The CORRECTION FOR RESIDENCE OF BIRTH AND INFANT MORTALITY RATES *in* CATTARAUGUS COUNTY

*A Summary of Recent Studies made by the Research Division of the Milbank Memorial Fund**

THE increasing number of mothers in rural communities and small villages and towns who go to city hospitals for confinement is a fact of common knowledge. What is not so fully realized is the effect of this changing condition upon the accuracy of officially recorded birth and infant mortality rates in view of the practice, universally followed in the statistical bureaus, of crediting all births and deaths to the places where they occur rather than to the places where the mothers reside.

That this is not merely an academic question for statisticians to ponder over, but is a matter of practical importance to sanitarians who wish to use birth and infant mortality rates accurately, is clearly emphasized by a fairly intensive study in Cattaraugus County, which contains about 40,000 persons ordinarily classified as "rural" and about 30,000 living in towns and cities having a population of 10,000 or more.

The geographical location of a given community in relation to hospital facilities determines to a large extent the degree to which the locally recorded births and deaths are affected by this factor of residence. In Cattaraugus County, the hospitals in Olean provide medical service not only to local residents but also to many residents of nearby rural districts. Since this city is near the eastern and southern lines it is readily accessible to residents of Pennsylvania and of

*Acknowledgments are made to the Cattaraugus County Health Department, especially to Miss Frances King, statistician, for assistance in compiling the data and to the Bureau of Vital Statistics, the New York State Department of Health, for access to the certificates.

Allegany County, as is shown in the accompanying map. On the other hand, residents of northern and western Cattaraugus County find it convenient to go to Buffalo or Jamestown, New York, for hospital care, and some residents in the southern districts go to Bradford, Pennsylvania. Obviously, the official vital statistics for Cattaraugus County are affected in two ways: (1) by the inclusion of non-residents and (2) by the allocation of residents to other localities.

Resident Birth Rates

There has been a steady increase in the number of births to mothers not residents of Cattaraugus County which have been registered in Olean as shown by the figures in the accompanying table. Non-resident births registered in other parts of the County have numbered from 3 to 15 annually. Balanced against these are the births to residents mothers which occurred elsewhere and were officially recorded, therefore, outside the County. The number of resident births recorded in adjoining areas was ascertained by an examination of all birth certificates registered in Allegany, Chautauqua, Erie and Wyoming Counties and in Bradford, Pennsylvania, for the years 1916, 1920, 1925, 1926 and 1927. It was assumed that the number of births to Cattaraugus County mothers occurring in more distant places would be too few to materially affect the birth rates. The non-resident births were deducted from the total number of births registered in the County for each year from 1926 to 1927, and a birth rate for

Births to mothers, not residents of Cattaraugus County, registered at Olean, 1916-1927.

Year	Number of Births	Year	Number of Births
1916	10	1922	31
1917	21	1923	36
1918	23	1924	51
1919	31	1925	57
1920	37	1926	86
1921	43	1927	94

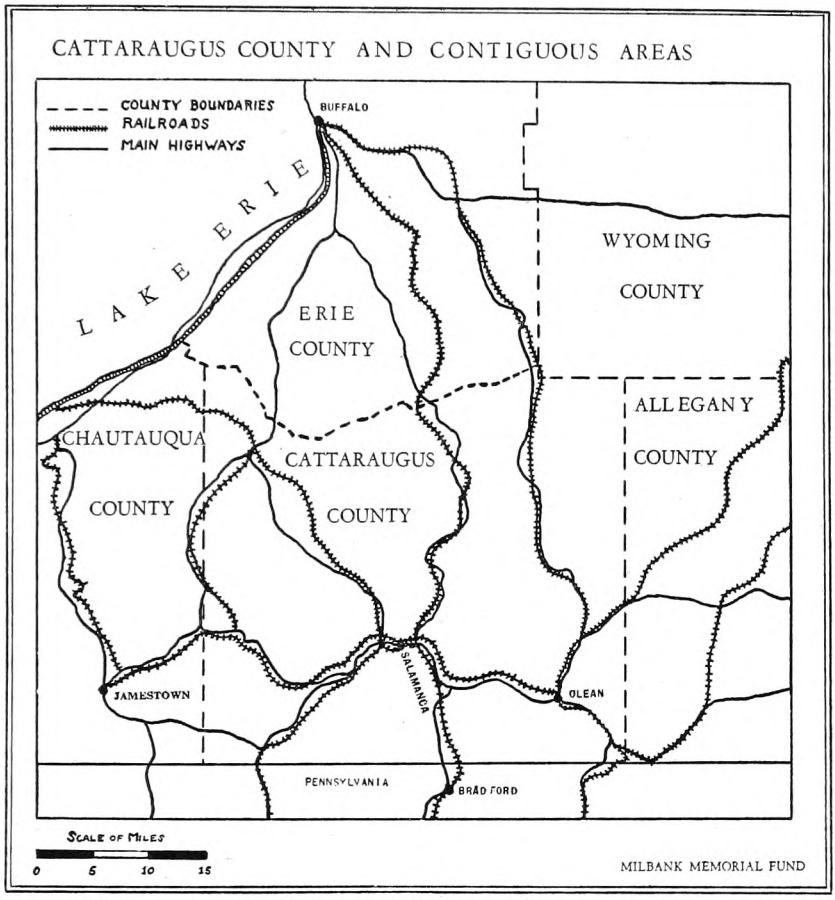


Fig. 1. Map showing accessibility by railways and highways of Cattaraugus County to neighboring cities and of neighboring rural districts to Cattaraugus County cities.

resident births within the County was computed for each year. For the five years noted above, resident births recorded outside the County were added and a *net resident birth rate* was computed. For the years between 1916 and 1920, and the years from 1920 to 1925, the net resident birth rate was estimated on the basis of the difference between the partially corrected and completely corrected rates in the years when both are known.

While correcting the birth rate for non-residents resulted

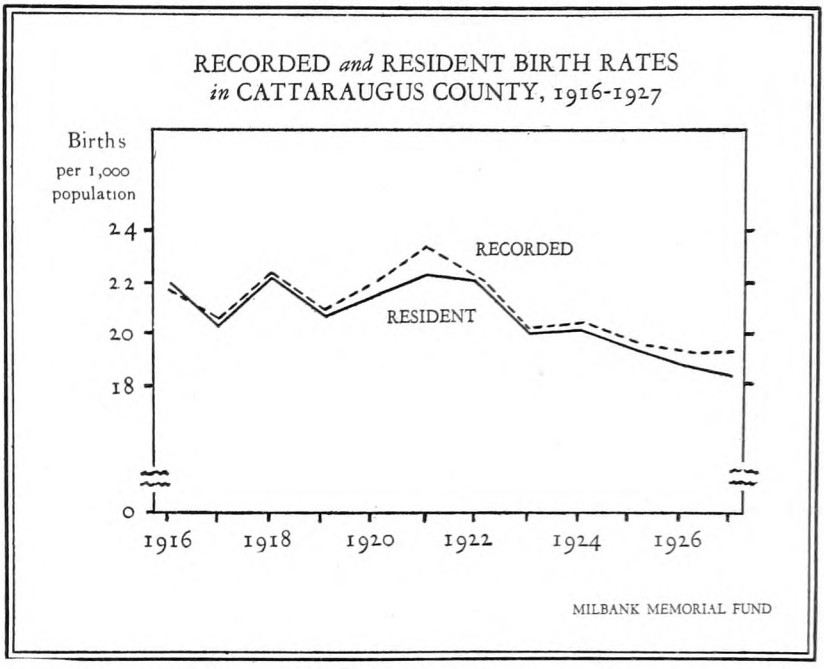


Fig. 2. Officially recorded birth rates in Cattaraugus County compared with the resident rates obtained by deduction of births to mothers who were not residents of the County and the addition of births to Cattaraugus County mothers registered in adjoining areas, 1916–1927.

in a slightly higher rate for Cattaraugus County in 1916, the general result is a reduction in the official birth rate with the exception of 1922 in which year the corrected and uncorrected rates are the same. These differences are shown graphically in Fig. 2. Judging from the divergence in the lines in 1924, 1925, 1926 and 1927, the effect of non-residents upon the birth rate is becoming increasingly important, owing to the fact that the number of non-resident births registered in Cattaraugus County has increased more rapidly than the number of births to Cattaraugus residents in other areas.

The result of the correction of the birth rates for residence is more striking when the urban and rural parts of the County are considered separately as is shown in Fig. 3. Deduction of the non-resident births from the number registered in the

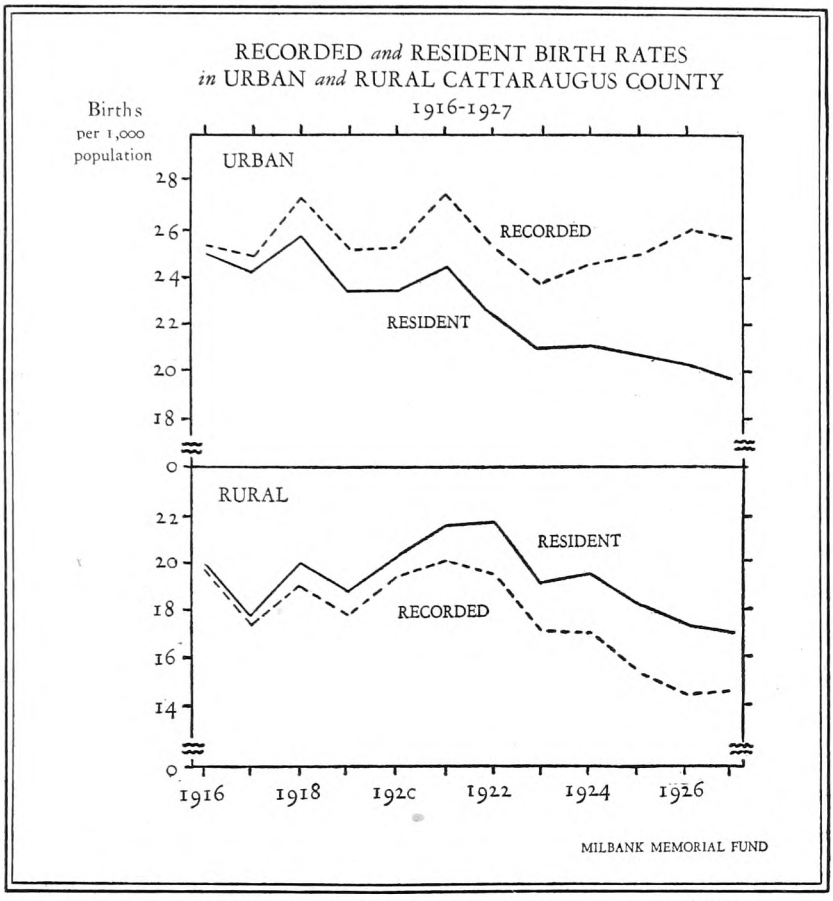


Fig. 3. Officially recorded birth rates in urban and rural Cattaraugus County compared with the resident urban and rural rates obtained by allocation of births to residence of mothers, after deduction of births to non-resident mothers and addition of births to Cattaraugus County mothers registered in adjoining areas, 1916–1927.

urban part of the County (Olean and Salamanca) and the reallocation to the rural part of the County of births to rural mothers who had come to the hospitals in Olean or Salamanca for confinement results in a marked reduction in the urban birth rate as officially recorded. Nearly all the births which were registered outside Cattaraugus County were births to mothers whose place of residence was in the rural area. When these as well as the births to rural mothers

registered in the urban part of the County are added to the recorded rural births, the rural birth rate is greatly increased. The magnitude of the correction of both the urban and rural birth rate steadily increased from 1916 to 1927. In 1927, the urban birth rate is decreased 23 per cent by correction for residence and the rural rate is increased by 19 per cent.

Obviously, the increase in hospitalization of maternity cases, with the result that many births are recorded in localities of which the mother is not a resident, is becoming so important a factor that official birth rates for urban and rural areas represent the facts very inaccurately and correction for residence is essential to obtain the true birth rates.

Resident Infant Mortality Rates

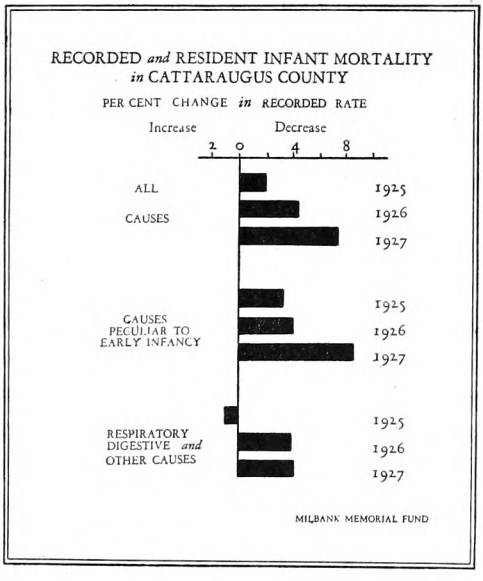
The inclusion in the number of infant deaths officially credited to Cattaraugus County of deaths which occur in the County among the non-resident births and also a certain number of deaths of non-resident infants brought into the County after birth for hospital care has had an adverse effect on the County's infant mortality rate as officially recorded. For the seven years from 1921 to 1927 the death rate among *resident* infants born in the County was computed and with the exception of one year (1925) when the rate was unchanged, the resident rate was lower than the recorded rate. The decrease varied from 2 per cent to 9 per cent, the largest decrease occurring in the year 1927.

For the three years 1925, 1926 and 1927 the names of resident infants were checked against the alphabetical index of all deaths in the State, which is maintained by the Bureau of Vital Statistics, State Department of Health, in order to ascertain the deaths which occurred before the

infant returned to the County. Adding these deaths to all resident deaths recorded in the County and relating the total to the resident births in the County plus the births to residents recorded outside gave an infant death rate for the *total* resident population under one year of age. These resident rates are also lower than the official infant mortality rate in each of the three years and differ only slightly from the rates for resident infants born in the County. The percentage decrease in the infant death rate resulting from the correction for residence is shown in the upper part of Fig. 4.

When the death rate for resident infants under one year of age is divided according to two broad groups of causes, namely (1) causes peculiar to early infancy including deaths from premature birth and all congenital defects and (2) all other causes, which are chiefly respiratory, gastro-intestinal and communicable diseases, the resident infant death rate for "early infancy" causes shows a slightly greater percentage decrease over the officially recorded rate than was found in the total infant death rate. The percentage decrease in the recorded infant rates from each of these two groups of causes in the years 1925, 1926

Fig. 4. The percentage change in the infant mortality rates officially recorded in Cattaraugus County resulting from the exclusion of non-resident births and infant deaths recorded in the County and the inclusion of resident births and infant deaths recorded in adjoining counties in 1925, 1926 and 1927.



and 1927, when they are corrected for residence, is shown in Fig. 4. The mortality during the first week of life among the non-resident infants born in Olean was much higher than among the resident infants; the average death rate in the first week of life for the seven years 1921–1927 was 70 per 1,000 for the non-resident living births compared with 37 per 1,000 among resident births. This difference can undoubtedly be explained by the fact that the non-resident births are a selected group which includes a large proportion of maternity cases for which some complication of confinement was expected. Since the great majority of non-resident infant deaths resulted from some "early infancy" condition, the exclusion of the non-resident infants has a greater effect on the Cattaraugus County rate for these causes than on the rate for all other causes.

Resident Infant Mortality Rates for Urban and Rural Cattaraugus County

Both the urban and rural death rates from all causes are lowered by the correction for residence in most years, the decrease varying from 1 to 13 per cent, but in 1926 the urban rate was increased 4 per cent and the rural rate was decreased 8 per cent by correction, with the result that the difference between the urban and rural infant mortality was materially widened. Although the 1926 result was exceptional, it indicates the unreliability of

Deaths from "early infancy" causes per 1,000 live births in rural and urban Cattaraugus County, 1922-1924 and 1925-1927.

Period	Recorded Rate	Rate Among Residents		Per Cent Change	
		Born in County	Total	Residents Born in County	Total
URBAN					
1922–1924	51.26	49.08	—	−4.2	
1925–1927	50.95	49.08	48.91	−3.7	−4.0
RURAL					
1922–1924	47.07	48.60	—	+3.3	
1925–1927	42.66	41.59	41.42	−2.5	−2.9

comparing the urban and rural parts of the County unless the influence of non-residents is eliminated.

The effect of correcting for non-residents on the infant mortality rate from "early infancy" conditions in the urban and rural sections of the County is shown in the accompanying table. Since the annual rates show very wide fluctuations and the change in the rate resulting from correction for residence also varied widely, the table compares the average rate for the three latest years with the previous three years.

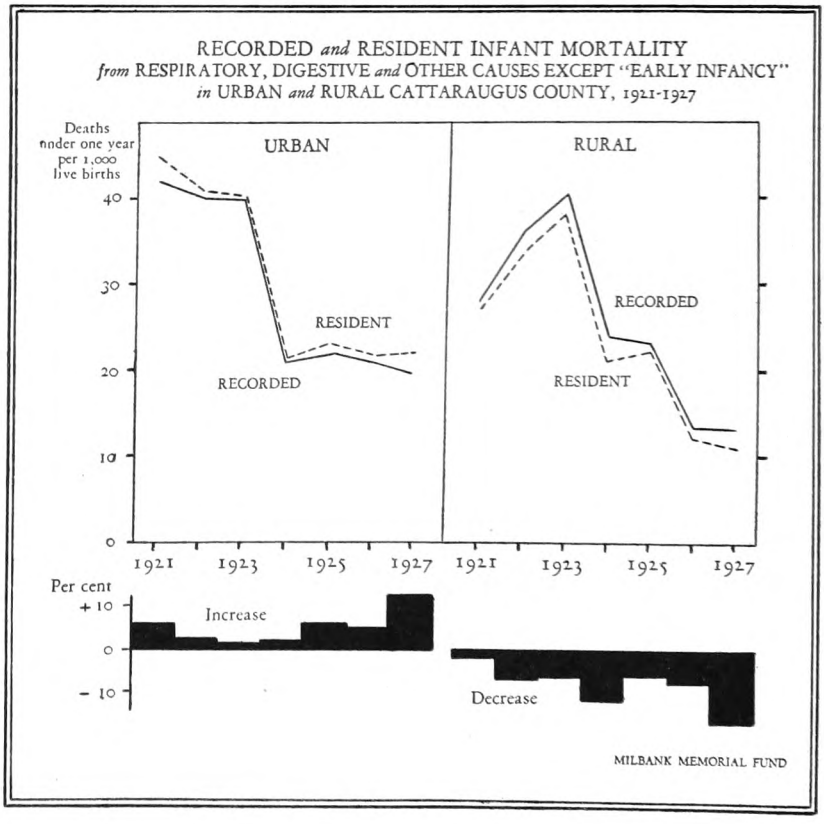
The corrected resident rates for the two areas thus give quite different results from those afforded by the officially recorded rates. In the earlier period, the corrected rural infant death rate from "early infancy" causes is almost identical with the urban rate but the recorded rates show the rural mortality to be 8 per cent lower. A further difference is that the corrected resident rates for the rural area show a greater decline in the infant mortality from "early infancy" causes than is indicated by the recorded rates.

The resident infant urban death rates from respiratory, gastro-intestinal and communicable diseases are from 1 to 13 per cent higher than the registered rates and the difference is more marked in the total resident rate than in the rate for residents born in the County. The opposite is true of the rural death rates from these causes: for the rural section the rates are lower after correction for residence and the total resident rate shows less difference in most years than the rate for residents born in the County. Since the urban rate is increased by correction for residence and the rural rate is lowered the divergence in the mortality rates for the two areas is widened, as is brought out clearly in Fig. 5. The corrected rural infant mortality from communicable, respiratory and gastro-intestinal disease is lower than the urban mortality in every year, whereas the registered mortality

rates were higher in three of the seven years, and in the remaining years the difference between the two is widened.

The results of this study point definitely to a need for *resident* infant mortality rates. An accurate picture of changes in the infant death rates from year to year can be obtained only from resident rates and the comparative mortality from specific causes in different parts of the County is likely to be very unreliable when based on the officially recorded births and deaths under one year of age.

Fig. 5. Infant mortality rates from respiratory, digestive, and communicable diseases and all other causes except causes peculiar to "early infancy" in urban and rural Cattaraugus County as officially recorded, compared with the mortality rates for resident infants and the percentage change in the recorded rates resulting from correction for residence, 1921–1927.



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QUARTERLY BULLETIN

NEW YORK HEALTH DEMONSTRATIONS

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HEALTH EDUCATION IN SCHOOLS IN THE METROPOLITAN HEALTH DEMONSTRATION AREA

As developed by

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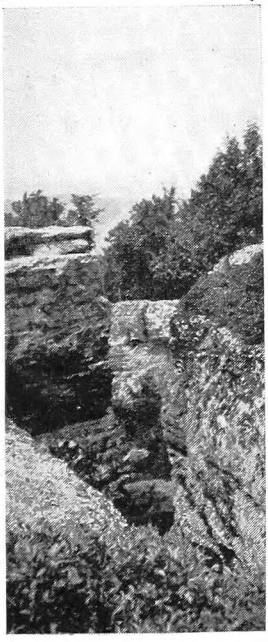

SAM was a mythical boy created by a class of school children and their teacher to assume the burden of the entire class, so far as personal cleanliness and health habits were concerned. The light of the vicarious Sam's countenance was usually dimmed under a dull coat of dirt. Sam frequently forgot to use his toothbrush morning and evening. Sam often stayed up too late at nights. Sam didn't drink milk. Sam refused to eat foods that were good for him. Sam wouldn't play out of doors.

And then Sam had a change of heart and complexion. The children began to imagine him as appearing each morning

a new and shining Sam, the evidence of heroic struggles with wash cloth, soap and toothbrush. Soon the class launched into a journalistic bulletin of the new Sam's daily life.

"Sam washes his face, ears and neck every morning," was the first day's illustrated entry. "Sam uses his toothbrush every day.—Sam sleeps with his window wide open.—Every morning Sam eats a good breakfast of fruit, hot cereal, toast and milk. —Sam plays part of every day out of doors. —Sam likes spinach, carrots, string beans and other vegetables.—Sam sees a doctor once a year for a health examination.—Sam visits his dentist twice a year."

HOW a health education program has been developed in the public and Catholic schools in the Bellevue-Yorkville health demonstration area is discussed in the leading article of this issue. Working with the Boards of Education, the Department of Health, the public and Catholic school principals, teachers, doctors and nurses, two supervisors of health education are assisting in developing a health program that is designed to be a permanent feature of the curricula in the schools chosen for demonstration. ¶The Board of Education has requested that these programs be extended to other schools in the Boroughs of Manhattan and the Bronx.

In this fashion the journal of Sam's new life was chronicled and illustrated, day after day, by Sam's interested creators. By the time that the last chapter of a full health biography was closed, and its pages carefully folded together, newspaper fashion, the entire class had stored away health knowledge and had established health habits that would influence for good their entire lives. For the mythical Sam was very

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definitely made to live well and to grow sturdy under their watchful care, and the children in that classroom began to travel the paths they made for Sam, marching toward health.

Sam's newspaper is on exhibition at the Bellevue-Yorkville Health Demonstration headquarters at 325 East 38th Street, New York City, along with a great variety of other health education projects that have been developed within the area of influence of the Bellevue-Yorkville Health Demonstration.

The development of a health education program in the public and Catholic schools in the Bellevue-Yorkville demonstration area is one of the major services of the demonstration. The demonstration has given to the schools two supervisors of health education, one for the thirteen public schools and one for the twelve Catholic schools in the district. Working with the Boards of Education, the Department of Health, the public and Catholic school principals, teachers, doctors and nurses, these supervisors are assisting in the development of a health education program that is designed to be a permanent, practicable and effective feature of the school curriculum. The outcome, it is hoped, will be healthy,

A COMPARATIVE study of methods of school-room ventilation, especially in selected schools of the three centers of the New York Health Demonstrations, has been a major activity of the New York Commission on Ventilation since 1926. The manner in which these studies have been made is described in the article beginning on page 67. ¶ Activities in which the Commission has been engaged during this period are also briefly summarized. These include three laboratory inquiries which it has helped to finance—studies, respectively, of body radiation, of the effect of drafts and of atmospheric ionization.