....	12		3	3	2	2	1	1	
Professional and semiprofessional service.....	26	1			1	1	4	17	2
Public service.....	14	2		3	5	2		2	
Laborers.....	6	2		2	2				
Officials, firemen, and policemen.....	8			1	3	2		2	
Agriculture.....	10	3	3	1	1		1	1	
Farmers.....	2						1	1	
Farm laborers.....	8	3	3	1	1				
No occupation and not reported.....	8								8

^a Excluding persons engaged in work in the factory which is not peculiar to the industry, as clerks, machinists, boilermakers, etc.

TABLE 9.—Births during selected year in families of specified number of persons, and average number of persons per family, according to amount of family income and nativity of mother.

Family income and nativity of mother.	Average number of persons of persons per family.	Total births.	Births during selected year in—						
			Families of specified number ^a of persons.						
			1	2	3	4	5 or 6	7 or 8	Over 8.
All mothers.....	3.7	1,015	4	342	242	171	158	70	28
Under \$550.....	3.4	140	2	57	34	18	18	9	2
\$550 to \$649.....	3.5	138	1	45	30	34	19	8	1
\$650 to \$849.....	3.6	258	.....	86	70	39	43	16	4
\$850 to \$1,049.....	3.8	172	.....	49	43	40	23	13	4
\$1,050 to \$1,249.....	4.0	111	.....	1	36	23	13	19	5
\$1,250 and over.....	3.7	160	.....	58	40	22	24	8	8
No income.....	2.0	1	.....	1	.....	.....	.....	.....	.....
Not reported.....	4.6	35	.....	10	.....	5	12	2	4
Native mothers.....	3.5	766	4	294	181	126	108	34	19
Under \$550.....	3.0	86	2	46	17	8	9	3	1
\$550 to \$649.....	3.3	97	1	36	21	23	13	3	.....
\$650 to \$849.....	3.5	208	.....	75	57	31	32	10	3
\$850 to \$1,049.....	3.5	125	.....	41	33	28	15	5	3
\$1,050 to \$1,249.....	3.6	89	.....	1	34	19	12	5	3
\$1,250 and over.....	3.5	135	.....	53	33	20	17	6	6
No income.....	2.0	1	.....	1	.....	.....	.....	.....	.....
Not reported.....	4.6	25	.....	8	.....	1	4	7	2
Foreign-born mothers.....	4.4	249	.....	48	61	45	50	36	9
Under \$550.....	4.0	54	.....	11	17	10	9	6	1
\$550 to \$649.....	4.0	41	.....	9	9	11	6	5	1
\$650 to \$849.....	4.2	50	.....	11	13	8	11	6	1
\$850 to \$1,049.....	4.4	47	.....	8	10	12	8	8	1
\$1,050 to \$1,249.....	5.8	22	.....	2	4	1	4	9	2
\$1,250 and over.....	4.6	25	.....	5	7	2	7	2	2
Not reported.....	4.6	10	.....	2	1	1	5	.....	1

^a Excluding infant born during selected year.

TABLE 10.—Births during selected year to mothers of specified nativity 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.	All mothers.			Native mothers.			Foreign-born mothers.		
	Total births.	Gainfully employed.		Births.	Gainfully employed.		Births.	Gainfully employed.	
		Number.	Per cent. ^a		Number.	Per cent. ^a		Number.	Per cent. ^a
All classes.....	1,015	125	12.3	766	69	9.0	249	56	22.5
Under \$450.....	79	26	32.9	38	9	23.7	41	17	.....
\$450 to \$549.....	103	19	18.4	67	11	16.4	36	8	.....
\$550 to \$649.....	151	23	15.2	106	11	10.4	45	12	.....
\$650 to \$849.....	255	27	10.6	206	17	8.3	49	10	.....
\$850 to \$1,049.....	159	15	9.4	123	11	8.9	36	4	.....
\$1,050 to \$1,249.....	94	4	4.3	79	3	3.8	15	1	.....
\$1,250 and over.....	143	2	1.4	125	1	.8	18	1	.....
No earnings.....	7	4	.....	6	3	.....	1	1	.....
Not reported.....	24	5	.....	16	3	.....	8	2	.....

^a Not shown where base is less than 50.

TABLE 11.—*Births from all pregnancies,^a infant deaths, infant mortality rate, and per cent 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. ^b	Stillbirths.	
					Num-ber.	Per cent of total births. ^b
All pregnancies	3,081	2,965	271	91.4	116	3.8
Under 20.....	303	285	29	101.8	18	5.9
20 to 24.....	1,090	1,057	103	97.4	33	3.0
25 to 29.....	906	875	77	88.0	31	3.4
30 to 34.....	505	484	44	90.9	21	4.2
35 to 39.....	225	216	15	69.4	9	4.0
40 and over.....	52	48	3		4	7.7
First pregnancy	1,003	956	99	103.6	47	4.7
Under 20.....	243	228	24	105.3	15	6.2
20 to 24.....	487	467	46	98.5	20	4.1
25 to 29.....	209	203	20	98.5	6	2.9
30 to 34.....	56	51	8	156.9	5	8.9
35 to 39.....	8	7	1		1	
Second pregnancy	690	671	51	76.0	19	2.8
Under 20.....	57	54	5	92.6	3	5.3
20 to 24.....	348	340	27	79.4	8	2.3
25 to 29.....	205	199	15	75.4	6	2.9
30 to 34.....	59	57	2	35.1	2	3.4
35 to 39.....	21	21	2			
Third pregnancy	477	463	43	92.9	14	2.9
Under 20.....	3	3				
20 to 24.....	187	182	21	115.4	5	2.7
25 to 29.....	192	185	14	75.7	7	3.6
30 to 34.....	73	71	7	98.6	2	2.7
35 to 39.....	18	18				
40 and over.....	4	4	1			
Fourth pregnancy	308	300	27	90.0	8	2.6
20 to 24.....	51	51	7	137.3		
25 to 29.....	154	148	15	101.4	6	3.9
30 to 34.....	71	69	4	58.0	2	2.8
35 to 39.....	30	30	1			
40 and over.....	2	2				
Fifth pregnancy	212	207	21	101.4	5	2.4
20 to 24.....	17	17	2			
25 to 29.....	86	83	6	72.3	3	3.5
30 to 34.....	81	80	11	137.5	1	1.2
35 to 39.....	23	22	1		1	
40 and over.....	5	5	1			
Sixth pregnancy	140	130	13	100.0	10	7.1
25 to 29.....	45	43	6		2	
30 to 34.....	67	62	5	80.6	5	7.5
35 to 39.....	22	19	2		3	
40 and over.....	6	6				
Seventh pregnancy	98	95	5	52.6	3	3.1
25 to 29.....	12	11	1		1	
30 to 34.....	52	51	2	39.2	1	1.9
35 to 39.....	29	28	2		1	
40 and over.....	5	5				
Eighth pregnancy	66	60	3	50.0	6	9.1
25 to 29.....	3	3				
30 to 34.....	29	27	1		2	
35 to 39.....	28	27	2		1	
40 and over.....	6	3			3	

^a Excluding miscarriages.^b Not shown where base is less than 50.

TABLE 11.—*Births from all pregnancies,^a 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. ^b	Stillbirths.	
					Number.	Per cent of total births. ^b
Ninth pregnancy	46	43	4		3	
30 to 34.....	14	13	3		1	
35 to 39.....	25	23	1		2	
40 and over.....	7	7				
Tenth pregnancy	27	27	3			
30 to 34.....	2	2				
35 to 39.....	16	16	3			
40 and over.....	9	9				
Eleventh pregnancy	9	8	2		1	
30 to 34.....	1	1	1			
35 to 39.....	4	4				
40 and over.....	4	3	1		1	
Twelfth pregnancy	4	4				
35 to 39.....	1	1				
40 and over.....	3	3				
Thirteenth pregnancy	1	1				
40 and over.....	1	1				

^a Excluding miscarriages.^b Not shown where base is less than 50.

TABLE 12.—Births to mothers married specified number of years, stillbirths, and infant deaths, by number of births to mother.

Number of births to mother.	Total births.	Number of years of mother's married life.																			
		Under 2	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 and over.
Total:																					
Total births.....	3,081	177	138	196	180	157	214	204	131	151	192	104	142	117	114	130	112	82	86	55	399
Stillbirths.....	116	10	1	4	7	8	7	8	1	7	3	5	8	2	9	4	7	2	2	1	20
Infant deaths.....	271	20	15	12	19	10	20	19	18	13	14	7	11	11	11	14	13	8	6	.....	30
1 birth:																					
Births.....	308	169	72	23	10	8	12	6	3	2	2	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
Stillbirths.....	13	10	.....	.....	.....	.....	2	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Infant deaths.....	34	17	9	2	2	1	2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2 births:																					
Births.....	434	8	66	146	76	44	26	18	12	18	4	4	2	2	2	.....	.....	2	.....	.....	2
Stillbirths.....	15	.....	1	2	3	3	2	2	.....	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....
Infant deaths.....	30	3	6	6	7	3	1	2	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3 births:																					
Births.....	483	.....	.....	27	90	84	90	51	42	21	24	12	24	9	.....	3	.....	6	.....	.....	.....
Stillbirths.....	16	.....	.....	2	4	3	.....	2	.....	1	1	.....	2	.....	.....	.....	.....	.....	.....	.....	.....
Infant deaths.....	37	.....	.....	4	9	3	4	5	5	2	2	.....	.....	.....	.....	.....	.....	1	.....	.....	.....
4 births:																					
Births.....	404	.....	.....	.....	4	16	56	88	32	44	36	12	28	20	28	4	24	8	.....	.....	4
Stillbirths.....	11	.....	.....	.....	.....	1	1	4	.....	2	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....
Infant deaths.....	35	.....	.....	.....	1	1	8	4	5	6	3	.....	2	.....	1	1	2	1	.....	.....	.....
5 births:																					
Births.....	330	.....	.....	.....	.....	5	30	35	30	10	60	25	45	30	10	10	5	5	20	.....	10
Stillbirths.....	12	.....	.....	.....	.....	1	2	.....	.....	.....	.....	1	3	1	.....	1	2	.....	.....	.....	1
Infant deaths.....	29	.....	.....	.....	.....	2	5	6	3	.....	3	.....	3	3	.....	1	1	.....	1	.....	1
6 births:																					
Births.....	264	.....	.....	.....	.....	.....	.....	6	12	42	30	30	36	24	18	18	12	12	12	.....	12
Stillbirths.....	11	.....	.....	.....	.....	.....	.....	.....	.....	1	3	1	3	1	3	1	1	.....	.....	.....	.....
Infant deaths.....	31	.....	.....	.....	.....	.....	.....	1	3	3	2	4	2	4	4	4	2	.....	2	.....	.....
7 births:																					
Births.....	224	.....	.....	.....	.....	.....	.....	.....	.....	14	28	21	7	14	14	35	14	21	21	7	28
Stillbirths.....	6	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	1	.....	.....	1	.....	.....	1	.....	.....	1
Infant deaths.....	22	.....	.....	.....	.....	.....	.....	.....	.....	2	4	3	2	2	.....	2	1	3	1	.....	2

TABLE 12.—Births to mothers married specified number of years, stillbirths, and infant deaths, by number of births to mother—Continued.

Number of births to mother.	Total births.	Number of years of mother's married life.																		
		Under 2.	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 and over.
8 births:																				
Births.....	176									8				8	24	24	24	16	8	
Stillbirths.....	16									2					4			1	1	
Infant deaths.....	15													1	3	4		2		
9 births:																				
Births.....	171													9	18	27	9	18	9	27
Stillbirths.....	5														2			1		1
Infant deaths.....	14													1	3	1	2	2		
10 births:																				
Births.....	170															10	10		10	10
Stillbirths.....	7																			
Infant deaths.....	10															1	2		1	
11 births:																				
Births.....	55																	11		11
Stillbirths.....	2																	2		
Infant deaths.....	8																	3		
12 births:																				
Births.....	48																			
Stillbirths.....	1																			
Infant deaths.....	6																			
14 births:																				
Births.....	14																			
Stillbirths.....	1																			
Infant deaths.....																				

TABLE 13.—*Mothers reporting specified number of miscarriages, by number of pregnancies to mother and nativity of mother.*

Pregnancies to mother and nativity of mother	Total mothers.	Mothers reporting specified number of miscarriages.					
		None.	1	2	3	4	6
All mothers.....	997	895	77	17	5	2	1
Pregnancies:							
1.....	296	296					
2.....	216	204	11	1			
3.....	154	140	11	3			
4.....	106	86	19	1			
5.....	71	54	14	3			
6.....	48	37	11				
7.....	28	26	1		1		
8.....	23	15	3	3	1		1
9.....	21	16	2	1	2		
10.....	17	14	1	2			
11.....	10	4	3	1	1	1	
12.....	4	2	1	1			
13.....	3	1		1		1	
Native mothers.....	754	676	57	15	4	2	
Pregnancies:							
1.....	258	258					
2.....	171	160	10	1			
3.....	112	101	10	1			
4.....	72	57	14	1			
5.....	47	36	8	3			
6.....	33	24	9				
7.....	18	17			1		
8.....	12	6	2	3	1		
9.....	6	3	1	1	1		
10.....	12	9	1	2			
11.....	7	2	2	1	1	1	
12.....	3	2		1			
13.....	3	1		1		1	
Foreign-born mothers.....	243	219	20	2	1		1
Pregnancies:							
1.....	38	38					
2.....	45	44	1				
3.....	42	39	1	2			
4.....	34	29	5				
5.....	24	18	6				
6.....	15	13	2				
7.....	10	9	1				
8.....	11	9	1				1
9.....	15	13	1		1		
10.....	5	5					
11.....	3	2	1				
12.....			1				
13.....	1						

TABLE 14.—*Mothers reporting specified number of stillbirths, by number of births to mother and nativity of mother.*

Births to mother and nativity of mother.	Total mothers.	Mothers reporting specified number of stillbirths.			
		None.	1	2	3
All mothers.....	997	901	79	14	3
Births:					
1.....	308	295	13		
2.....	217	203	13	1	
3.....	161	146	14	1	
4.....	101	92	7	2	
5.....	66	57	6	3	
6.....	44	37	5		2
7.....	32	27	4	1	
8.....	22	10	8	4	
9.....	19	14	5		
10.....	17	13	2	1	1
11.....	5	4		1	
12.....	4	3	1		
14.....	1		1		
Native mothers.....	754	684	59	10	1
Births:					
1.....	267	256	11		
2.....	172	159	12	1	
3.....	116	106	9	1	
4.....	67	60	5	2	
5.....	47	40	5	2	
6.....	29	24	4		1
7.....	20	15	4	1	
8.....	12	6	4	2	
9.....	6	5	1		
10.....	11	9	2		
11.....	4	3		1	
12.....	2	1	1		
14.....	1		1		
Foreign-born mothers.....	243	217	20	4	2
Births:					
1.....	41	39	2		
2.....	45	44	1		
3.....	45	40	5		
4.....	34	32	2		
5.....	19	17	1	1	
6.....	15	13	1		1
7.....	12	12			
8.....	10	4	4	2	
9.....	13	9	4		
10.....	6	4		1	1
11.....	1	1			
12.....	2	2			

TABLE 15.—*Mothers reporting specified number of infant deaths, by number of live births to mother and nativity of mother.*

Live births to mother and nativity of mother.	Total mothers.	Mothers reporting specified number of infant deaths.				
		None.	1	2	3	4
All mothers.....	983	763	179	32	8	1
Live births:						
1.....	309	273	36			
2.....	219	189	29	1		
3.....	158	121	36	1		
4.....	98	71	19	6	2	
5.....	63	42	15	6		
6.....	45	21	17	6	1	
7.....	36	16	14	5	1	
8.....	16	10	4	1	1	
9.....	17	10	3	2	1	1
10.....	13	6	5	2		
11.....	5	3		1	1	
12.....	3		1	1	1	
13.....	1	1				
Native mothers.....	742	597	121	18	5	1
Live births:						
1.....	269	243	26			
2.....	170	148	21	1		
3.....	114	90	23	1		
4.....	65	49	11	4	1	
5.....	45	30	11	4		
6.....	30	14	11	4	1	
7.....	19	7	10	1	1	
8.....	7	5	2			
9.....	8	4	2		1	1
10.....	9	4	4	1		
11.....	4	2		1	1	
12.....	1			1		
13.....	1	1				
Foreign-born mothers.....	241	166	58	14	3	
Live births:						
1.....	40	30	10			
2.....	49	41	8			
3.....	44	31	13			
4.....	33	22	8	2	1	
5.....	18	12	4	2		
6.....	15	7	6	2		
7.....	17	9	4	4		
8.....	9	5	2	1	1	
9.....	9	6	1	2		
10.....	4	2	1	1		
11.....	1	1				
12.....	2		1		1	

TABLE 16.—Births during selected year in dwellings of specified number of rooms, according to number of persons in dwelling and nativity of mother.

Persons ^a in dwelling and nativity of mother.	Total births.	Number of rooms in dwelling.														Not reported.
		1	2	3	4	5	6	7	8	9	10	11	12	13	16	
All mothers.....	1,015	2	21	33	54	266	226	170	122	72	26	7	5	2	1	8
Persons in dwelling:																
2.....	236		10	13	13	84	49	30	18	9	5	1	2			2
3.....	222		6	6	14	63	56	35	22	15	3	1				1
4.....	194		1	7	11	48	42	36	27	10	7	2	1			2
5.....	134		1	1	4	11	30	34	25	16	7	3		1		1
6.....	87		1	2	2	4	18	14	16	14	2	1				
7.....	65		1				8	6	5	5	5	2			1	
8.....	33		1				8	6	5	5	5	2			1	
9.....	22						2	6	5	3	4	1		1		
10.....	8						1	1	2	1	1	1		1		
More than 10.....	11				1		2		1	4	1	1				
Not reported.....	3							1								2
Native mothers.....	766		9	18	35	191	170	139	105	56	22	7	5	1	1	7
Persons in dwelling:																
2.....	204		6	10	9	74	43	27	17	9	4	1	2			2
3.....	174		1	4	9	49	42	31	20	13	3	1				1
4.....	152			3	8	34	34	29	24	9	6	2	1			2
5.....	92				8	17	18	21	16	7	3		1			1
6.....	59				1	10	11	14	11	9	1	1				
7.....	45		1			5	13	11	9	3	1	1			1	
8.....	15					2	3	1	4	3	2					
9.....	16						5	4	3	2	1		1			
10.....	4						1		1	1		1				
More than 10.....	4			1				1	1					1		
Not reported.....	1															1
Foreign-born mothers.....	249	2	12	15	19	75	56	31	17	16	4			1		1
Persons in dwelling:																
2.....	32		4	3	4	10	6	3	1		1					
3.....	48		5	2	5	14	14	4	2	2						
4.....	42		1	4	3	14	8	7	3	1	1					
5.....	42		1	1	4	3	13	16	4							
6.....	28			1	2	3	8	3	2	3	5	1				
7.....	20					1	5	4	4	3	3					
8.....	18		1				6	3	4	1	2			1		
9.....	6						2	1	1		2					
10.....	4						1		2	1						
More than 10.....	7					2			3	1	1					
Not reported.....	2						1									1

^a Excluding infant born during selected year.

TABLE 17.—Dwellings of families included in study in each ward or ward group, according to specified sanitary condition.

Sanitary condition of dwelling.	Total dwellings.	Ward of residence.									
		East Side.					West Side.				
		1	2, 3, 4, 5	6, 9	7, 8	10	11, 12	13, 14, 18	15, 16, 17	19	20
Total.....	1,005	65	118	102	69	58	149	184	66	118	76
Type of toilet:											
Water-closet.....	490	32	104	65	61	27	13	94	53	20	21
Privy.....	515	33	14	37	8	31	136	90	13	98	55
Drinking water:											
One source.....	977	64	108	101	66	56	146	182	65	115	74
Dug well.....	616	35	49	65	24	35	125	97	27	102	57
Driven well.....	339	29	54	35	37	21	18	82	35	11	17
Purchased.....	20		4	1	5		3	3	3	1	
City.....	2		b1							1	
More than one source.....	27	1	9	1	3	2	3	2	1	3	2
Not reported.....	1		1								

^a Dwelling means place in which family lived during greater part of year following infant's birth, or, in case of stillborn child, where mother spent the greater part of her pregnancy period.^b Purified by private filtration plant.

SCHEDULE USED IN STUDY.

C. B.—14.

WARD No. ----- B. C. No. ----- D. C. No. -----

BABY. 1. M. F. 2. L. I. 3. L. B., S. B.; At 1 year: Alive, Dead

4. Date birth

5. Phy'n, Mwf.—Name

Address

6. Death (a) Date

(b) Age mos.

(c) Causes

(d) Physician

Defects, Deforms.: None, Over. Eyes: OK Over

7. Feeding (Months).

1	2	3	4	5	6	7	8	9	10	11	12

(a) Breast

(b) Mixed

(c) Artificial

(d) Night feedings

○ Reasons for change

8. Milk dealer (a) Name

(b) Kind: Grocery, Dairy, Farm, Cow shed

FATHER. 9. Nationality

10. Age 11. Sp. Eng.: Y. N. 12. Rd. & Wr.: Y. N. 13. Yrs. U. S.

14. Occ.

Ind.

Empr, OA, WE

HOME. 15. Street, alley. 16. Front, rear. 17. Fams. in bldg.

18. Persons: (a) Family

(b) Lodgers

(c) Others

(d) Total:

19. Rooms

20. Vent'n: (a) Means G. F. P.

(b) Results Good, Fair, Poor

21. Clean, Medium, Dirty

22. Water (a) Source: City, Spring, Dug well, Driven well. (b) In, out

23. Toilet (a) Type

Fam. exc. use: Yes, No

(b) House, porch, yard, cellar. (c) Persons using

24. Direct city sewer connection: (a) Sinks: Yes, No (b) Toilet, Yes, No

INCOME. 25. Annual earnings (a) Father, \$

(b) Mother, \$

(c) Other income, \$

(d) Total, \$

MONTHLY RENTAL. 26. Amount, \$

Own, free

MOTHER. 27. Nationality

28. Age

29. Marriage ages

duration

years

30. Sp. Eng.: Yes, No 31. Rd. and Wr.: Yes, No 32. Yrs. U. S.

33. Pregnancies

(a) Losses

	Mother's age	Year of—	Period	Cause	Age at Death
1st					
2d					
3d					
4th					
5th					
6th					
7th					
8th					
9th					
10th					
11th					
12th					
13th					
14th					
15th					

Name

Born at

MOTHER

Name

Address

FATHER

Name

Address

34. Record of employments

Age

1		
2		
3		
4		
5		
6		
7		
8		

35. Work (a) Yr. before conf.

(b) Yr. after conf.

(c) Ceased

before (d) Resumed

after

36. From baby ac. work from

(a) Reg., Irreg. (b) Extent

(c) Caretaker: Relation

Age

37. Usual home duties: Servant No servant Occasional help.

(a) Ceased part of duties

before (b) All

before

(c) Resumed part of duties

after (d) All

after

GENERAL TABLES.

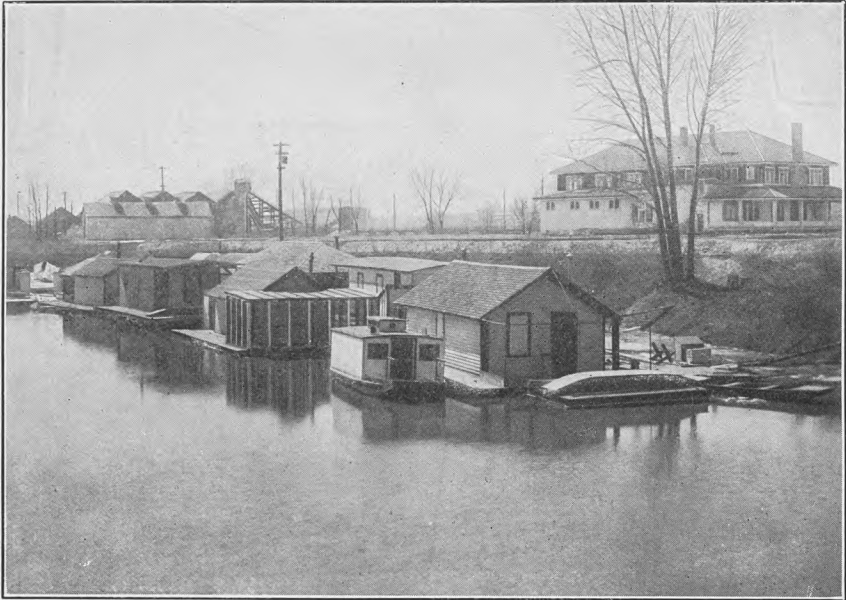


PLATE I.—THE ATTRACTIVE SIDE OF HOUSEBOATING. TIED UP FOR THE WINTER IN LAKE LINTON.

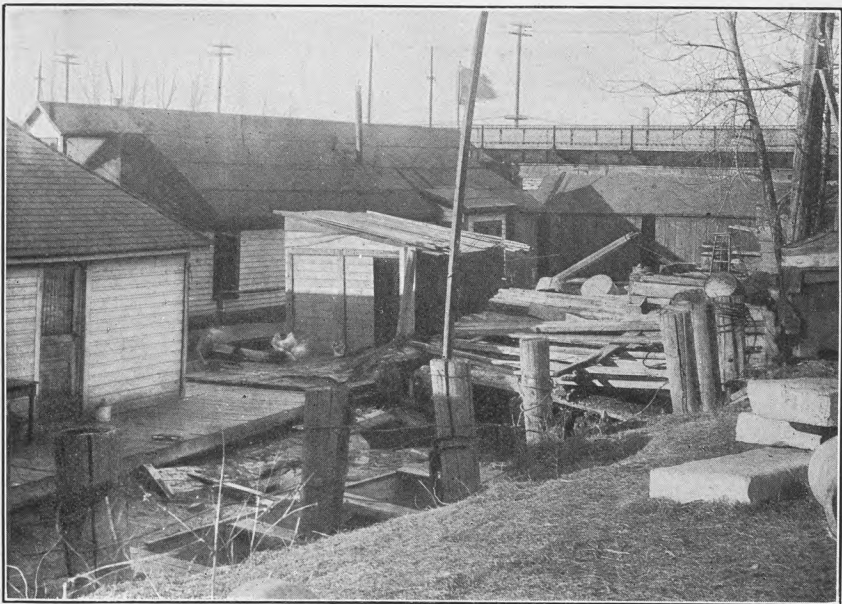


PLATE II.—A REAR VIEW OF SOME HOUSEBOATS.

The surface of the water between the houseboats and the river bank is covered with rubbish and with filth from a sewer opening not far away.



PLATE III.—A TYPE OF INSANITARY DWELLING.

The dwelling in the foreground is representative of those which, after they once become vacant, were not permitted to be reoccupied until they were made sanitary. In the shed in the rear a horse was stabled. Equidistant between house and shed is the shallow well which supplied the water for household use.



PLATE IV.—REAR OF HOUSES IN AN OUTLYING SECTION WHERE SEWER CONNECTION HAD NOT BEEN MADE WITH THEM.



PLATE V.—A DRAINAGE PROBLEM IN SAGINAW.



PLATE VI.—NOT FAR FROM THE RIVER, HOUSING AND SANITARY CONDITIONS BAD.



PLATE VII.—REAR VIEW OF TWO HOUSES ALONG A SEMISTAGNANT STREAM. A BETTER CLASS OF HOMES JUST ACROSS THE STREET.

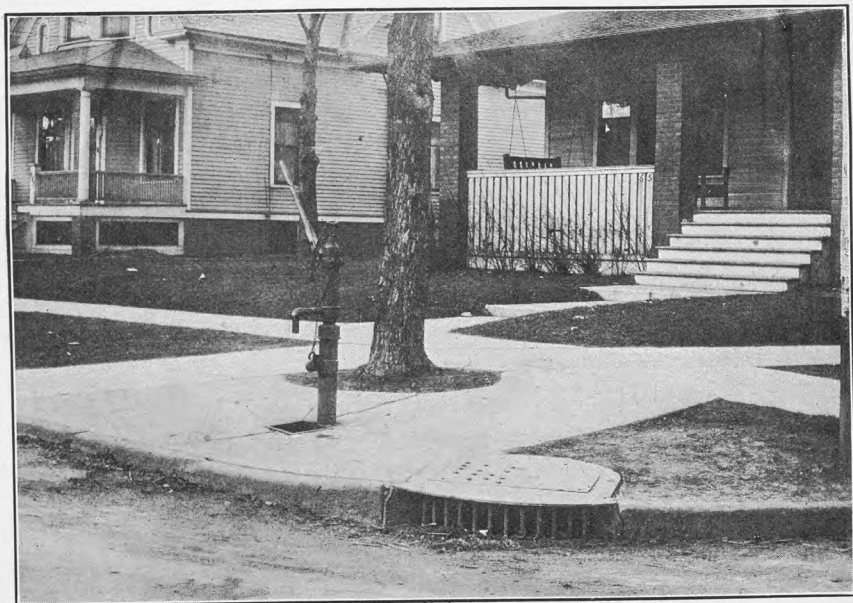


PLATE VIII.—A MUNICIPAL DEEP WELL.

Located at the street corner and within a few feet of a sewer opening. The pump has a public drinking cup attached.



PLATE IX.—ANOTHER MUNICIPAL DEEP WELL.

Located in a good residence section with a public drinking cup attached to the pump.

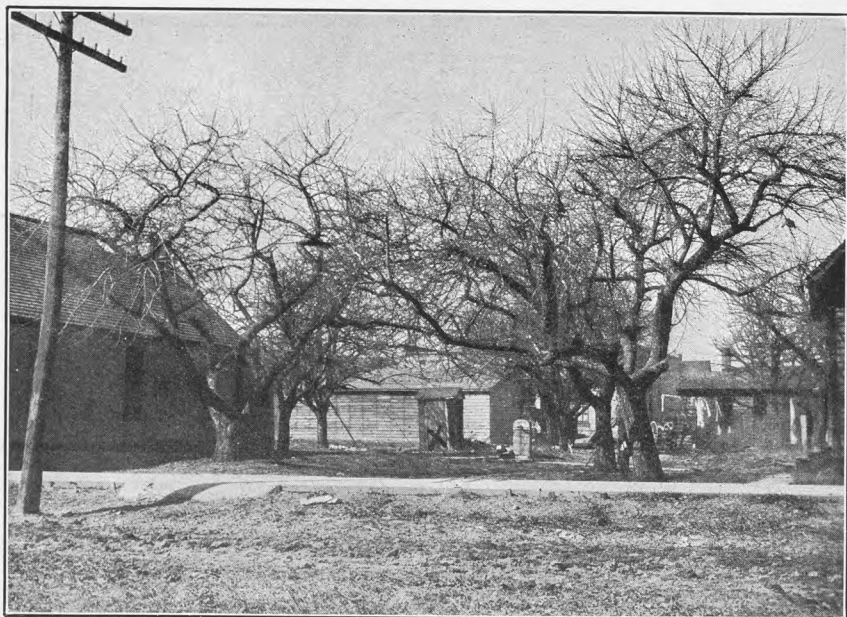


PLATE X.—VIEW OF THE DUG WELL WHICH SUPPLIED DRINKING WATER TO TWO FAMILIES.

Note position in relation both to privies and the slope of the ground. Drainage is so poor in this section of the city that sidewalks and street are both elevated considerably above the natural surface level.



PLATE XI.—VIEW OF A TYPICAL UNPAVED STREET IN SAGINAW.

Deep, grass-grown roadside ditches containing ashes and rubbish, and excellent sidewalks, were found along the unpaved streets.



PLATE XII.—LARGE RUBBISH DUMP.

At the time of the study both animal and vegetable refuse was thrown here. It became quite offensive in the summer time and harbored rats at all seasons of the year.

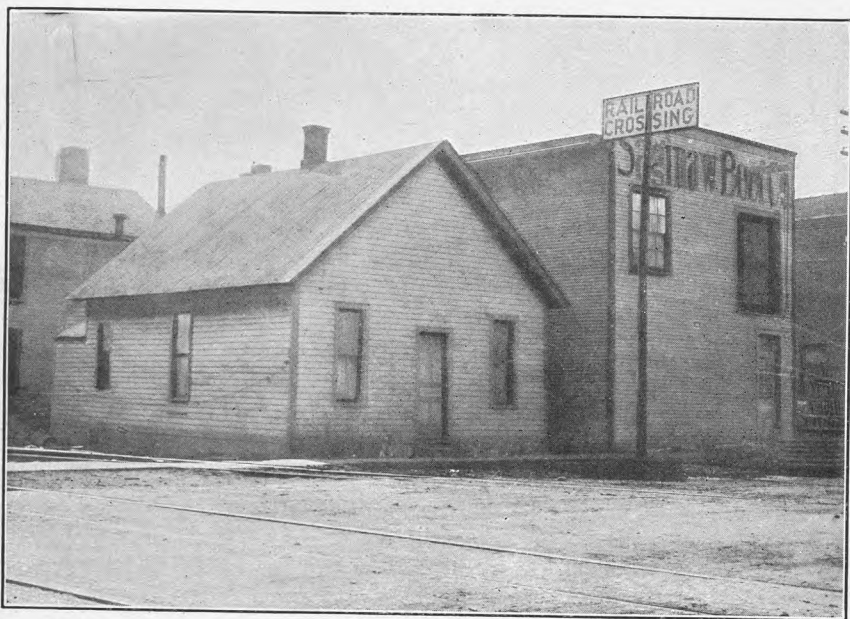


PLATE XIII.—TYPE OF STRUCTURE COMMON NEAR THE RAILROAD TRACKS.
In this instance the lot is crowded and below street level, and the house has insufficient light and air.



PLATE XIV.—A REAR HOUSE WAS RARELY SEEN IN SAGINAW.
The one above, located in a factory district, housed the family of a baby scheduled in the report. This family included eight persons.

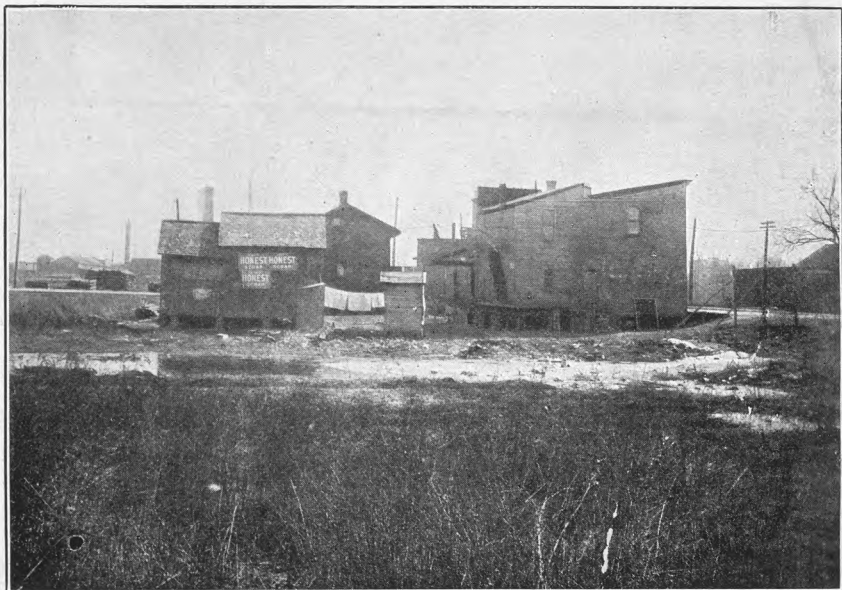


PLATE XV.—FRAME BUILDINGS ON WOODEN PILES.

Located in a low-lying part of the city not far from the river. Compare the street level with the surface level.



PLATE XVI.—A NEARER VIEW OF THE SAME BUILDING. DID THE CITY NEED A BUILDING CODE?