

THE FIRST YEAR OF THE RURAL HEALTH EXPERIMENT IN TING HSIEN, CHINA

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PRIOR to 1925, the activities of the Mass Education Movement in China were mainly along the lines of large scale mass education campaigns and establishment of "People's Schools" for teaching illiterates. The ultimate objective of the Movement is, however, not merely to teach the illiterate millions to read, but to educate them for modern citizenship. In an attempt to find out what this education should be, an experiment was set up in Ting Hsien for discovering the most effective and practical system of education, using this restricted area as a unit which should serve as a pattern for the other districts or "hsiens" of China.

The four main problems of rural reconstruction, as the members of the Movement see it, are Ignorance, Poverty, Weakness (physical), and Selfishness. It is the function of the Department of Public Health to tackle the third problem; or, to put it in positive terms, its function is, as we say in Chinese, the building up of a strong virile people through the promotion of health education and the practical application of curative and preventive medicine. The inauguration of the Department is made possible through a generous grant from the Milbank Memorial Fund.

China is not a nation of big cities, but of hundreds of

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This paper is a condensation of Dr. Yao's first annual report, covering the period September 1, 1929-June 30, 1930. For a statement as to the initiation of the health program of the "Ting Hsien Experiment" in educational, industrial, agricultural, and health progress, see the Milbank Memorial Fund *Quarterly Bulletin* for October, 1930, pp. 97-107.

“hsiens” or counties, each of which is a community unit. The culture and ways of living of one hsien, allowing for climatic differences, are essentially the same as those of another hsien. About 85 per cent of the Chinese population live in rural districts. Ting “Hsien,” or county, is a typical Chinese rural district in North China, located about 170 miles south of Peiping along the Peiping-Hankow railroad. Topographically, Ting Hsien is a flat countryside, traversed with dirt roads designed for horse-cart transportation. These roads are possible for bicycles and, with a certain amount of repairing, small sized motor cars can be used. Politically, the Hsien is administered from a district magistrate’s office responsible to the Provincial Government. Often there are three or four changes of magistrates in a year. It has a population of about 400,000, of which 13,556 are in the city and three suburbs and the remainder scattered in 472 villages. Each village has two village elders elected by the villagers. They are the responsible heads for official affairs. Politically, the Hsien is divided into six areas. The initial health program will be applied only to one of them, “The First Central Area,” or the health demonstration area, which includes the City and the seventy-two villages around it. It has a radius of about six miles, with a population of approximately 50,000. The health activities will be extended to the other areas as soon as experience and personnel warrant.

Health Problems in Rural China

Over 90 per cent of the people were illiterate.² Most of them are poor, ignorant, and superstitious. They live in mud huts, blackened with soot and smoke, swamped with flies, mosquitoes, bedbugs, fleas, and rats. Even the so-called

² The verb “were” is in the past tense because a large amount of illiteracy in Ting Hsien has been wiped out since the Mass Education Movement began its work in 1927. *Ed. Note.*

middle class keep their domestic animals in the quarters where they sleep, cook, and eat. Their lives are haunted with frequent sickness and disease. The health knowledge of the people is low and the available medical facilities are nil. Modern medicine is a curiosity and public health is unheard of. In the whole county of 400,000 people there is not a single qualified modern trained physician. The annual death rate in China is probably about 30 per 1,000 population. The chief causes of controllable excess mortality are considered to be smallpox, gastro-intestinal diseases and tetanus neonatorum, and tuberculosis. Tuberculosis, however, is more dependent on the economic status of the people than the first three causes mentioned.

Since these three will yield more readily to comparatively simple health measures, they should be taken as the immediate specific problems to be attacked. The prevalence of gastro-intestinal diseases including dysentery, typhoid, and cholera, in all probability causing 400 deaths per 100,000, is due to the negligence of personal hygiene, and lack of pure water, and absence of proper means of disposal of human excreta. Tetanus neonatorum results from lack of proper midwifery. Deliveries are conducted on beds made of mud bricks by untrained persons with unwashed hands and long dirty fingernails. The cord is cut with unboiled scissors and the bleeding is controlled by applying mud or ash. Finally the cord is wrapped in dirty cotton and rags. Not infrequently two or three children die successively in the same family from tetanus. Maternal mortality is in all probability over 15 per 1,000 births. The cause is ascribed to winds by the common people. Smallpox is another important cause of mortality due to the fact that in China vaccination is only done once in one's life and often too late. The practice of vaccinating a baby with the material from a successful take

of another child is very common. Trachoma attacks at least 60 per cent of the people from the habit of using common washing facilities and the lack of knowledge and treatment of the disease.

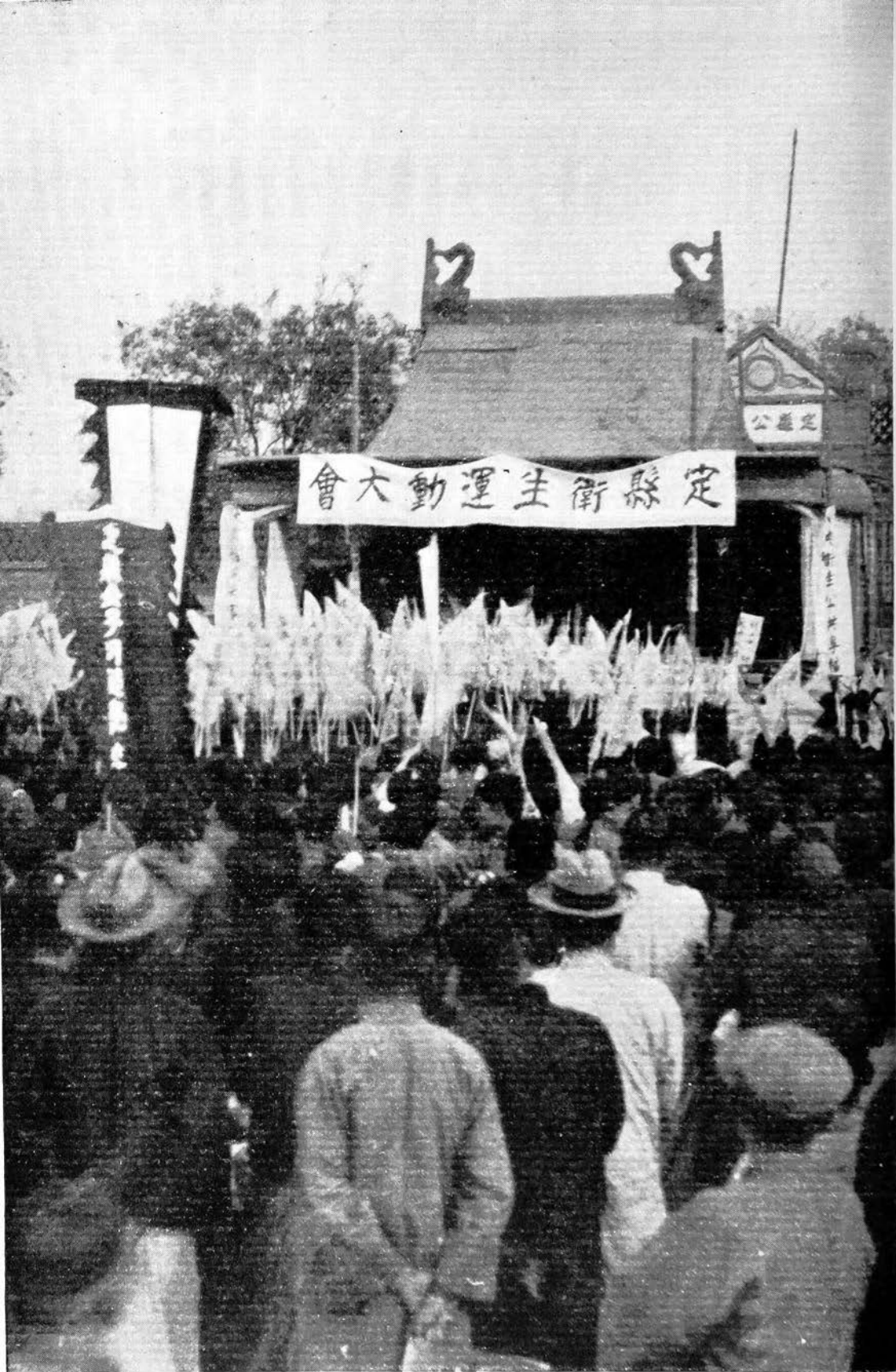
The Ting Hsien Health Program

As to the policy of the Health Department we have seen no other statement as admirable as that made by Mr. Edgar Sydenstricker, director of the Division of Research of the Milbank Memorial Fund, after his intensive study of the work at Ting Hsien and many conferences with our staff members. Therefore I can do no better here than to make a résumé of his statement:

- (1) The health program should not be considered as an isolated effort, but should always be interwoven with the other activities of the Movement in Ting Hsien because the success of the health work has much to do with concurrent progress of other activities.
- (2) Since the principal aim of the health work is to discover a model rural health program, the experimental character of the work should be kept in mind all the time and in all phases of the health activities, without prejudice for or against any existing system elsewhere.
- (3) While it is thoroughly realized that the cost of the experiment as such will be far beyond the ability of the local population to bear, the result which the experiment should strive to attain is a practicable program capable of duplication elsewhere in rural China under Chinese leadership without foreign financial aid.
- (4) In view of the absolute lack of physicians, hospitals and clinics of the modern type, relief and curative facilities must be developed along with preventive measures.
- (5) While the supervisory personnel must be drawn from other sources, the subordinate type of personnel should be recruited and trained locally for the purpose of ascertaining (a) what types of local health personnel can be devel-



Grocery shops on a Chinese village street



A health education mass meeting in Ting Hsien

oped locally and (b) how far they may be trained at local centers. This should be viewed from the standpoint of actual conditions in China without slavish adherence to the professional standards of the West.

(6) Proper provision should be made for measuring results of the experiment, especially in terms of decreased mortality from the incidence of diseases and conditions against which public health activities are specifically directed.

(7) Adequate provision should be made from the outset for determining the relative importance of the various health problems in various parts of China in order that the contributions which it is hoped will be made by the Ting Hsien experiment may be of national significance.

(8) It is deemed advisable to attack at first only a few problems in a small area and gradually take up other problems and extend the activities in a larger area.

Initial Organization of Medical and Health Services

The health activities of the year under review were mainly directed toward the setting up of a working machinery, the establishment of medical clinics, and the creation of public health consciousness in the people to pave the way for further activities.³ Health education naturally received the greatest emphasis during the first year.

Personnel and Equipment. A small portion of the headquarters of the Mass Education Movement in Ting Hsien City was temporarily set aside for the Health Department. This consisted of a few rooms for use as clinics and offices. Since these quarters were wholly inadequate, plans for a health center, including a small hospital, were drawn up and work has been begun on the new buildings.

The personnel of the Department consisted of myself until October, 1929. By the end of June, 1930, two clinic assist-

³ For a summary of the public health program, see the Milbank Memorial Fund *Quarterly Bulletin*, October, 1930, pp. 104-107.

ants, one public health nurse, one nurse and sanitary inspector, and one clerk had been added to the staff.⁴

Summary of Medical Services. The following is a statistical summary of the medical services rendered up to July 1, 1930 through clinics, calls, and laboratory work:

Summary of Medical Services Rendered

1. *Preventive Services:*

Smallpox vaccinations	9,984
Physical examinations (complete)	128
Weight and height	20
Typhoid inoculation	244
Ante and post-natal examinations	18
Deliveries	3
<i>Total</i>	<i>10,397</i>

2. *Curative Services:*

Operations	84
Change dressings	1,748
Eye treatments	1,159
Prescriptions	1,250
Dental treatments	6
Others	1,593
<i>Total</i>	<i>5,840</i>

3. *Laboratory Services:*

Urine analyses	7
Stool examinations	3
Sputum examinations	2
Bacteriological examination of wells	26
<i>Total</i>	<i>38</i>

GRAND TOTAL 16,275

Clinic and Dispensary Work. In the general clinic, which

⁴ Since July 1, 1930, the supervisory staff gradually has been increased, and the training of public health visiting aides, sanitary inspectors, and midwives has been begun in Ting Hsien.

was held every morning, all kinds of cases were seen. Cases of trachoma and patients requiring operative treatment were referred to the respective clinics. Of the 158 clinics conducted, 102 were for general, 20 for trachoma, and 36 for operative treatment. The daily attendance of the general clinic was about 40. Altogether there were 1,546 individuals seen, who made a total of 4,375 visits. One thousand nine hundred and eight conditions were treated and 6,141 medical services were rendered.

On May 12, 1930, a first aid station was opened in Niuts'un village about 8 li⁵ southeast of the city. Regular clinics were conducted on Wednesday and Saturday mornings. A doctor takes charge one day and a nurse the other day. On clinic days, health lectures were given to the primary schools of that village. Ten clinics were conducted with 119 visits made by fifty-three patients. Fifty conditions were treated, resulting in 120 medical services.

Investigation of Water Supplies. The water used in Ting Hsien is all obtained from shallow wells. These are generally poorly constructed, have badly fitting platforms that often are level with or even below the street surface, and are operated by hand. In September, 1929, twenty-six wells, which are used for drinking purposes, were investigated and a sample of water from each well was sent to the Peiping Union Medical College for bacteriological examination. Of the twenty-six wells, fifteen (58 per cent) contained *B. coli* of fecal origin. It is evident that the water from these wells, if unboiled, is unsafe for drinking purposes. The habit of drinking unboiled water, especially in the summer months, is very common among the farmers and school children in Ting Hsien. Water from these sources apparently plays an important role in the dissemination of gastro-intestinal diseases.

⁵ One li is approximately one-eighth of a mile.

Immunization. It was decided to commence immunization measures by utilizing the confidence which the Chinese already possess in smallpox vaccination. For, although there is still a great deal of superstition and misinformation among the people about vaccination, the principle of it has been known in China for years. Persons are inoculated only once in their lives and often too late because it is done only in spring time and custom rules that the child must be more than one hundred days old. The inoculation is usually done with the serum from a successful take of another child without aseptic precautions. Thus smallpox is still quite a common disease in the country.

A vaccination campaign was launched in March, 1930. In order to reach the greatest possible number, the members of the Health Department enlisted the cooperation of students of the Training School of the Movement, of the People's Schools and the Men's Normal Schools in the City. After these students were taught the principles and methods of vaccination, they themselves were vaccinated. Under supervision they in turn vaccinated their schoolmates. Then they were taken out to vaccinate children in other schools. The multiple puncture method was employed, no dressing being applied. After this period of training the student helpers were organized into teams to do vaccination in the villages assigned them. Each team was provided with a vaccination outfit consisting of sewing needles, cotton balls soaked in alcohol or Chinese wine in a tightly closed can, vaccine tubes, clean towels, pencils, and report blanks.

With the help and cooperation of the older departments of the Movement and the People's School graduates, the propaganda work of the Local Health Committee and the financial assistance of the Hsien government, the campaign was a great success. Within a month's time, 21,605 people were



Vaccination day in Ting Hsien—Dr. Yao at left



至公辦

我們要有光榮的

新學教育之進步
教育與生活

D. Y. (right) and one of his principal allies

vaccinated, 9,984 of whom were vaccinated by members of the Movement.

Of the 9,984 people vaccinated, 2,087 or 20.7 per cent had had no previous vaccination and most of them were older than 12 months. Seven thousand, three hundred and ninety-one or 74.1 per cent had had only one vaccination before and many of them had very little or no immunity against the disease. This is shown by a study of their reactions after vaccination. Inspection and readings were made on 1,000 students whose age varied from 5 to 17 years and who had had only one vaccination in infancy. It was found that 38.7 per cent showed immediate reaction, 30.4 per cent showed accelerated reaction and 30.9 per cent showed reaction or primary vaccination.

An enquiry was also made of 540 unselected people in regard to the frequency of the occurrence of smallpox. It was found that 35 (6.4 per cent) had had the disease; 24 (4.4 per cent) out of these 35 never had any vaccination and 11 were vaccinated only once during infancy. If this sample is representative, about 3,000 people in the health demonstration area have been attacked by smallpox.

School Hygiene. School health work was begun in the Mass Education Training School for teachers. Physical examinations, vaccinations, and typhoid inoculations were done. The dormitories and kitchen were regularly inspected. In addition, a course on principles of public health was offered. The students were also taught the methods of vaccination, first aid, and the treatment of trachoma. As a part of their practical training, they participated in the health and vaccination campaigns.

Health work was also conducted in the kindergarten opened in April, 1930, under the auspices of the Movement. There were twenty students, mostly children of the staff of

the Association. Physical examination, smallpox vaccinations, and periodical weighing and inspection were carried out. Cooperation of the parents was encouraged through meetings and letters.

School health work has been done in the public primary schools in Niu-ts'un since the opening of the clinic in that village. Health classes were conducted once a week. Physical examinations and vaccinations were done. Arrangements were made for correcting defects. There has been a great improvement of the sanitation in the school. More windows were opened, the walls were white-washed, the toilets were made cleaner, and boiled water was provided for the students.

Beginnings of a Nursing Service. The nursing service began with a staff of a man nurse trained in clinical nursing and a woman nurse trained in public health nursing. The latter joined the Department in March, 1930. They participated in all the health activities in the clinics, school health clubs, and educational campaigns. In addition, a beginning has been made in home visiting. Regular visits have been made in the homes of the staff and of the people living in one of the streets near the Association. Altogether there were 345 visits made.

Health Education

The educational and agricultural activities of the Movement carried on since 1926 in Ting Hsien had won the confidence of the people and local government. A large number of Mass Education Schools, or "People's Schools," had been established and training schools for teachers had been provided. The basis and, to a considerable extent, facilities for creating interest in health thus had been provided when the Health Department was begun in 1929.

The health education work up to July 1, 1930, is summarized in Table 1:

ACTIVITIES	NUMBER	ATTENDANCE
Health lectures	304	42,826
Health classes	153	5,101
Health conference	40	415
Mothers' health club	7	59
Children's health club	8	91
Talks	1,328	3,948
Home visits	345	744
Campaigns	3	12,500
Dramas	3	800
<i>Total</i>	<i>2,190</i>	<i>66,484</i>
Other Activities		
Posters and pamphlets distributed (19 kinds)	64,053 sheets	
Newspaper items	18	
Newspaper article words	8,280	

Table 1. Health education work in Ting Hsien, China, prior to July 1, 1930.

Among the various popular educational activities that were carried on from September 1, 1929, to July 1, 1930, the following deserve especial mention:

In order to create a popular interest and social consciousness of the importance of a health program in Ting Hsien, a two-day health campaign was launched on November 12 and 13 utilizing the experience of our "Literacy Campaigns" of former years. Thanks to the cooperation of all the departments of the Movement, the People's Schools, governmental schools, the gentry, the local government and even the army stationed nearby, the campaign was a decided success.

During December, 1929, and January, 1930, the Department of Public Health cooperated with the Department of Agriculture in an extension project known as "The Farmers' Travelling School," which operated successively in six selected market villages, spending a week in each. There were illustrated lectures, exhibits, and moving pictures, and the representatives of the Department of Public Health, besides

giving a series of health lectures, did vaccination and clinic demonstrations. Women secretaries produced a health play which was entertaining and instructive. Attendance was always good, many people coming from neighboring villages. These were experimental campaigns for the purpose of finding out what sort of methods or arousing interests was most successful.

The fly, dangerous as it is, is considered by most of the people as harmless and even beneficial in the home as there is a misconception that food left over in the summer, if not eaten by flies first, will be poisonous to man. In order to make the people realize the true nature of this insect, an anti-fly campaign was carried out last summer. Besides the usual posters, demonstrations and lectures, the wholesale killing of flies in the city was encouraged with medals and prizes, and in the villages by setting up a fly market in the Health Department at the rate of two coppers per hundred flies. Children came with captured flies from villages even 10 *li* away. At first they thought flies were bought for medicinal purposes. When they were told the truth they were amazed and incredulous and some of them left their flies with us without even asking for their coppers! Police on their own initiative started to persuade peddlers to protect their food-stuffs against flies and fly cages appeared on the streets.

In the fall of 1929, upon the request of General Wen whose army was stationed nearby, a training course in mass education was given to the 130 officers under him. Health was one of the subjects given. These officers, after their training, started mass education among their soldiers. It has been mentioned how they helped in the city health campaigns. In the streets the soldiers always give us the military salute and called us their "Big Teachers."

Last spring a Mass Education Training Institute was held

for Christian leaders from various parts of China, as far south as Canton and as far north as Moukden. Inspired by the work of the Movement, several churches in China have decided to carry on mass education work among their members. All the departments took part in the training. As a manifestation of their interest in our health scheme, the American Board Mission in Paotingfu is going to open three rural health courses for their evangelists under the direction of this Department.

Two conferences for village elders were conducted by our Education Department, one in K'ao P'eng and the other in Chai-ch'eng. Health lectures were also given, and when the elders were told about bacteria, the cause of tetanus neonatorum, and the danger of the fly, they were very much surprised, as these things were unknown to their forefathers.

Last winter, the students of our Training School, as a part of their practical training, started a number of "Lantern Classes." These classes were conducted every evening in the open air on the streets, and the students were the people in the neighborhood. Men and women, young and old, were equally admitted. The lanterns were very large, the texts of the lessons painted on them, new characters on one side, and the illustration on another. The people gathered around and listened to the accompanying lectures, health being one of the topics. This method was found to be very effective for holding the audience, many attending the lectures regularly. In the experimental People's Schools health talks were given weekly with the object of finding out what material and what presentation were most suitable. These talks were accompanied with practical demonstrations. Since April, 1930, a Children's Health Club has been conducted for the purpose of finding out the best methods of training children to form wholesome health habits.

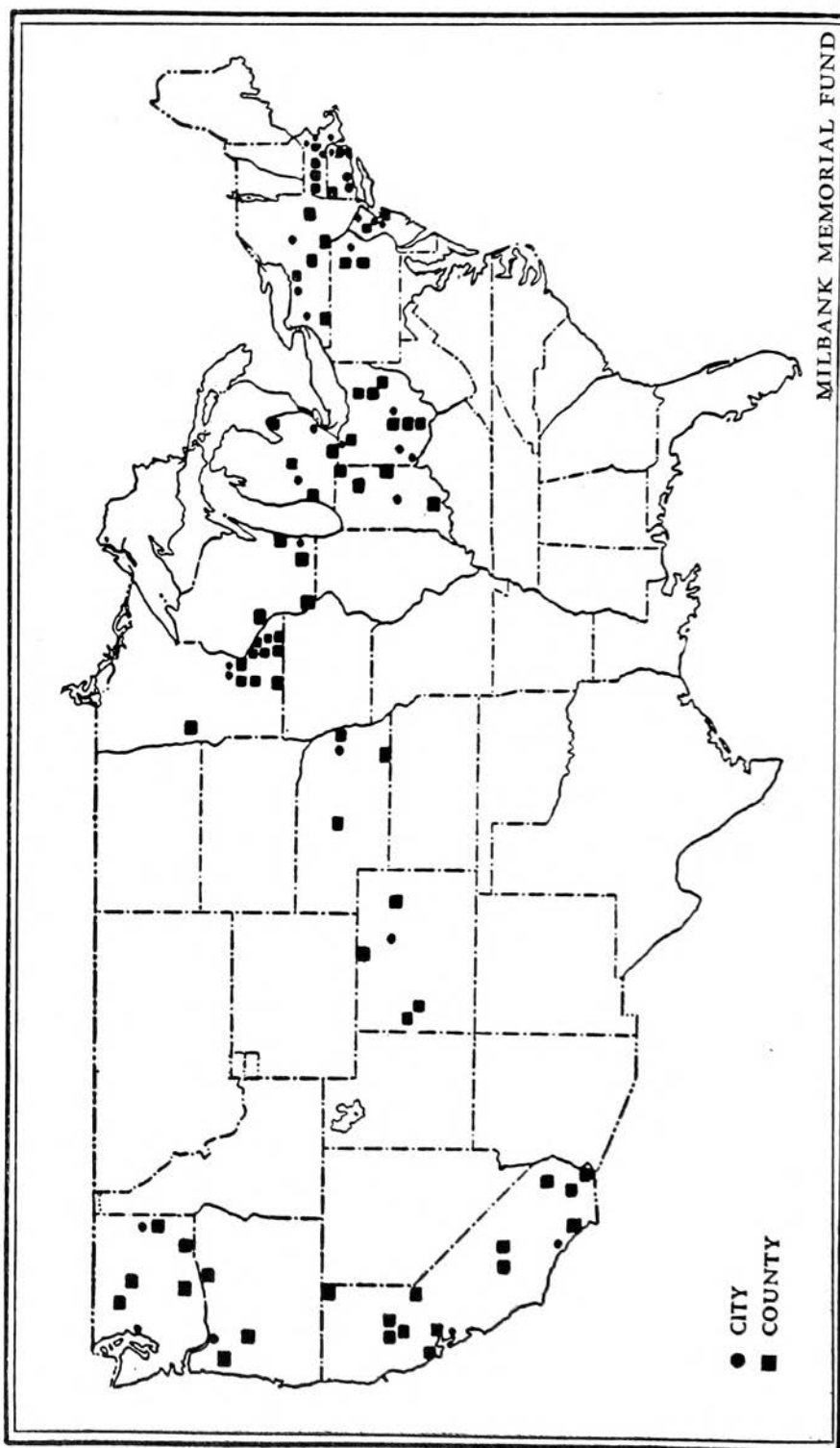


Fig. 1. Map of the United States showing the location of the cities and counties from which the urban and rural samples were taken.

DIFFERENTIAL FERTILITY ACCORDING TO GEOGRAPHIC AREAS IN THE UNITED STATES¹

by KATHARINE BERRY



DIFFERENCES in human fertility according to race, social classes, economic conditions, education, religion, urbanization, and density have been studied more or less intensively by various students in this country. Although these conditions have not always been defined with as much precision as might be desired, and their interrelations have not been fully explored, the general results of an accumulating series of inquiries indicate that there are important environmental and possibly genetic factors which should be taken into account in any adequate consideration of fertility and birth rates, of the size of the family, and of other related questions involved in what are commonly spoken of as "population problems."

It is the purpose of this paper to report upon an inquiry into differential fertility according to another condition and possible factor, namely, geographic sections of the United States. No particular hypothesis as to the reasons for a differential fertility of this kind has been set up, for, as it will be seen, the data here utilized will not permit of any exact determination of the effect of the various factors possibly involved, whether they be climatic, dietary, economic, or other. It will be feasible, however, to hold constant in a general way certain factors—race, social class, and urbanization—which are known to be associated with differences in fertility rates. Within these deliberately imposed limitations, therefore, it will be possible to ascertain whether or not there are differential fertility rates according to certain broadly

¹ From the Division of Research, Milbank Memorial Fund.

defined geographic sections which are not associated with the three conditions mentioned.

The existence of a geographic differential fertility is suggested but not proved by certain birth statistics issued by the Bureau of the Census. For example, the average number of children ever born to native women who gave birth to children in 1927² suggests a relatively low fertility (less than three children per mother) in Connecticut, New York, New Jersey, Ohio, Illinois, California, Oregon, and Washington, and a relatively high fertility (more than 3.2) in the Mountain States and the South. But these statistics include neither women who had failed to bear any children nor those who bore no children in 1927, do not take into account possible differences in age of mothers at marriage and in 1927, and include women of mixed parentage. Thompson³ has used the published census material in another way. By comparing the number of children under five years of age per 1,000 native white women 20-44 years of age in urban and rural areas of different sections of the United States, he indicated the existence of differential fertility rates according to geographic location. As will be indicated, the nature of these differences was similar in general to those found by the present study.

The present inquiry attempts a more definite approach by utilizing the records of samples of women drawn at random from the original schedules collected by the 1910 census from 33 cities having populations ranging from 100,000 to 500,000 and from 74 counties adjacent to these cities. (Fig. 1.) It will be recalled that the 1910 census included for each

² Birth, Stillbirth, and Infant Mortality Statistics: 1927, Bureau of the Census, Table J, page 16.

³ Unpublished census monograph "Ratio of Children to Women in the United States," by W. S. Thompson, quoted in the Preliminary Report of the White House Conference on Child Health and Protection, Table 33, p. 48. See also his paper on "Size of Family from which College Students Come," *Journal of the American Statistical Association*, December, 1925 (XX: 481-495).

married woman information as to the number of children born, the number of children still living, the number of times married, the length of present marriage, age of the woman at marriage, the nativity of herself and of her parents and of her husband and his parents, and the occupation of her husband. The samples were limited to wives in families in which both husband and wife were of native white parentage and but once married. The rural sample was confined to families living on farms. The geographic areas represented were New England, Middle Atlantic, East North Central, West North Central, Mountain, and Pacific. The occupational record of the husband permitted a classification into broad social classes.⁴

Tables 1 to 5 give the essential tabulations of these data for urban and rural areas within each geographic section selected. It should be noted that since in the New England States, only Massachusetts, Rhode Island, and Connecticut, and in the Mountain States only Colorado, had cities of more than 100,000 and less than 500,000 in 1910, the samples for these areas are lacking in certain states usually included in these two divisions. Furthermore, it seemed desirable to present the data for New York State separately since a more detailed analysis indicated that its birth rates were dissimilar to those of New Jersey and Pennsylvania. The Pacific area is broken up into two units, the data for California being separated from those of Washington and Oregon. Since the sub-division of the data according to geographic areas resulted in rather small numbers in the more specific social classes used in previous studies⁴ of this material, it seemed rather desirable to combine the professional and business classes in the cities into a group which may be termed the

⁴ Edgar Sydenstricker and Frank W. Notestein, "Differential Fertility According to Social Class," *Journal of the American Statistical Association*, March 31, 1930, pp. 9-32.

Children Born, Wives, and Children Born per 100 Wives for Urban Areas	AGE OF WIFE AT CENSUS OF 1910						
	Under 45	Under 20	20-24	25-29	30-34	35-39	40-44
<i>Children born</i>							
New England	3,560	*	186	551	788	1,027	1,000
New York	7,133	*	607	1,412	1,669	1,770	1,639
New Jersey & Pa.	4,029	*	301	761	902	919	1,131
East North Central	21,427	189	2,091	4,279	5,007	5,074	4,787
West North Central	4,523	*	285	784	1,039	1,148	1,243
Mountain	3,787	*	240	655	907	933	1,029
California	7,661	*	680	1,327	1,758	1,973	1,868
Washington & Oregon	7,383	*	723	1,358	1,594	1,945	1,721
<i>Wives</i>							
New England	2,239	*	230	468	514	539	470
New York	4,810	*	725	1,236	1,085	943	755
New Jersey & Pa.	2,324	*	329	571	496	456	435
East North Central	12,737	353	2,287	3,203	2,808	2,287	1,799
West North Central	2,825	*	437	675	614	560	479
Mountain	2,276	*	353	504	540	441	379
California	5,381	*	903	1,271	1,221	997	842
Washington & Oregon	4,610	*	861	1,164	961	858	641
<i>Children born per 100 wives</i>							
New England	159	*	81	118	153	191	213
New York	148	*	84	114	154	188	217
New Jersey & Pa.	173	*	91	133	182	202	260
East North Central	168	54	91	134	178	222	266
West North Central	160	*	65	116	169	205	259
Mountain	166	*	68	130	168	212	272
California	142	*	75	104	144	198	222
Washington & Oregon	160	*	84	117	166	227	268

*Not shown because births and birth rates are based on less than 100 wives.

Table 1. Children born, wives, and children born per 100 wives by age of wife at census, for each urban area. In order to obtain an adequate sample of the professional class it was necessary to search three times as many schedule pages as were used for the other urban classes. For that reason the data for the professional class are given one-third their actual weight.

“white collar workers” and the skilled and unskilled laborers into a group which may be denoted as “laborers.” Although such classification permits a rather wide margin of economic

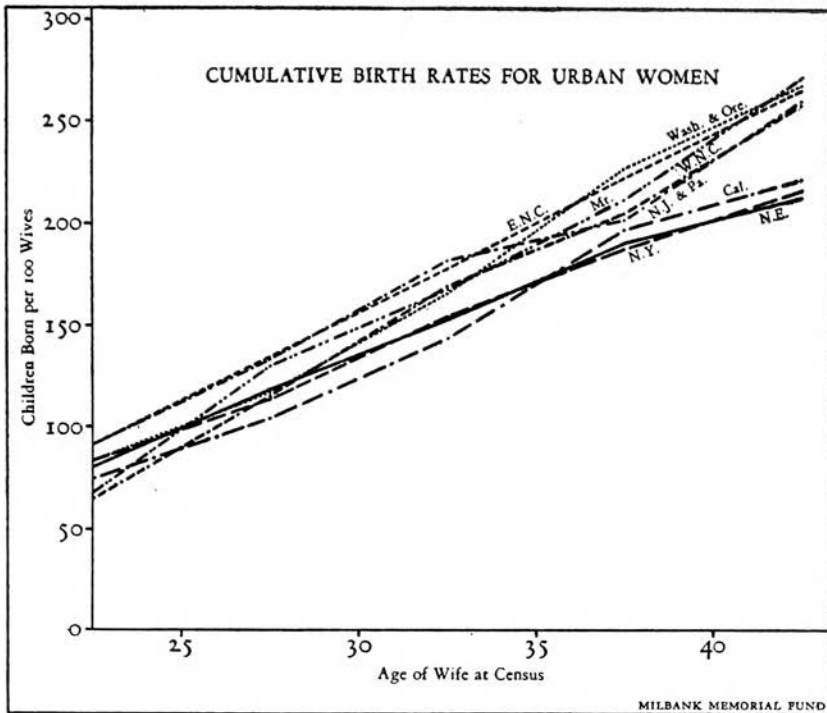


Fig. 2. Total number of children ever born per 100 wives in quinquennial age group under 45, for urban geographic area.

well-being within each of the two classes, it seems reasonable to regard the division as a real one in view of the fact that there are certain obvious differences in standards of living, education and achievement between the two classes. No specific rural social classes could be considered since the farm owner class is the only one for which sufficient numbers were available in each of the geographic areas, and the farm owners dominate the entire rural sample.

Two indices of fertility are used in presenting the results of this study: (1) the cumulative birth rate at specific ages of women in terms of the total number of children born per 100 wives by quinquennial age groups for each area; (2) a cumulative birth rate standardized according to the age distribution of the wives in the entire sample.

Although the cumulative birth rates here presented are only for women up to 45 years of age, the curves plotted in Figures 2-5 clearly reflect two facts. One is the growth of the family during the childbearing period of the woman. If this was the only fact portrayed, however, the curves should reach a horizontal asymptote at the end of the childbearing period. A second fact is that such an asymptote is not reached nor even approached in any of the areas or social classes. The obvious explanation is that the older women who had entered their childbearing period as far back as 1880, had borne children more rapidly in the earlier part of their married life than those who entered the childbearing period later. In other words, a secular trend appears in all of the fertility rates here presented. How much of the accumulated rates in the age period 40-44 years is due to secular trend is not important for the purpose of this particular study. The two facts are mentioned to emphasize the fact that we are not dealing with a static condition but are employing a cross section, taken in 1910, of a changing fertility.

Considering now the indications yielded by the data presented in the light of the foregoing limitations, we may observe:

1. The fertility rates of rural women were higher than those of urban women in every geographic section considered.
2. In the East the fertility rate of women on farms was about 50 per cent higher than that of women living in cities, whereas in the West it was about 75 per cent higher. The ratios of the rural rates to the urban rates—both standardized for age—varied from 1.47 to 1.56 in the Eastern section of the country and from 1.72 to 1.91 in the Western section.
3. The fertility rates of urban women in the various geographic sections showed a somewhat smaller relative varia-

tion than the fertility rates of rural women. The range in the rates standardized for age in the urban areas was from 147 to 173 per 100 women, or 18 per cent, whereas the range of the rates for rural areas was from 219 to 301, or 37 per cent.⁵

4. In considering further the general differences between the Eastern and Western sections of the country, two rather interesting exceptions may be noted. For the cities in the East North Central states and New Jersey and Pennsylvania, the standardized rates for age are higher than the rates for the Eastern area. In fact, the standardized rate for the East North Central section is the highest of all the areas, and that of New Jersey and Pennsylvania is next highest. This exception, however, is not reflected in the rural areas of the same states. The other exception is that of California. The fertility rates of women in this State are consistently lower than those of other areas in the Western section for both cities and farms.

5. When the women in the urban areas are roughly classified according to the social status of their husbands, it appears that the white collar class had a higher fertility rate

⁵ Thompson's studies, already referred to in footnote 3 (page 80), suggested differences in urban and rural fertility rates according to geographic divisions as follows:

Indices of the number of children under 5 per 1,000 native white women 20-44 years of age in communities of different size, by division, 1920.

Ratio of children in cities of 100,000 and over for the whole United States=100.

AREA	CITIES 100,000 AND OVER	RURAL DISTRICTS
New England	94.4	154.8
Middle Atlantic	100.3	172.4
East North Central	105.6	187.4
West North Central	96.2	199.4
Mountain	104.4	227.3
Pacific	78.6	165.1

Children Born, Wives, and Children Born per 100 Wives in Rural Areas	AGE OF WIFE AT CENSUS OF 1910						
	Under 45	Under 20	20-24	25-29	30-34	35-39	40-44
<i>Children born</i>							
New England	3,396	*	225	466	631	972	1,090
New York	7,125	*	564	1,125	1,625	1,954	1,811
New Jersey & Pa.	3,598	*	196	467	797	998	1,107
East North Central	29,042	255	2,330	4,971	6,778	7,122	7,586
West North Central	6,288	*	461	1,058	1,285	1,646	1,800
Mountain	4,337	*	324	699	1,006	1,167	1,096
California	9,908	70	714	1,562	2,078	2,668	2,816
Washington & Oregon	8,858	50	743	1,424	2,003	2,320	2,318
<i>Wives</i>							
New England	1,373	*	160	234	271	340	344
New York	3,183	*	521	657	688	680	557
New Jersey & Pa.	1,381	*	184	262	315	313	260
East North Central	11,247	471	1,991	2,477	2,349	2,062	1,897
West North Central	2,108	*	369	474	423	393	367
Mountain	1,539	*	270	343	324	295	240
California	3,931	124	614	832	819	820	722
Washington & Oregon	3,103	117	567	709	642	574	494
<i>Children born per 100 wives</i>							
New England	247	*	141	199	233	286	317
New York	224	*	108	171	236	287	325
New Jersey & Pa.	261	*	107	178	253	319	426
East North Central	258	54	117	201	289	345	400
West North Central	298	*	125	223	304	419	490
Mountain	282	*	120	204	310	396	457
California	252	56	116	188	254	325	390
Washington & Oregon	285	43	131	201	312	404	469

*Not shown because births and birth rates are based on less than 100 wives.

Table 2. Children born, wives, and children born per 100 wives by age of wife at census, for each rural area.

in the Western areas than in the Eastern, if California again be regarded as an exception. The fertility rate of the laboring class does not follow so clearly this line of demarcation between East and West. In fact, the highest fertility rates of the laboring class are found in New Jersey and Pennsylvania and

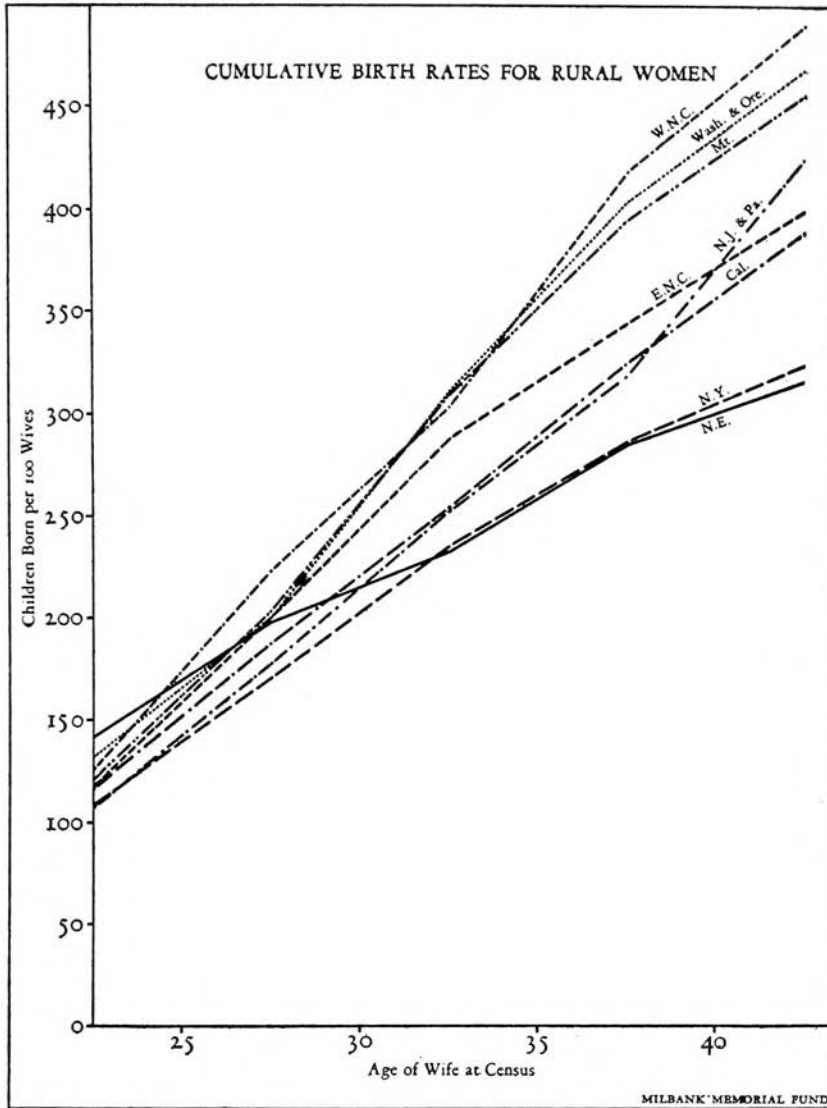


Fig. 3. Total number of children ever born per 100 wives in quinquennial age groups under 45, for rural geographic areas.

in the East North Central States, and the lowest are in New England, New York, and California. It might be suggested that the dominance of manufacturing and mechanical workers and miners, which are highly fertile groups, in the total

Children Born, Wives, and Children Born per 100 Wives for White Collar Workers	AGE OF WIFE AT CENSUS OF 1910						
	Under 45	Under 20	20-24	25-29	30-34	35-39	40-44
<i>Children born</i>							
New England	1,971	*	70	275	465	585	574
New York	3,668	*	212	582	876	1,024	963
New Jersey & Pa.	2,053	*	114	347	462	537	585
East North Central	8,490	*	528	1,493	2,007	2,210	2,222
West North Central	3,150	*	145	541	719	803	937
Mountain	1,892	*	90	303	445	493	555
California	3,854	*	300	618	911	1,014	990
Washington & Oregon	3,563	*	238	619	770	1,019	911
<i>Wives</i>							
New England	1,341	*	104	274	319	344	294
New York	2,682	*	301	647	640	598	482
New Jersey & Pa.	1,357	*	159	317	293	308	263
East North Central	5,767	*	782	1,361	1,358	1,207	979
West North Central	1,994	*	259	479	453	406	375
Mountain	1,233	*	155	278	299	260	224
California	2,974	*	465	686	699	577	489
Washington & Oregon	2,404	*	372	617	525	491	369
<i>Children born per 100 wives</i>							
New England	147	*	67	100	146	170	195
New York	137	*	70	90	137	171	200
New Jersey & Pa.	151	*	72	109	158	174	222
East North Central	147	*	68	110	148	183	227
West North Central	158	*	56	113	159	198	250
Mountain	153	*	58	109	149	190	248
California	130	*	65	90	130	176	202
Washington & Oregon	148	*	64	100	147	208	247

*Not shown because births and birth rates are based on less than 100 wives.

Table 3. Children born, wives, and children born per 100 wives by age of wife at census, for white collar workers in each area. In order to obtain an adequate sample of the professional class, it was necessary to search three times as many schedule pages as were used for the other urban classes. For that reason the data for the professional class are given one-third their actual weight.

populations of occupied males of Newark and Scranton, for example, is an indication of what a more detailed analysis would show.

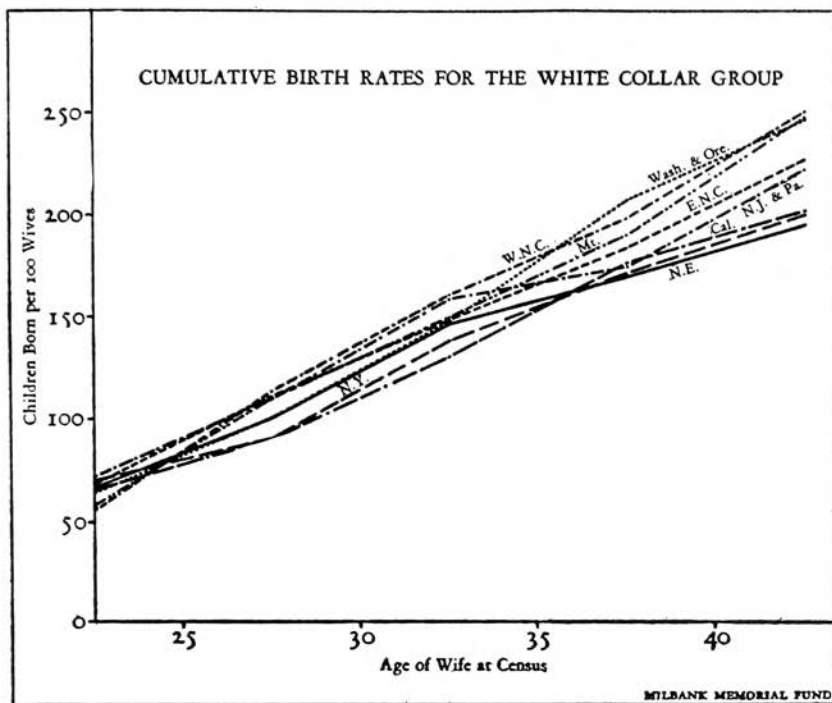


Fig. 4. Total number of children ever born per 100 wives in quinquennial age groups under 45, for the "white collar" group in different geographic areas.

6. The white collar workers had smaller families in every area than the laborers. In fact, the families of the white collar workers in the West North Central States, where the highest fertility rate was shown for this class, are smaller than the families of laborers in California, for which the lowest rates were shown in the laboring class. The white collar workers as a group appeared to be affected less by factors associated with geographic location than did the laboring class. In the former the highest rate exceeds the lowest rate by 17 per cent, whereas in the latter the highest rate exceeds the lowest by 26 per cent.

Although the material used in this study does not permit us to go behind the indications summarized above, it is hard

Children Born, Wives, and Children Born per 100 Wives for Laboring Class	AGE OF WIFE AT CENSUS OF 1910						
	Under 45	Under 20	20-24	25-29	30-34	35-39	40-44
<i>Children born</i>							
New England	1,589	*	116	276	323	442	426
New York	3,465	*	395	830	793	746	676
New Jersey & Pa.	1,976	*	187	414	440	382	546
East North Central	12,937	159	1,563	2,786	3,000	2,864	2,565
West North Central	1,373	*	140	243	320	345	306
Mountain	1,895	*	150	352	462	440	474
California	3,807	*	380	709	847	959	878
Washington & Oregon	3,820	*	485	739	824	926	810
<i>Wives</i>							
New England	898	*	126	194	195	195	176
New York	2,128	*	424	589	445	345	273
New Jersey & Pa.	967	*	170	254	203	148	172
East North Central	6,970	273	1,505	1,842	1,450	1,080	820
West North Central	831	*	178	196	161	154	104
Mountain	1,043	*	198	226	241	181	155
California	2,407	*	438	585	522	420	353
Washington & Oregon	2,206	*	489	547	436	367	272
<i>Children born per 100 wives</i>							
New England	177	*	92	142	166	227	242
New York	163	*	93	141	178	216	248
New Jersey & Pa.	204	*	110	163	217	258	317
East North Central	186	58	104	151	207	265	313
West North Central	165	*	79	124	199	224	294
Mountain	182	*	76	156	192	243	306
California	158	*	87	121	162	228	249
Washington & Oregon	173	*	99	135	189	252	298

*Not shown because births and birth rates are based on less than 100 wives.

Table 4. Children born, wives, and children born per 100 wives by age of wife at census, for laboring class in each area.

to resist the temptation to speculate somewhat as to the possible effects of certain conditions that have been suggested by other studies as having a bearing upon the facts here presented.

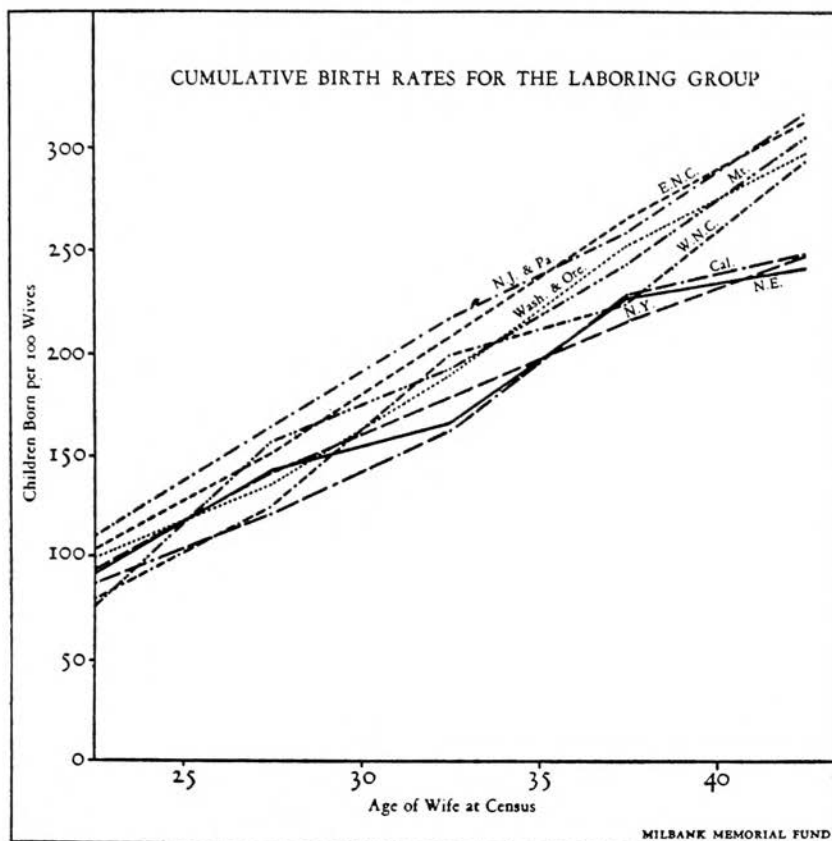


Fig. 6. Total number of children ever born per 100 wives in quinquennial age groups under 45, for the "laboring" group in different geographic areas.

The greater variations in the fertility rates of rural women than in those of urban women naturally raise the question of whether or not urbanization *per se* had, even prior to 1910, a leveling or standardizing effect upon the birth rate. If we can assume that the real geographic differentiation in fertility is more accurately exemplified by rural rates than by urban, and that the cities draw most of their population from adjacent territory, this effect of urbanization might be indicated. The fact that the variation in the fertility rates for the laboring group is greater than that of the white collar

	TOTAL URBAN	TOTAL RURAL	WHITE COLLAR WORKERS	LABORING GROUP
<i>Total Area</i>	160	260	139	187
New England	147	229	132	169
New York	147	219	130	170
New Jersey & Pa.	168	247	143	206
East North Central	173	262	143	201
West North Central	158	301	150	178
Mountain	165	288	146	189
California	143	246	128	164
Washington & Oregon	166	292	147	187

Table 5. Standardized cumulative birth rates for the urban and rural groups and for the urban social classes in the geographic areas.

group might be considered as in line with an explanation of this sort upon the assumption that the latter are more completely urbanized than the former. But here other factors than the fact of merely living in cities may be operative, such as differences between the two groups in education, intellectual interests, social conventions, and inheritance.

The fact that in rural areas of the West the fertility rates were higher than those in the East is an invitation to further study of the possible bearing of other differences in the two sections, such as in social conventions, in the character of the food supply and dietary habits, in the economic condition of farm families, or in the demand for farm labor arising out of differences in crops and size of farms. The possibility that the principal factors responsible for a declining birth rate operated in the East before they did in the West prior to 1910, is another interesting hypothesis. Other questions suggest themselves, such as: Do the metropolitan centers of the East and Chicago exercise an influence upon the adjacent rural territory with respect to size of family that

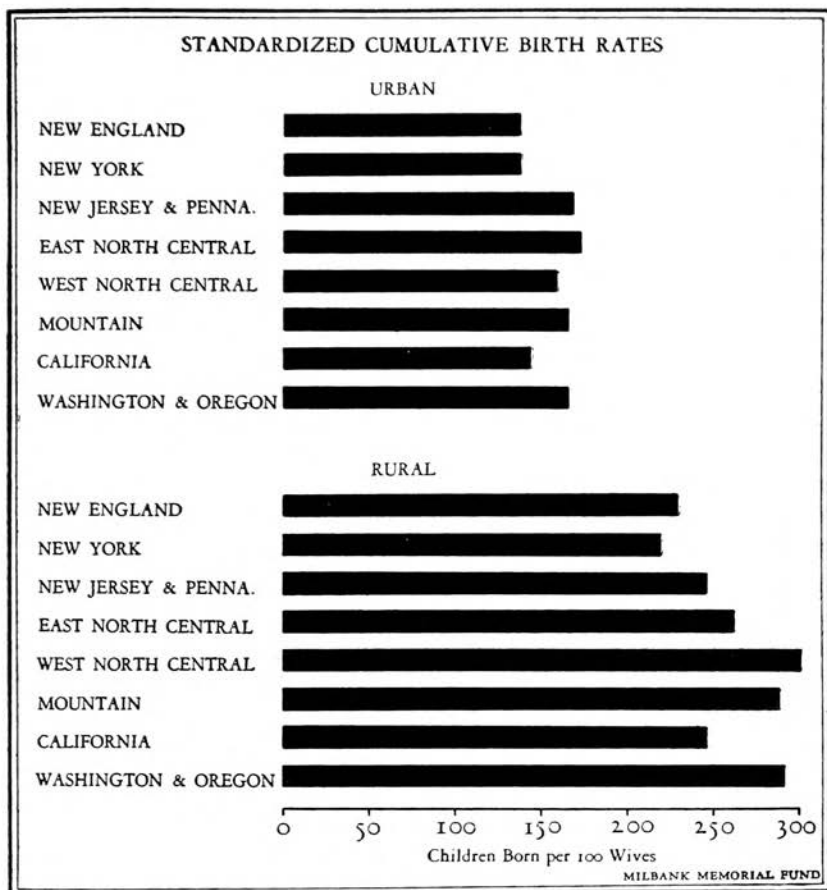


Fig. 6. Cumulative birth rates for women under 45 in urban and rural samples of different geographic areas, standardized for the wife's age by applying the rate for each quinquennial age group to the age distribution of the total number of wives under 45 included in the study.

is not felt in sections where such centers do not exist? Is the relatively low fertility rate of California women, which stands out as such an exception to the higher rates that prevail in other Western areas, in any way associated with the unusual origin of so large a portion of the California population, or with the fact that California is a resort section? To what extent are these differential fertility rates

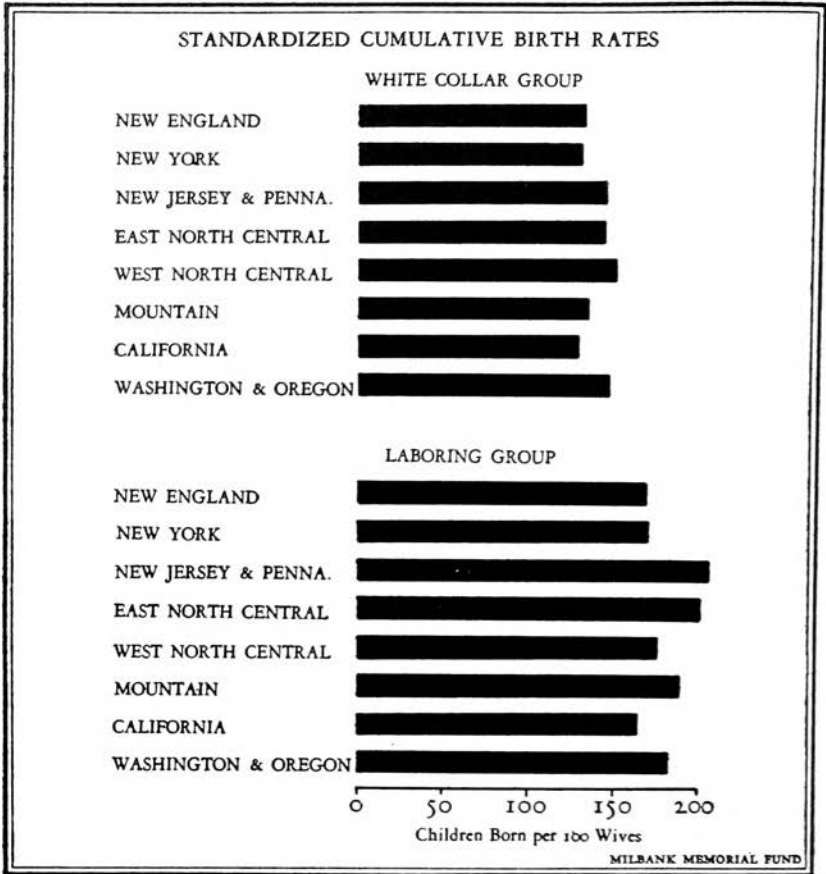


Fig. 7. Cumulative birth rates for women under 45 in "white collar" and "laboring" groups of different geographic areas, standardized for the wife's age by applying the rate for each quinquennial age group to the age distribution of the total number of wives under 45 included in the study.

due (1) to voluntary limitation of the size of the family, (2) to "birth control," prior to 1910?

There is here a challenge to further research in order to discover the important factors that have influenced the human fertility rate and to evaluate more precisely their effects upon the changing composition of our population.