

# SEX DIFFERENCES IN MORTALITY IN THE UNITED STATES<sup>1</sup>

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THE continued decline in the gross mortality rate in the United States since 1930 has been cause for satisfaction, especially in view of the distressing economic hardships which have been experienced by a large portion of the population. Gross rates, however, give an average picture of mortality which conceals the great inequalities in the extent to which various groups in the population share in the reduced mortality. Furthermore, since the population is aging and immigration of young adults has stopped, comparison of the crude average mortality in recent years with that for earlier years provides a very inaccurate index of the mortality changes. In the present report, recent trends in the mortality for specific sex-age groups are considered. Special attention is given to differences in mortality by sex, because the widening disparity between the death rates for males and females suggests a situation with respect to health conditions in this country which merits consideration. Some excess mortality among males as compared with females is a universal phenomenon, but the difference has been steadily increasing in the United States for the past thirty-five years and the increase in this excess has been especially rapid in the past fifteen years. This trend for males to share less than females in the improvement in mortality which is taking place cannot be neglected in the planning of health programs to extend the gains already made in the postponement of death and, should it continue, may have definite significance to the social and economic problems of our national life.

The decline in mortality<sup>2</sup> for each sex since 1929 is apparent in

<sup>1</sup> From the Milbank Memorial Fund.

<sup>2</sup> The mortality data used in this study, except when otherwise specified, relate to the thirty-four states and the District of Columbia which were in the death registration area of 1920 and comprised 81.4 per cent of the population of the United States in 1930.

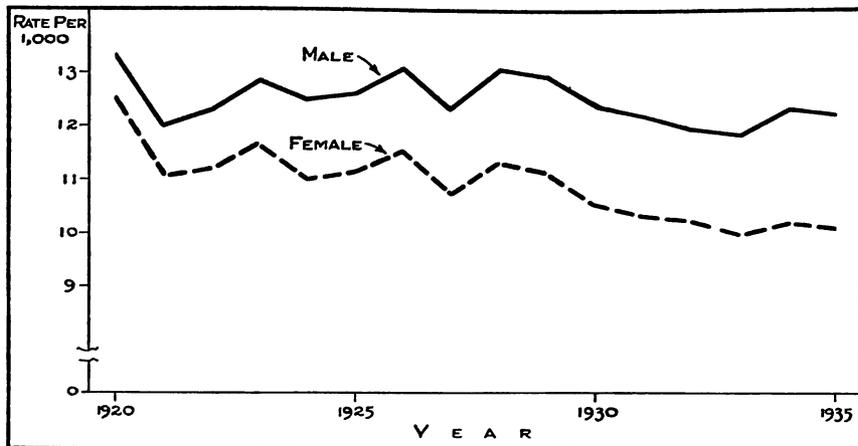


Fig. 1. Annual death rates (crude) for males and females in the Registration States of 1920, including the District of Columbia, for the period 1920-1935.

Figure 1, which presents the crude annual death rates since 1920. In the years before 1930, there was a slight upward trend evident in the male death rates but since 1930 the rates have shown a tendency to decline. The lowest rate, 11.9 in 1933, was, however, only one per cent less than the rate in 1921, the year in which the previous low rate was recorded. On the other hand, the death rate for females has shown a downward trend for the entire period since 1921 and each year's rate since 1930 has been lower than any rate recorded from 1921 to 1929.

The decline in the mortality for each sex in recent years is significantly increased if the total rates for all ages are adjusted to the same age distribution, thus eliminating the effect of a larger proportion of older persons in the population in the most recent years. In Table 1, crude and adjusted rates for each sex are shown for three calendar periods, 1921-1923, 1927-1929, and 1933-1935. When the latest period is compared with the earliest, the mortality for males (adjusted) shows a decline of 8.6 per cent as against 18.0 per cent for females. The greater decrease in the female death rate than in the male death rate naturally increased the difference between the rates; so that in the years 1933-1935 the male rate exceed-

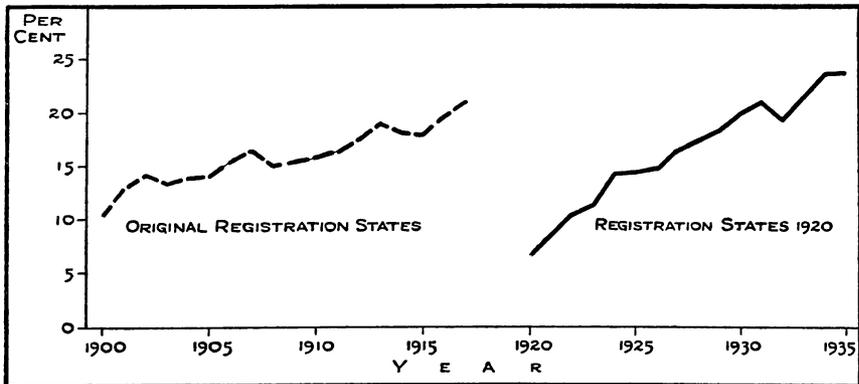
CALENDAR PERIOD	DEATH RATE PER 1,000 POPULATION				PER CENT CHANGE IN ADJUSTED RATES BETWEEN 1921-1923 AND LATER PERIODS		EXCESS MORTALITY FOR MALES PER CENT
	Male		Female		Males	Females	
	Crude	Adjusted <sup>1</sup>	Crude	Adjusted <sup>1</sup>			
1921-1923	12.40	12.31	11.30	11.15	-	-	10.4
1927-1929	12.80	12.48	11.06	10.64	+1.38	- 4.57	17.4
1933-1935	12.14	11.25	10.07	9.14	-8.61	-18.03	23.2

<sup>1</sup> Adjusted to the age distribution of the total population of the 1920 Registration States according to the census, January 1, 1920. Deaths of unknown age are included in the total adjusted rate.

Table 1. Mortality by sex in the 1920 Registration States and the District of Columbia at three calendar periods, 1921-1923, 1927-1929, and 1933-1935. ed the female rate by 23 per cent whereas in 1921-1923 the excess was 10 per cent.

The steady increase in the excess in mortality among males as compared with that among females is shown strikingly in Figure 2 in which have been plotted the percentages by which the annual adjusted rates for males were greater than the rates for females. In 1920, the excess mortality for males was 6 per cent but in 1935 it was 24 per cent. It is clear from the chart that there has been a consistent increase in the difference between the sex-specific rates which has persisted in years in which the male rates showed a decline as well as in years when the male rate increased.

Fig. 2. Percentage excess in male mortality over female mortality after annual rates for each sex in each year were adjusted to the age distribution of the total population of the Registration States of 1920.



It is of interest to compare the differences between the sex-specific rates since 1920 with those shown by the mortality experience in earlier years. This comparison is made in Figure 2, which indicates the percentage excess in the male rates for the population of the Original Registration States for each year from 1900 to 1917,<sup>3</sup> inclusive. The excess is based on sex-specific rates which were adjusted to the same age distribution used in the adjusted rates for the period 1920-1935, namely, the total population of the 1920 Registration States according to the census of January 1, 1920. A gradually increasing excess mortality for males is found to have characterized this earlier period, the percentage excess in the male death rate having increased from about 10 per cent in 1900 to 21 per cent in 1917. The comparatively small difference in the rates by sex noted in 1920 and several succeeding years for the Registration States of 1920 was true also for the Original Registration States. This abrupt change in the ratio of the male rate to the female rate is associated with a sharp drop in the death rate to a level considerably below the pre-war rates. The decline was greater for males than for females, the average death rate for males in 1920-1921 being 15 per cent below the rate for 1915-1916 and for females only 7 per cent. The sudden decline in the death rate for males in these years has been a very puzzling phenomenon for which no satisfactory explanation has been offered.<sup>4</sup> The excess mortality for males rapidly increased again and in 1934 and 1935 it was higher than that recorded for any

<sup>3</sup> Rates for the years 1918 and 1919 have not been used because of the difficulty of estimating accurately the male population in these years due to the withdrawal of large numbers of males from civil life during the World War. The Original Registration States include the six New England States and New York, New Jersey, Indiana, Michigan, and the District of Columbia.

<sup>4</sup> It is of interest to note that the relatively greater change in the male death rate was limited to the age groups between 15 and 75 years of age. At ages 20 to 34 years, the death rate for males in 1920-1921 was 17 per cent below that in 1915-1916 but the rates for females increased slightly; at ages 35 to 54 years, the rates for males and females declined 24 per cent and 9 per cent, respectively; and at ages 55 to 64 years the percentages were 16 and 8. During the war, several million men in the younger adult ages had been under a regime of physical training, had received immunizing treatments, and many had physical defects corrected. It is possible that this experience contributed to the lower death rate in the years immediately following the war period, but other factors also must have been involved since the improvement in the male death rate shows an excess at older ages.

pre-war year. But the comparatively favorable ratio of the mortality among males to that among females in the first part of the last decade demonstrates the possibility of extending the improvement in the mortality among females to the mortality among males.

## SEX DIFFERENCES AT SPECIFIC AGES

The problem of sex differences in mortality is further defined when these differences are considered by age or when the unfavorable mortality experience of males is located at specific ages. The basic data for such an analysis are presented in Table 2 and Figure 3 which give the sex-age specific death rates for the periods 1921-1923, 1927-1929, and 1933-1935, the latter being the latest years for which deaths by sex and age are available.

Some of the more significant indications to be obtained by a study of Figure 3 may be summarized briefly:

Table 2. Sex-age specific mortality in the 1920 Registration States and the District of Columbia at three calendar periods, 1921-1923, 1927-1929, 1933-1935, and the percentage excess in mortality of males at each period.

AGE GROUP	DEATH RATE PER 1,000 POPULATION <sup>1</sup>						PER CENT THAT THE MALE RATE WAS ABOVE OR BELOW THE FEMALE RATE		
	Male			Female			1921-23	1927-29	1933-35
	1921-23	1927-29	1933-35	1921-23	1927-29	1933-35			
ALL AGES	12.40	12.80	12.14	11.30	11.06	10.07	+ 9.7	+15.7	+20.5
0-4	25.09	21.33	15.85	20.96	17.21	12.64	+19.7	+23.9	+25.4
5-14	2.45	2.12	1.66	2.10	1.72	1.32	+16.9	+23.1	+25.9
15-24	3.81	3.62	2.82	3.81	3.44	2.43	0	+ 5.4	+16.1
25-34	5.03	5.01	4.15	5.12	4.73	3.62	- 1.6	+ 6.0	+14.6
35-44	7.38	7.82	7.00	6.67	6.50	5.39	+10.6	+20.4	+29.9
45-54	12.14	13.74	13.38	10.85	10.99	9.80	+11.9	+25.1	+36.4
55-64	24.55	27.12	26.41	21.56	21.82	20.02	+13.9	+24.3	+31.9
65-74	53.61	58.06	56.54	48.41	49.27	46.21	+10.7	+17.8	+22.4
75 and Older	133.30	142.09	141.00	129.24	132.89	127.96	+ 3.1	+ 6.9	+10.2

<sup>1</sup> The populations for each sex and age group in the years between 1920 and 1930 were estimated by the arithmetic method from the censuses of 1920 and 1930. The population in 1935 was estimated by advancing the population of each five-year sex-age group according to the 1930 census to the next higher five-year age group and deducting the deaths that would have occurred in the intervening five-year period; for the years between 1930 and 1935 the populations were obtained by the usual arithmetic method. Exceptions to this procedure were the estimates for the age group 5-9 in 1935 which was corrected for underenumeration of the population under 5 years of age in 1930 and the age group under 5 years in 1935 for which estimates made by the Scripps Foundation, Oxford, Ohio, were used. Rates for the age group under 5 years are based on the census population or its equivalent. Populations were adjusted to July 1st of each year.

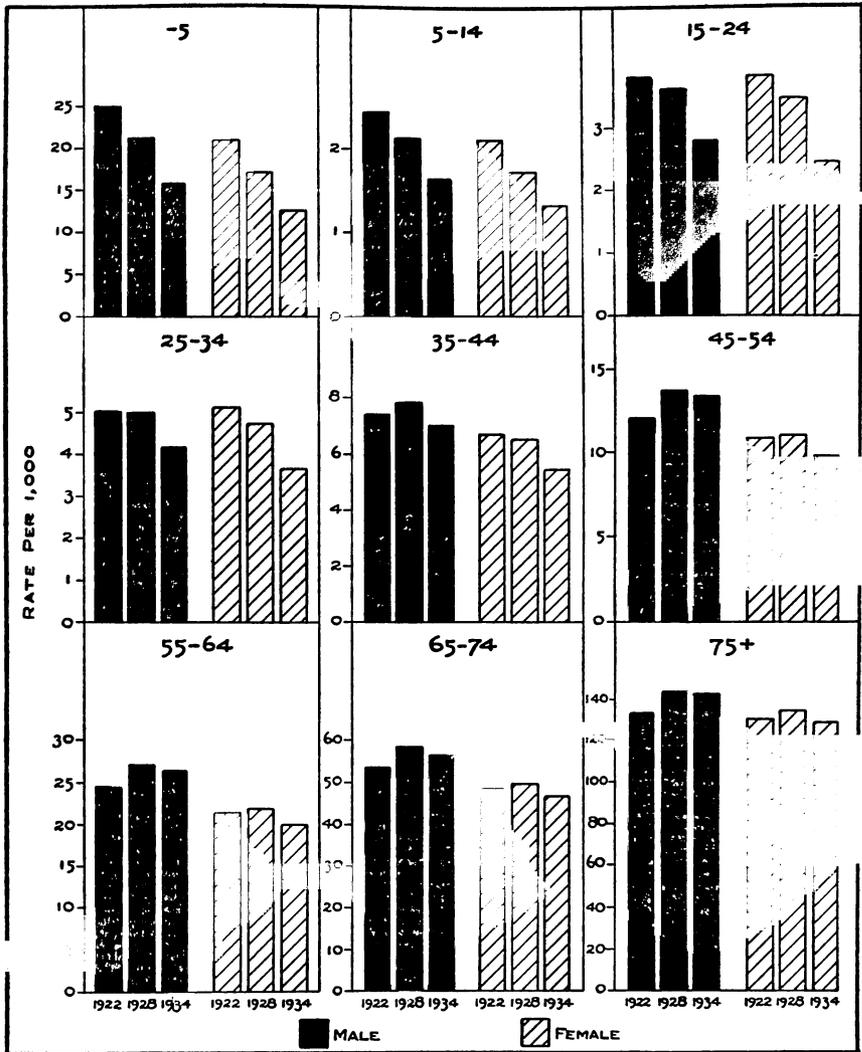


Fig. 3. Sex-age specific mortality in the Registration States of 1920 at three calendar periods, 1921-1923, 1927-1929, and 1933-1935. Note that the *vertical scale at each group* is different; equal differences between the length of the bars for any age group represent roughly equal proportionate differences in rates.

1. For age groups under 25 years of age, mortality for each sex shows a progressive decline from one calendar period to the next, although the decline was less between 1921-1923 and 1927-1929 than between 1927-1929 and 1933-1935.

2. At ages 35-44 years and for each older ten-year age group, the male

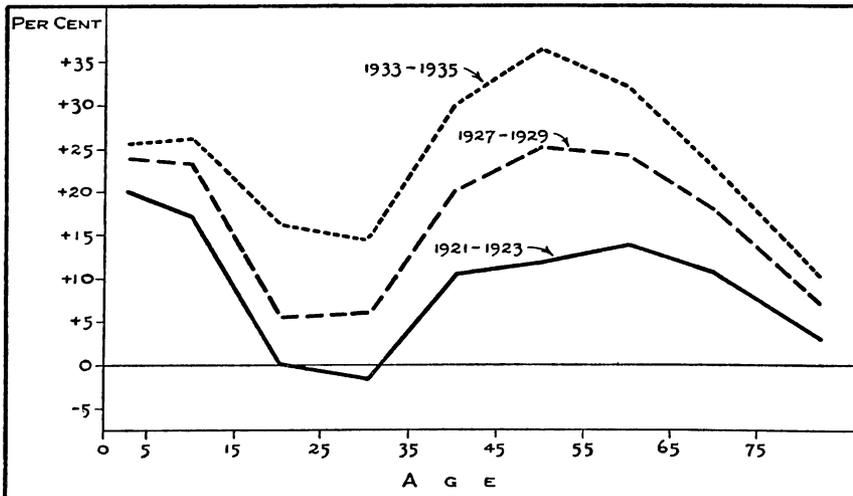
death rate was higher in 1927-1929 than in the earlier period, but there was no comparable increase in the female rate. In the age group 45-54 years, and at successively older ages, the mortality among females shows a slight but insignificant increase over the period 1921-1923.

3. Between 1927-1929 and 1933-1935, mortality rates for each sex and at every age show some reduction, but in every adult age group the reduction is greater for females than for males. The decline is considerable up to the age group 45-54 years but, in this age group and in older age groups, the improvement in the death rate for males was slight.

4. When the rates for 1933-1935 are compared with those for 1921-1923, it appears that the female death rates were lower in 1933-1935 at every age, although the differences are slight at the advanced ages. For males, the death rates in the period 1933-1935 were lower than in 1921-1923 only up to age 45, and the rates for the age group 45-54 years and each older age group were definitely higher than in 1921-1923.

The net effect of these age-specific changes on the comparative mortality for males and females at each age is portrayed in Figure 4 and Table 2. It is apparent from this chart that the progressively wider disparity noted in the total mortality for males and females has occurred to some extent at every age. There are, however, wide

Fig. 4. Percentage that the male death rate was above or below the female death rate at specific ages in three calendar periods, 1921-1923, 1927-1929, and 1933-1935, in the Registration States of 1920.



differences in the proportionate excess mortality for males at various ages and in the extent of the change in the period between 1921-1923 and 1933-1935. The excess in each of the three periods is relatively great in childhood and middle life, lower in the young adult ages between 15 and 34 years of age, and also at advanced ages, 75 years and over. The increasing excess in the mortality among males, however, is especially significant and this has been most striking in the young adult ages and has continued through the older middle age groups.

The percentage excess of mortality for males was at a maximum in the age group 45-54 in 1933-1935 when it was 36 per cent higher than the female mortality. At these ages, the excess had been only 12 per cent in 1921-1923. Nearly as great an excess is found in the age groups 35-44 years and 55-64 years and the increase over 1921-1923

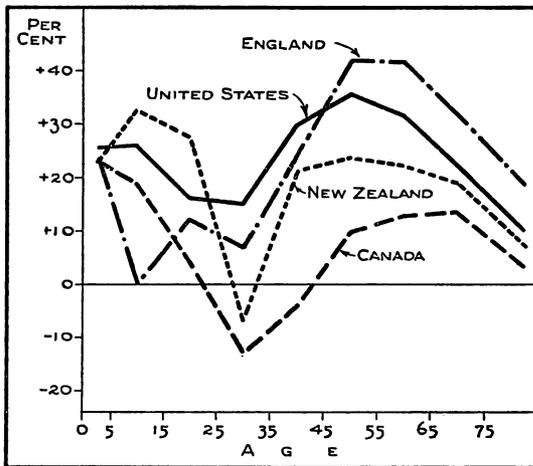


Fig. 5. Percentage that the male death rate was above or below the female death rate at specific ages in the United States (Registration States of 1920), 1933-1935, in England and Wales, 1934, in Canada, 1930-1932, and in New Zealand, 1930-1932.

also was similar. At ages 15-24 years and 25-34 years, the excess of mortality for males was about 15 per cent in 1933-1935. Although slightly less than half the excess at older ages, it represents an actual increase that is nearly as great since the male rate at ages 25-34 years was a little lower than the female rate in 1921-1923.

Several questions concerning the significance

of the excess of mortality for males naturally arise. Is this excess in the United States unusual or does it represent a natural condition to be found in other countries? Is this excess associated with an ex-

ceptionally favorable mortality among females in recent years or is the mortality for males unduly high? Some evidence on these questions is presented in Figures 5 and 6 which compare the situation in the United States with that in Canada, England and Wales, and New Zealand. The mortality data used do not refer to the same years for each country, but that does not affect the validity of these comparisons. For Canada and New Zealand, sex-age specific mortality in the years 1930-1932<sup>5</sup> have been used and for England and Wales, the data refer to the year 1934.<sup>6</sup> The mortality rates in these countries by sex for all ages and adjusted to the age distribution of the population of the 1920 Registration States were as follows:

	<i>Death Rate per 1,000 Adjusted for Age</i>	
	<i>Male</i>	<i>Female</i>
United States	11.25	9.14
England and Wales	10.75	8.58
Canada	10.03	9.13
New Zealand	8.27	7.09

The mortality in the United States in the period 1933-1935 was somewhat higher than that in Canada and England and Wales in the periods compared, and much higher than that in New Zealand which has the lowest mortality of any country.

The per cent that the mortality among males at specific ages was greater or less than the mortality for females is shown for each country in Figure 5. The great differences between these countries gives no support to an hypothesis that there is a normal or expected excess for males at any ages, except in early childhood, although some excess mortality for males at most ages is the general experience. The percentage of excess at ages 25-34 years and 35-44 years was greater in the United States than in any of the other countries. At older ages, the excess of mortality for males in the United States

<sup>5</sup> Data are from the STATISTICAL YEAR-BOOK of the League of Nations, 1936-1937.

<sup>6</sup> Data taken from THE REGISTRAR GENERAL'S STATISTICAL REVIEW OF ENGLAND AND WALES, 1934. Part I.

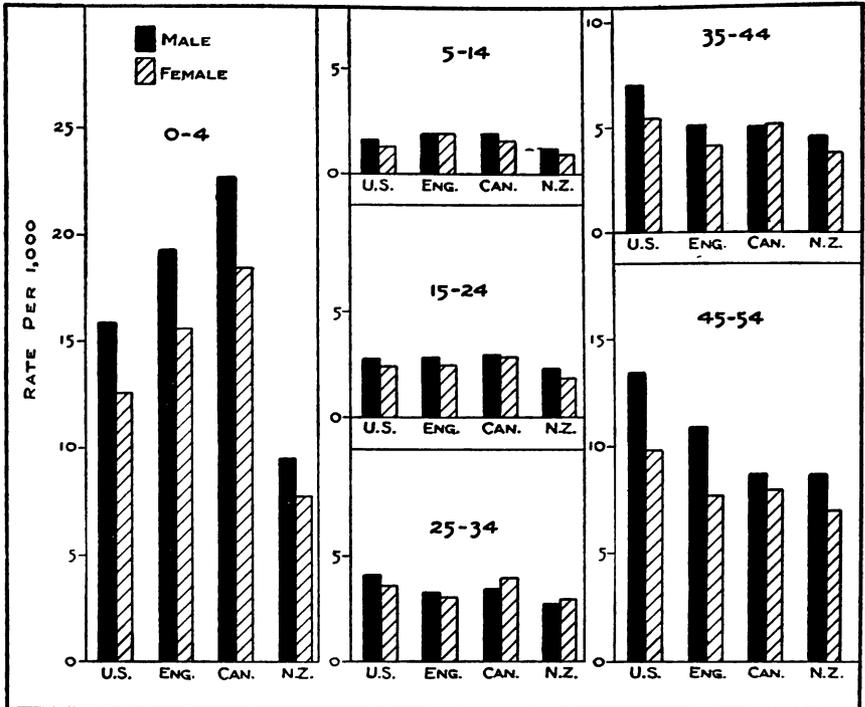


Fig. 6. Comparative mortality by sex and age up to 55 years of age in the United States (Registration States of 1920), 1933-1935, in England and Wales, 1934, in Canada, 1930-1932, and in New Zealand, 1930-1932.

was less than in England but greater than in Canada and New Zealand. Also at younger ages, between 5 and 24 years, the relative excess mortality for males in the United States was greater than in England and Canada but less than in New Zealand. In general, the males in the United States were at a greater disadvantage with respect to their chances of dying as compared with the chances of females dying than were males in these other countries. The relatively unfavorable situation in the United States at ages 25-44 years is especially important since these are ages at which death should be postponable and premature death of the breadwinner is a serious economic catastrophe.

The actual death rates at specific ages for each country, which are plotted in Figure 6 for ages up to 55 years, show that in middle life the mortality experience in the United States is less favorable

than in any of these countries. This is true for both males and females in the United States and, therefore, the high ratio of male to female mortality in this country is not associated with an especially low death rate for females. In childhood, the mortality in the United States is considerably lower than in either England or Canada, and in the age group 15-24 years, females in the United States have some advantage but males have approximately the same death rates. The lower childhood mortality in the United States offsets the effect of higher mortality at adult ages on the total death rates in this country and tends to obscure the real health problem which exists unless age-specific rates are considered. Greater attention is being given by health authorities to the adult health problem and it is evident that this is not a question of extending the benefits of modern medicine to the older age groups alone but of finding methods to protect the health of young adults, especially of postponing death for the males in the population.