NATIONAL CENTER For HEALTH STATISTICS | Series 3 Number 4

VITAL and HEALTH STATISTICS

ANALYTICAL STUDIES

Infant and Perinatal Mortality in the United States

Analysis of long- and short-term trends in infant mortality in the United States by age at death, cause of death, sex of child, color, and geographic area; fetal and perinatal mortality trends; role of various risk factors including birth weight, age of mother, birth order, mother's history of prior pregnancy loss; changes during the 1950 decade in personnel and facilities and services related to obstetrical and pediatric care; discussion of health insurance and maternal and child health programs and services.

Washington, D.C. October 1965

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
John W. Gardner
Secretary

Public Health Service
Luther L. Terry
Surgeon General

Public Health Service Publication No. 1000-Series 3-No. 4

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C., 20402 - Price 55 cents

NATIONAL CENTER FOR HEALTH STATISTICS

Public Health Service Publication No. 1000-Series 3-No. 4

Library of Congress Catalog Card Number 65-62151

CONTENTS

IN THIS REPORT detailed statistics are provided on changes in infant and perinatal mortality rates since the early 1930's. The analysis focuses on the lack of sizable decreases in these rates in the 1950's and describes the current situation in the white and nonwhite groups and in various geographic subdivisions. Statistics on fetal loss, congenital anomalies, and birth weight derived from special studies are given. Changes in parameters of infant loss that may explain the small decreases in this loss during the 1950's are considered, and differences in rates of change in the infant mortality rate among high-risk groups are analyzed. Statistics are presented on the ratios of general practitioners, obstetricians-gynecologists, pediatricians, nurses, and hospital beds to relevant segments of the population. Other factors, including obstetrical costs, health insurance, and maternal and child health programs, are discussed.

The rate of decline in the infant mortality rate was 4.7 percent per year during the 1940's. Between 1951 and 1962 it was 1 percent per year. The slowdown affected all segments of the population. The rate in many large cities increased, and the gap between rates in metropolitan and nonmetropolitan areas decreased. High-risk groups such as children weighing 2,500 grams or less at birth, children born to mothers who previously had a fetal death, and nonwhite infants showed almost no improvement during the 1950's.

Increased emphasis through special community-action programs on the problem of infant mortality is viewed as one of the elements that may help accelerate the rate of decline in infant mortality.

SYMBOLS

Data not available	---
Category not applicable	...
Quantity zero	-
Quantity more than 0 but less than 0.05	0.0
Figure does not meet standards of reliability or precision	*

INFANT AND PERINATAL MORTALITY IN THE UNITED STATES

The following research report was prepared by Sam Shapiro, Edward R. Schlesinger, M.D., and Robert E. L. Nesbitt, Jr., M.D. [a b]
The methodology, findings, and conclusions are those of the investigators.

INTRODUCTION

The relatively poor progress in reducing infant mortality since the early 1950's has been a source of increasing concern in the United States. The subject has been examined previously in the context of international, national, and local changes in pregnancy loss rates; but it is clear that continued discussion based on the analysis of old and new data is very much the order of the day.[1-5]

The tone and outlook of reports on infant mortality in the United States would be vastly different if, instead of being written in the present period, they were being presented 25-30 years ago or as recently as 10-15 years ago. During the late 1930's a backward glance at what had been accomplished in reducing the infant mortality rate had its rewards. The infant mortality rate had been cut at least in half in a matter of 20-25 years, and the country was apparently in the midst of further dramatic reductions in the loss rate. The decline continued at a rapid pace, and between 1940 and 1950 the infant mortality rate decreased by almost 40 percent.

In 1950 the assessment of the performance in the immediate past could well have led to an expectation of additional impressive gains in the future. Today the mood is quite different. For over a decade there has been no sizable decrease in the infant mortality rate. In fact, during the 1950's there were years in which the rate increased—a most unusual occurrence in half a century of vital statistics reporting in the United States. Events in the last few years give the definite impression that while the infant mortality rate will not remain stationary its downward movement will be slow indeed.

The emphasis of the report that follows is on the current national situation with regard to both infant and perinatal mortality. In developing the subject, considerable attention is given to how we arrived at our present state and the extent to which significant parameters of pregnancy loss have been altered over the years. Long- and short-term trends are discussed; the basic variables of sex of child, color, geography, and risk factors such as age of mother, birth order, and prior pregnancy history of the mother are also considered. Although the focus is on infant and perinatal mortality, other components of pregnancy loss and damage among the offspring—including early fetal loss, low birth weight, and congenital malformations—are dealt with briefly. It has been apparent for some time that the attack on infant and perinatal mortality must concern itself with these types of loss and damage, and, indeed, serious efforts are being made to enlarge our limited knowledge about them.

[a]This study was supported in part by U.S. Public Health Service Contract No. PH 86-63-129 and in part by USPHS grant CH 00075 from the Division of Community Health Services to the American Public Health Association for a series of monographs on vital and health statistics.

[b]Mr. Shapiro is Director of Research and Statistics, Health Insurance Plan of Greater New York; Dr. Schlesinger is Assistant Commissioner for Special Health Services, N.Y., State Department of Health; Dr. Nesbitt is Professor and Chairman, Department of Obstetrics and Gynecology at the State University, Upstate Medical Center, Syracuse, New York.

All of the information is derived from existing data or from special tabulations of data collected before the report was initiated. Official vital statistics are the primary source. Whenever possible, these data come from the Division of Vital Statistics, Public Health Service. In several instances where national data were unavailable, it proved feasible to examine important relationships on the basis of vital statistics for Upstate New York.[c]

Although vital statistics are the most comprehensive source of information for examining the national picture on infant and perinatal mortality, special studies conducted over the past two decades provide additional insights into the epidemiology of pregnancy loss. It is not the intent of the present report to incorporate all of these findings. The approach taken is to include a limited amount of data derived from special investigations which extend information about variables also found in vital statistics.

While the analysis of mortality data is the focus of the present report, a major section is devoted to a review of medical and paramedical manpower, facilities, and medical care costs in the United States with particular emphasis on their relationship to obstetrical and pediatric services. The final section of the report provides a perspective on the future course of infant mortality in the United States.

[c]"Upstate New York" refers to New York State, excluding New York City.

I. MORTALITY RATES

TREND IN INFANT, FETAL, AND PERINATAL MORTALITY

Infant Mortality

General trend.—The long-term trend in infant mortality in the United States and changes in rates of decline are examined in detail from the middle 1930's to the early 1960's in this report. It was not until 1933 that data became available for the United States as a whole. In 1915, the Bureau of the Census established the birth registration area which included 10 states and the District of Columbia in which the registration of live births was relatively complete.[d] Periodically other States were added as they met the minimum requirement of 90 percent completeness of birth registration. Generally the States that entered the Area late have had comparatively high infant mortality rates.

Incompleteness of birth registration persisted as a serious problem in large sections of the country long after 1933, and it was not until the birth registration test of 1950 showed that 98 percent of the live births were being registered that the issue could be dismissed as inconsequential for the United States as a whole.[6] There is no direct evidence about the relationship between the completeness of live birth and infant death registration. The usual assumption is that they are of the same order of magnitude and, therefore, that the errors cancel each other when rates are computed. However, this may be less true for very early infant deaths than for deaths later in infancy.

Despite restrictions imposed by changes in registration completeness, it is believed that inferences about the course of the infant mortality rate since the mid-1930's can be drawn with a fairly high degree of accuracy from data based on reported events. The trend analysis in this report starts with these years. With regard to what happened prior to the mid-1930's, it is perhaps sufficient to recognize that 10-15 percent of the newborn babies died in infancy at the beginning of the 20th century and that by the 1930's the mortality rate had been cut at least in half.

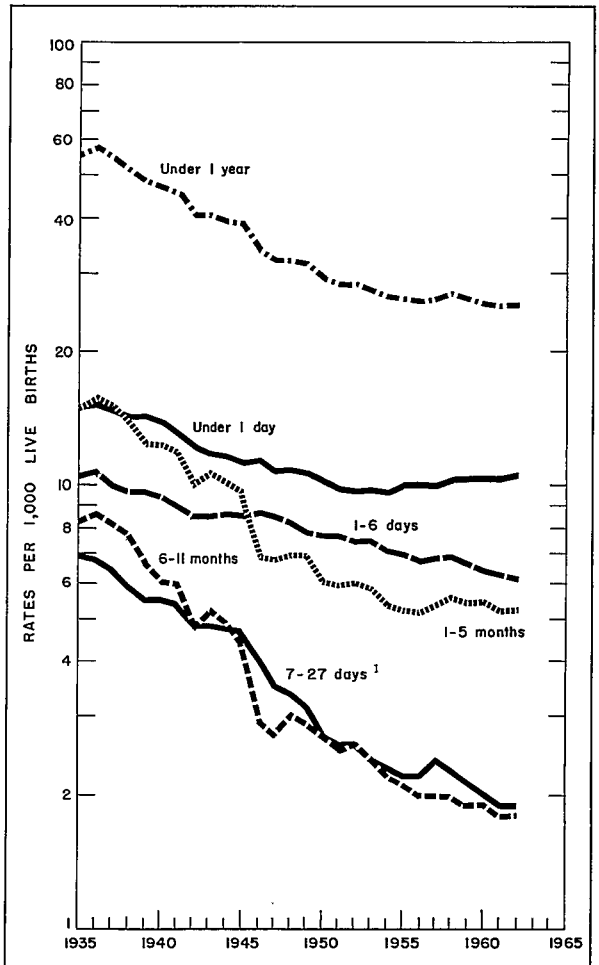
Between the mid-1930's and 1950 the rate was again greatly reduced. The annual rate of decline was 4.7 percent, but year-to-year changes were very uneven: a few years would go by with comparatively minor changes, and then there would be

[d]The death registration area was established in 1900 for the annual collection of mortality statistics.

a sharp drop.[e] An extreme example of this is found in the World War II period when the rates decreased only about 5 percent from 1942 to 1945. In the immediate postwar years the drop was three times as great. After 1950 the rate began to level off. At first it might have been assumed that this was another temporary situation, but, in time, it became clear that a fundamental change had occurred in the course of the infant mortality rate. Over the entire period of 1951-62 the rate of decline was 1.0 percent per year, or a small fraction of the annual rate of change in the preceding period. Furthermore, some of the year-to-year fluctuations involved important increases in the rate.

Trends by age at death, sex of child, and color.—The trend in the infant mortality rate is the resultant of widely different trends in mortality at various ages during infancy. Selected for analysis are three age groupings in the neonatal period (under 1 day, 1-6 days, and 7-27 days) and two age groupings in the postneonatal period (1-5 months and 6-11 months). These provide a fairly complete basis for understanding the changes in mortality that have taken place throughout infancy. Other age groupings lead to inferences that differ in detail but do not alter the general conclusion (table 1 and fig. 1).

Mortality in the first day of life decreased between 1935 and 1951 rather steadily but at a substantially slower rate than for the entire first year (2.9 percent).[f] Then it leveled off, and, starting with 1955, it began to increase slightly. There is no indication yet that the rate of loss in the



[1] From 1935 to 1948 this category refers to deaths at ages 7-29 days.

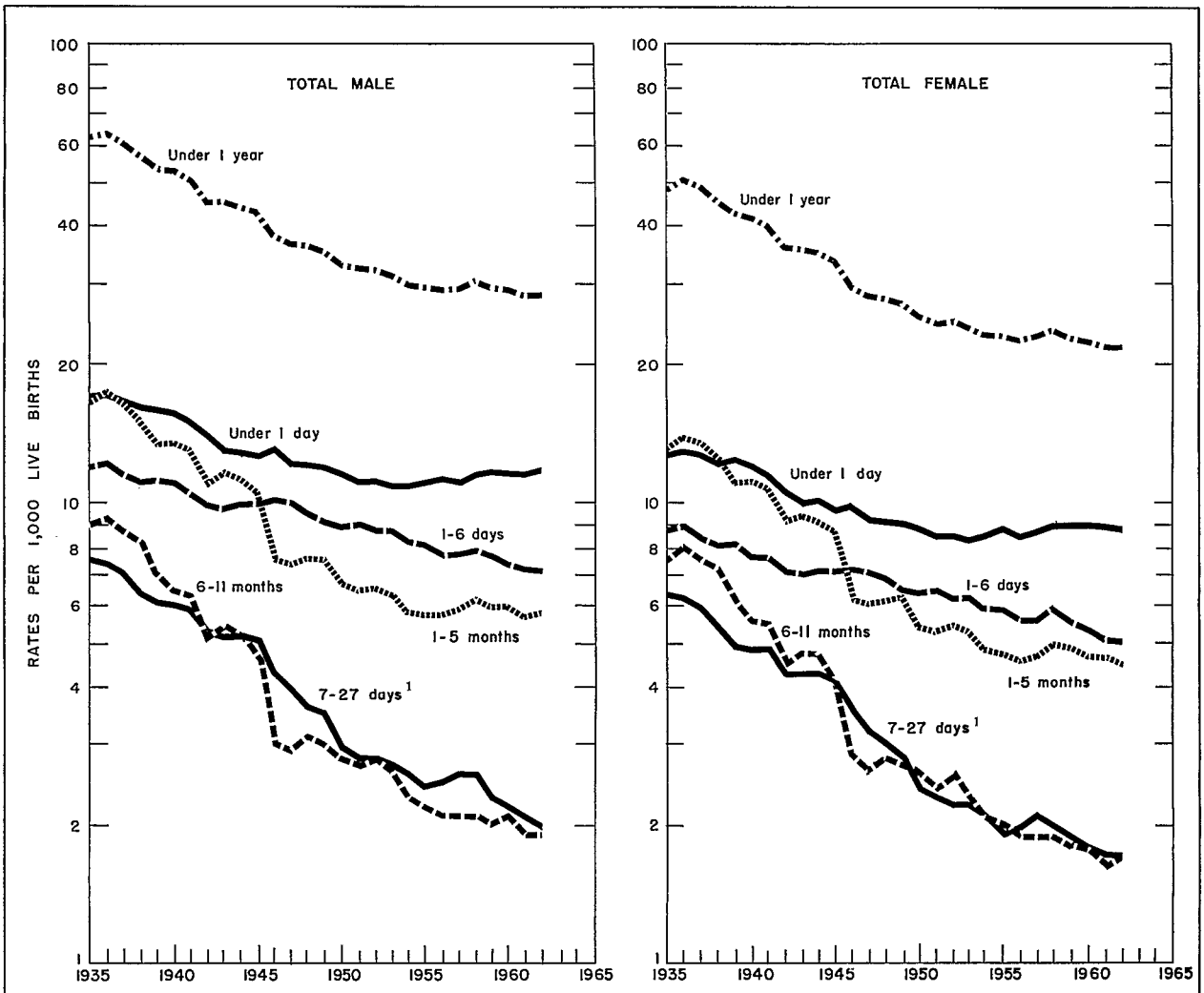
NOTE: Beginning in 1959 include Alaska and Hawaii.

Source: Annual volumes *Vital Statistics of the United States*, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

Figure 1. Infant mortality rates by age: United States, 1935-62.

[e] Annual rates of decline were obtained by fitting straight lines by the method of least squares to the logarithms of the death rates. From the slopes of these fitted lines the annual rates of decline or increase (in percent) are derived. Changes in infant mortality rates are determined from rates computed conventionally, i.e., the number of deaths in a particular year is related to the number of live births in that year to obtain an infant mortality rate. During a period of stability in the annual number of live births the rates closely approximate the risk of infant mortality in each of the years. When the number of live births decreases sharply from one year to the next, an accompanying decrease in mortality would be understated by conventional rates; the reverse would occur if there were a sharp increase in the number of live births. The latter situation held during the immediate post-World War II period. The large drop in the infant mortality rate between 1945 and 1946 is due, in part, to the changing number of births. Actually when infant mortality rates are adjusted for the factor, the decrease in the rate between 1946 and 1947 appears to be relatively greater than in the previous years. It should be noted that the effect of changes in the number of births varies with age at death; it is negligible during the first month following birth, but it becomes appreciable in the postneonatal period.

[f] All percentage changes in this section are per annum.



[1]From 1935 to 1948 this category refers to deaths at ages 7-29 days.

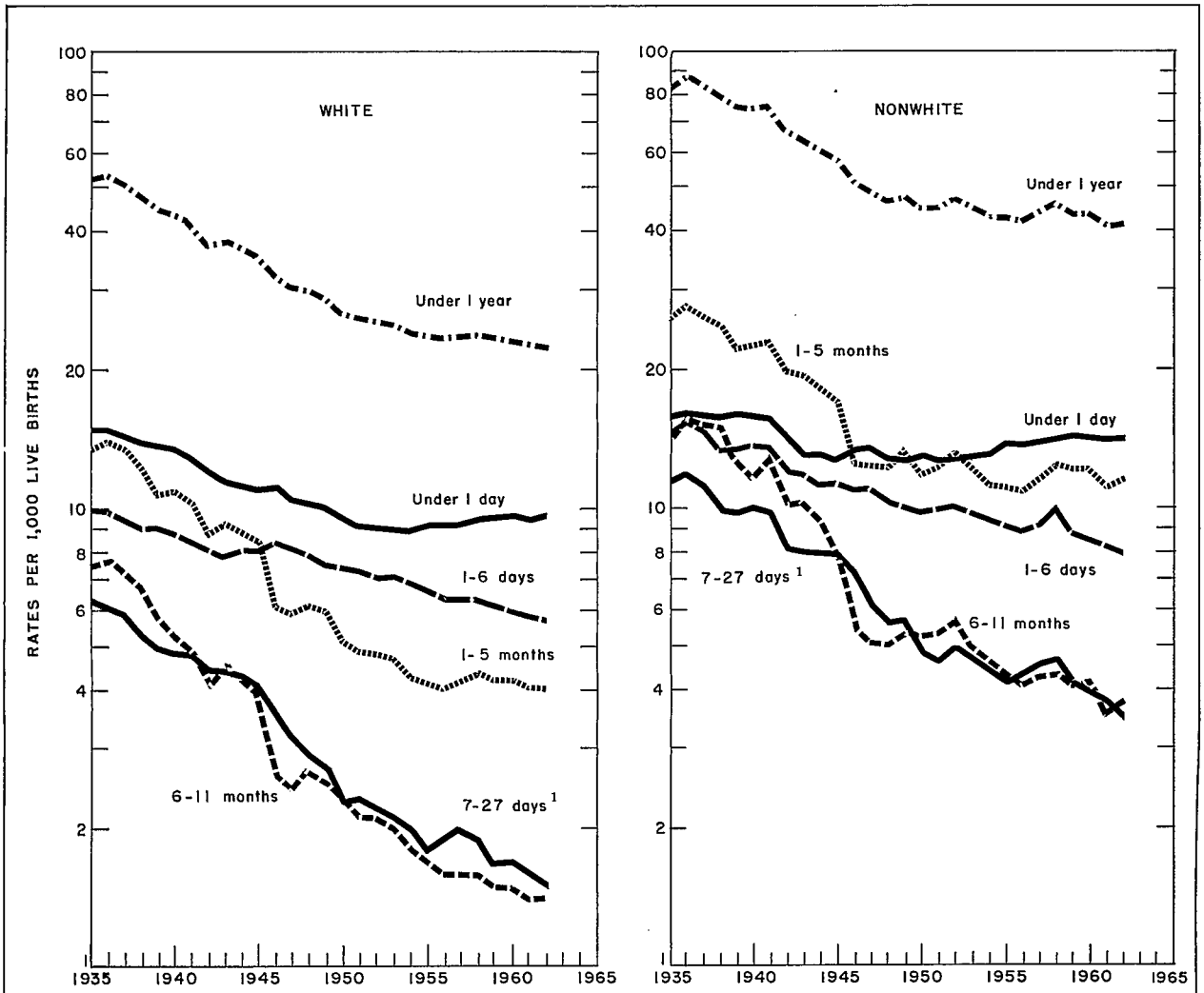
NOTE: Beginning in 1959 include Alaska and Hawaii.

Source: Annual volumes *Vital Statistics of the United States*, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

Figure 2. Infant mortality rates by age and sex: United States, 1935-62.

first day after birth has resumed its former downward trend. In the balance of the first week of life (1-6 days) the mortality rate followed a course similar to that of the rate for under 1 day until the early 1950's when, instead of increasing, it continued its slow downward movement (2.0 percent). After the first week the trend in the mortality rate showed great variability. At ages 7-27 days there were three distinctly different patterns. Between 1935 and 1945 the mortality rate declined at a fairly rapid rate (4.5 percent). This was followed by even larger reductions in the immediate postwar period. After 1950 the rate of decrease slowed down and was not much greater than at ages 1-6 days (2.7 percent).

The rate of decline in the mortality rate from 1935 to 1945 was larger in the postneonatal period than at earlier ages. At ages 1-5 months the



[1]From 1935 to 1948 this category refers to deaths at ages 7-29 days.

NOTE: Beginning in 1959 include Alaska and Hawaii. New Jersey excluded from data for 1962; race not reported.

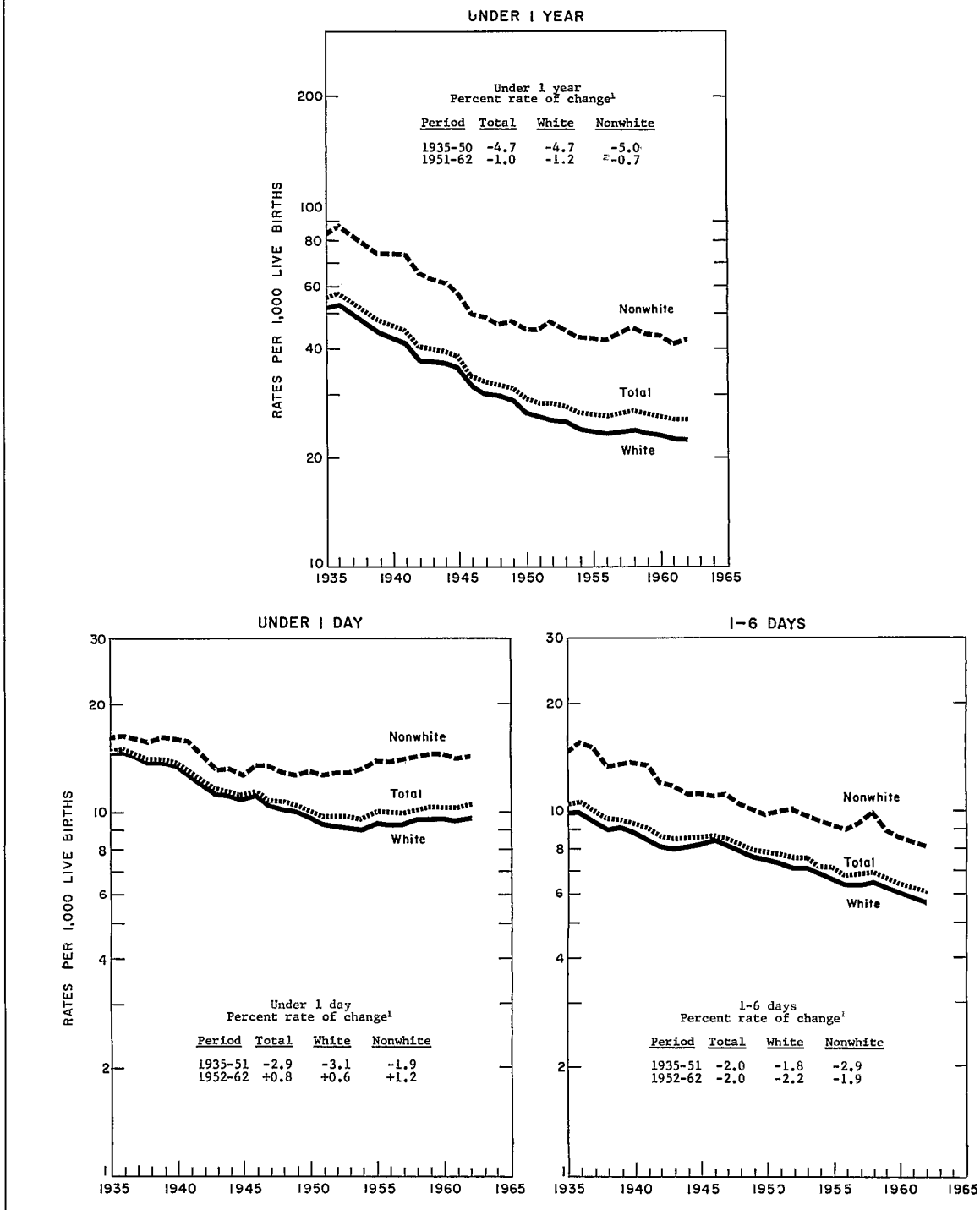
Source: Annual volumes *Vital Statistics of the United States*, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

Figure 3. Infant mortality rates by age and color: United States, 1935-62.

annual rate of decline was 5.4 percent. Following a sharp decrease in mortality immediately after World War II, the mortality rate at ages 1-5 months followed an erratic downward course until the mid-1950's. The precise year when the downward trend ended cannot be determined, but for purposes of the current discussion 1956 has been selected. For six successive years, 1957-62, the mortality rate has been higher than in 1956. However, there is some indication that the rate is starting to decline again—thus far very slowly. The course of the mortality rate at ages 6-11 months resembles that at ages 1-5 months except that the decrease in each period has been greater.

The trend in the infant mortality rate has been very similar for male and female births (table 2 and figs. 2 and 3). It is clear that the circumstances that led to reductions in infant mortality

788-022 O - 65 - 2



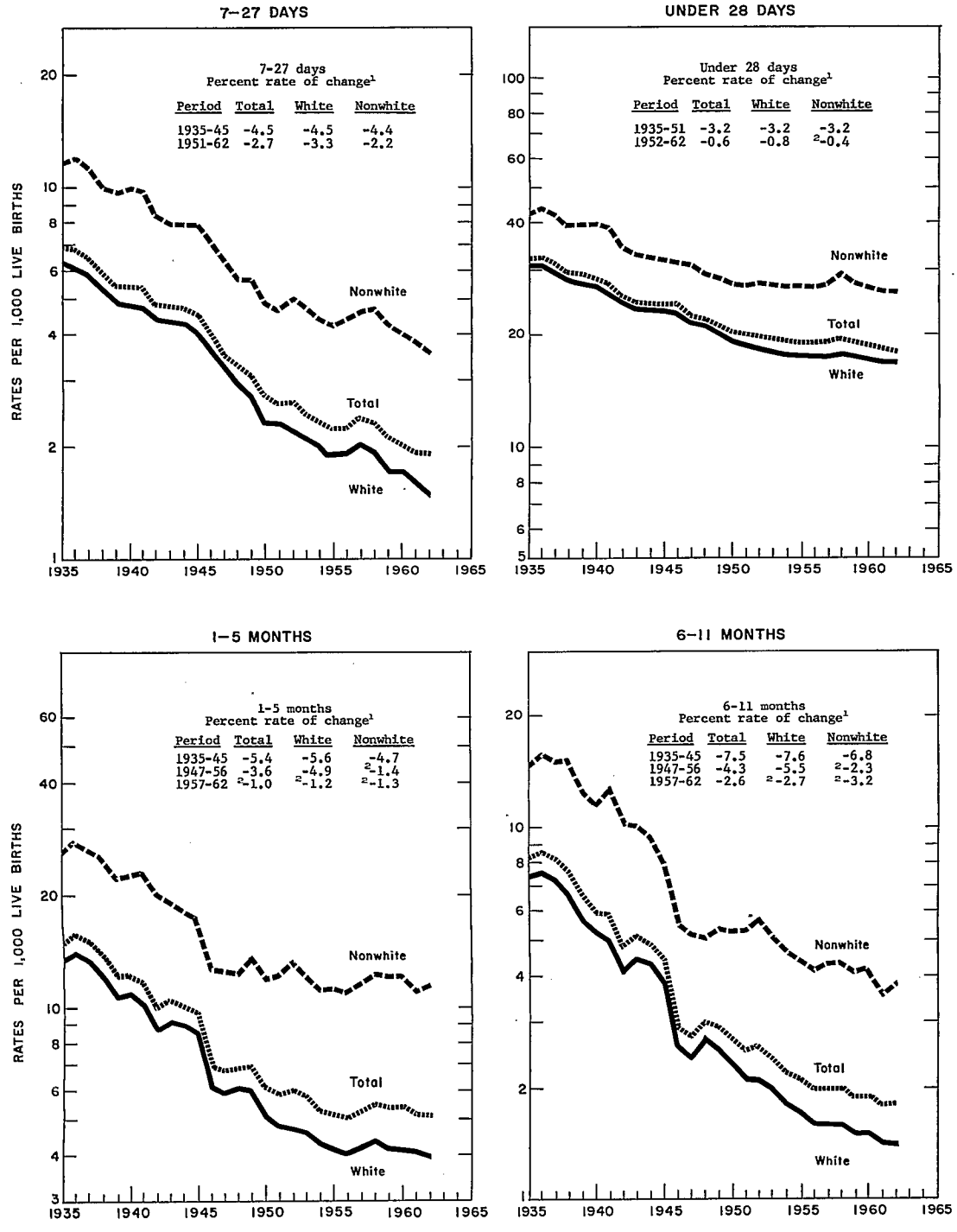
[1]Annual rate of change obtained by fitting least square lines to logarithms of rates for specified time period and taking anti-log of slope of fitted line.

[2]Coefficient of variations is one-third or more.

NOTE: Rates for 1959 to 1962 include Alaska and Hawaii. New Jersey excluded from data by color for 1962; race not reported.

Source: Annual volumes *Vital Statistics of the United States*, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

Figure 4. Infant mortality rates by color for each age group: United States, 1935-62.



[1]Annual rate of change obtained by fitting least square lines to logarithms of rates for specified time period and taking anti-log of slope of fitted line.

[2]Coefficient of variations is one-third or more.

NOTE: Rates for 1959 to 1962 include Alaska and Hawaii. New Jersey excluded from data by color for 1962; race not reported.

Source: Annual volumes *Vital Statistics of the United States*, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

Figure 4. Infant mortality rates by color for each age group: United States, 1935-62—Con.

have at no time favored one sex group over the other. Throughout the years 1935-62 the gap between the rates for males and females remained almost unchanged at every age level, with males having consistently higher rates.

The rates for white and nonwhite groups present a far different situation. Mortality trends for white infants closely parallel the trends previously presented for all races combined (table 3 and figs. 3 and 4). The only difference of any consequence is a slightly greater decrease in the death rate since 1950 for the white race than for the United States as a whole.

Until 1950 the rate of decrease in the loss during the first year of life was at least as great among the nonwhite births as the white. Since then the slowdown in the rate of decline has been more severe in the mortality rate for the nonwhite group. Larger differences than those suggested by the total infant mortality rate are found in the trends by age at death. Between 1935 and 1951 substantial decreases in mortality in the first day of life were scored by the white group; among nonwhite infants the decrease in the rate of loss under 1 day stopped in 1943. More recently—since 1952—the rate of increase in mortality at this age has been greater for the nonwhite than the white infants.

Question might be raised about the comparative accuracy of the mortality trends for under 1 day among white and nonwhite children. Improvement in the reporting of live births could be accompanied by a more complete registration of deaths in early infancy and thereby artificially increase the mortality rate. It might be argued that this would be more significant for the rates among nonwhite babies in view of the reduction in the lag between nonwhite and white persons in the use of hospitals and in the completeness of registration of live births. These considerations are important, but it is unlikely that they completely explain events in the more recent period. The same situation is found in many areas of the country where the problems of underregistration and accuracy of reporting have been inconsequential for a long time. Another possibility is that with improvement in medical care there has been a shift in the timing of the death of some infants from the prenatal to the immediate postnatal period and that this has been more common among the nonwhite than the white births. This, too, is highly speculative, and it might be more fruitful to seek other explanations for the difference in trends between the rates for white and nonwhite infants.

Following the first day of birth and continuing until the end of the neonatal period, comparisons between mortality trends for the two race groups show a somewhat different set of relationships from those observed in under 1 day. There is some indication that the rate of decline in the 1-6 day period was, at one time, greater for the nonwhite than the white infants and that in more recent years the change in the loss rate has been similar in both race groups. At 7-27 days the decline in losses was almost identical for white and nonwhite infants from 1935 through 1945. It has been more rapid among white births since 1947.

Taking the neonatal period as a whole, the reduction in death rates among the nonwhite births kept pace with the rate of decline among the white births until about 1951. Subsequently the rates for both race groups decreased only slightly, with the rate among nonwhite infants leveling off somewhat more than the rate among white infants.

Both race groups made substantial gains in lowering postneonatal mortality and at about the same rate until the mid-1940's. The sharp drop in the death rate immediately after the war was shared by both white and nonwhite infants. Since then the trends in the mortality rates for white and nonwhite births have differed. For almost a decade the rates among the white infants at ages 1-5 months and 6-11 months continued to decline briskly. The tendency of the rates to level off started about 1954 or 1955. In contrast, among the nonwhite infants the rate at 1-5 months flattened out shortly after the war ended. This situation has persisted through 1962. Mortality rates at 6-11 months followed an erratic course among the nonwhite births after 1946. Increases in the rate were experienced for several years, and, while there have been decreases in the past few years, reversals still occur.

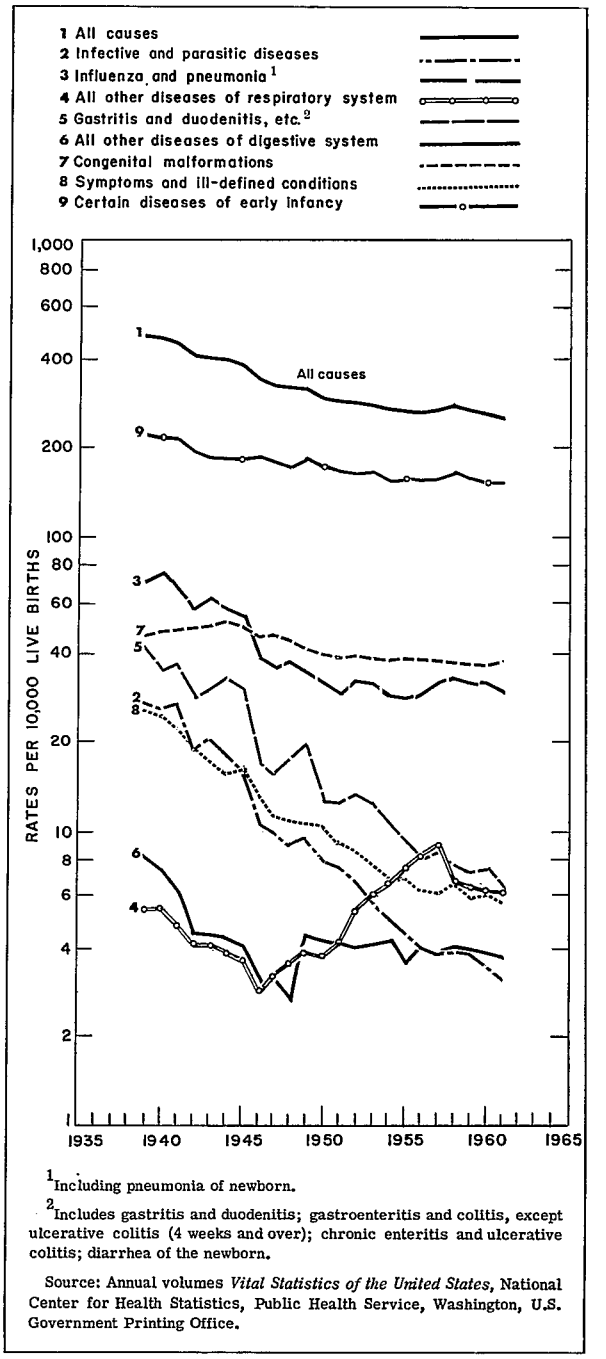
Trends by cause of death.—The decline in the overall infant mortality rate during the period prior to 1950 is generally accepted as reflecting the global effect of advances in medicine, maternal and child care, and improvement in medical facilities and economic and sanitary conditions in the United States. About half of the de-

crease between 1939 and 1950[g] resulted from the lowering of mortality from infective and parasitic diseases, influenza and pneumonia, and infections of the digestive system (fig. 5). The large decrease in the rate soon after World War II is mainly due to the reduction in loss from these causes, a circumstance which is attributed to the increased availability of antibiotics in the postwar period.

This is one of the few instances in which a decrease in the rate can be associated with a specific factor. Even here there is reason to moderate the conclusion. In the case of the rates for infective and parasitic diseases and for influenza and pneumonia the sharp drop after the war accentuated a decline that was already in progress. In the case of infections of the digestive system the large size of the reduction in the rate that followed the end of the war could be traced in part to the elimination of the increase in mortality from these conditions that occurred during the war.

Comparatively small but significant reductions in the mortality rate for certain diseases of early infancy also occurred prior to 1950. These are the causes of death that are heavily weighted with conditions related to the development of the child in utero and conditions affecting the delivery. Difficult as it is to identify the contributions toward the decrease in mortality from infectious diseases made by specific medical and economic circumstances, the problem becomes even more complex in dealing with this class of causes of death. Prenatal and postnatal programs would appear to be central factors although quantitative confirmation of the effectiveness of specific measures is not available.

Since 1950 the rates for the infective diseases and infections of the digestive system have declined still further, but the rates for respiratory diseases have not. Actually the combined rate for acute upper respiratory infections, bronchitis, and other diseases of the respiratory system (excluding influenza and pneumonia) has increased. To a large extent this rise reflects interest stimulated in the late 1940's and in the 1950's in hyaline membrane disease and abnormal pulmonary



[1] Including pneumonia of newborn.

[2] Includes gastritis and duodenitis; gastroenteritis and colitis, except ulcerative colitis (4 weeks and over); chronic enteritis and ulcerative colitis; diarrhea of the newborn.

Source: Annual volumes *Vital Statistics of the United States*, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

Figure 5. Infant mortality rates for selected causes of death: United States, 1939-61.

[g] Trends of cause-of-death rates start with the year 1939 rather than 1935 to reduce the effect of changes in rules for classification of causes of death.

ventilation as causes of death. In 1958 classification changes transferred hyaline membrane disease from the category other respiratory diseases to ill-defined diseases peculiar to early infancy, and the rate for other respiratory diseases was appreciably reduced. More time is needed to determine the course of the mortality rate for the latter set of conditions. At this point they still represent only one-sixth of the total loss attributed to all respiratory conditions.

The infant mortality rate for the category of conditions, certain diseases of early infancy, decreased slowly and irregularly for several years after 1950 and then changed little. This is, of course, indicative of the general lack of progress in reducing mortality in early infancy.

An interesting feature of the cause-of-death trends is that the rate for congenital anomalies has changed little in almost a quarter of a century. The rate of decline in this cause of death has consistently lagged behind the decline in the total infant mortality rate during both the period when the infant mortality rate declined rapidly and the past decade when it decreased only moderately.

Trends in cause-of-death rates for white and nonwhite infants have some elements in common (fig. 6). In both race groups the loss rates from infective and parasitic diseases have dropped to a tenth of what they were 20-25 years ago. The long-term decline in mortality from pneumonia and influenza and infectious diseases of the digestive system has also been impressive for both white and nonwhite infants. However, the magnitude of the decline in the rates for these diseases has not been the same in the two race groups. During the period of rapid reduction in mortality from pneumonia and influenza (from 1939 until shortly after the war) the relative gain was greater among white infants. Subsequently the differences in rates of decline increased. The death rate due to pneumonia and influenza among nonwhite children leveled off several years before the rate among the white. As for the loss from diseases of the digestive system major decreases in the rate for the white infants, in contrast with periodic large-scale increases in the rate for the nonwhite, were scored during the 1950's.

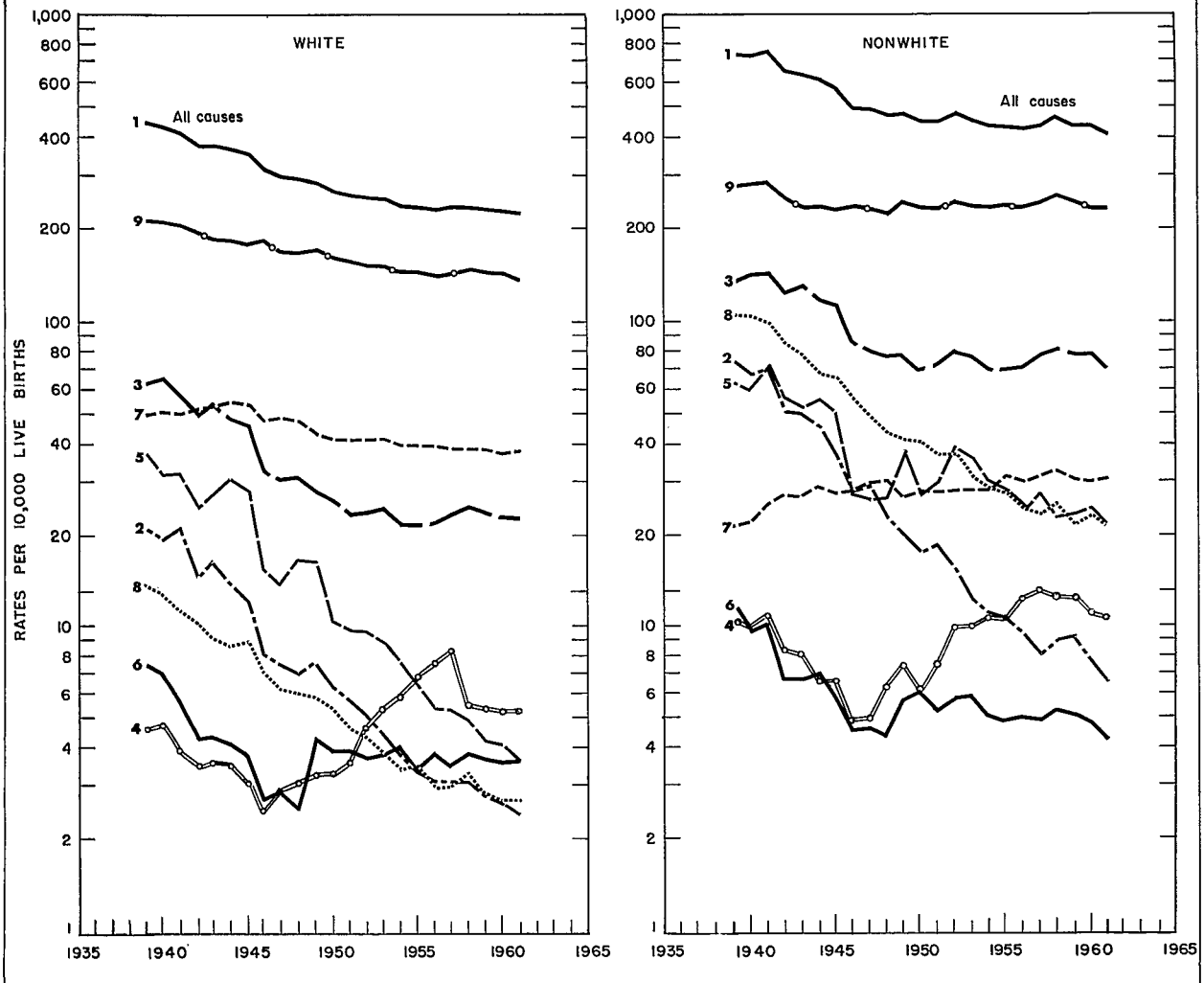
It is apparent that the rates for the more important causes of death reflecting the influence of postnatal environmental conditions have been substantially reduced in both race groups over the past 20-25 years. However, except for the infective and parasitic diseases the gap between the rates for white and nonwhite infants has widened. Today among the nonwhite births mortality due to pneumonia and influenza and infectious diseases of the digestive system is at least as high as the corresponding rates of loss among the white births 20-25 years ago. This observation must be qualified because of the changes in the proportion of the deaths in the nonwhite group that were classified as caused by ill-defined diseases. In 1939 about 1 in 7 were so classified; in 1961 only 1 in 20. The problem has been a minor one in the white group.

Congenital malformation mortality rates for white and nonwhite infants have undergone only slight changes over the years. The rates have been lower among the nonwhite group although racial differences in these rates are now much smaller than years ago. While the rate among nonwhite infants has slowly increased, the rate among white has slowly decreased. The classification issue related to ill-defined diseases that was previously discussed may also apply to the long-term comparison of congenital malformation rates, but the more recent courses of these rates could hardly be affected.

Generally trends in mortality rates among white children for certain diseases of early infancy provide the same insights as comparisons that involve all deaths in early infancy. This does not hold for the long-term trend among nonwhite infants. For example, between the early 1940's and the present there has been no change in the mortality rate attributed to certain diseases of early infancy. But the total neonatal mortality rate among the nonwhite births decreased by about one-fourth. This apparently anomalous situation resulted from the shift of large numbers of deaths from the category of ill-defined causes of death to categories included under certain diseases of early infancy.

Fetal and Perinatal Mortality

Much of the public concern about reproductive loss has been concentrated in the mortality among the live-born infants. However, the heavy concentration of infant deaths in the period immediately



[1]Including pneumonia of newborn.

[2]Includes gastritis and duodenitis; gastroenteritis and colitis, except ulcerative colitis (4 weeks and over); chronic enteritis and ulcerative colitis; diarrhea of the newborn.

Source: Annual volumes *Vital Statistics of the United States*, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

Figure 6. Infant mortality rates for selected causes of death by color: United States, 1939-61.

following birth has for a long time indicated the desirability of simultaneously examining the problem of fetal mortality. The circumstances responsible for the overwhelming majority of the deaths in early infancy arise from conditions established before delivery or from stresses during the birth process itself. Although national data are not available on causes of fetal death, these same circumstances must, of course, also be responsible for the loss of viable fetuses. The various conditions may differ in their relative importance for neonatal and fetal deaths, but they are present in both mortality categories. This has led to the introduction of the concept of perinatal mortality, a concept which provides for combining fetal deaths with loss in early infancy.

Another reason advanced for the use of the perinatal mortality measure is that it overcomes artifacts due to differences among physicians and hospitals in how they report a death that occurs immediately after birth. There is evidence that some of these births are reported as fetal deaths, but it is not at all certain how much this problem affects each of the components of the perinatal mortality rate. Also, as previously mentioned, there is the possibility that some of the pregnancies now terminating in live-born children who die soon after birth would formerly have terminated in fetal deaths.

It should be realized that a penalty of unknown dimensions is incurred when the perinatal mortality rate is used. This arises from the underreporting of fetal deaths, which may vary in magnitude with time, place, and population subgroup. Fragmentary data available on the issue of underreporting indicate that it is heavily influenced by an area's reporting requirements and its special efforts to improve registration completeness. The problem of underreporting may vary in degree, but it is generally assessed as being a serious matter in most places even today.[7]

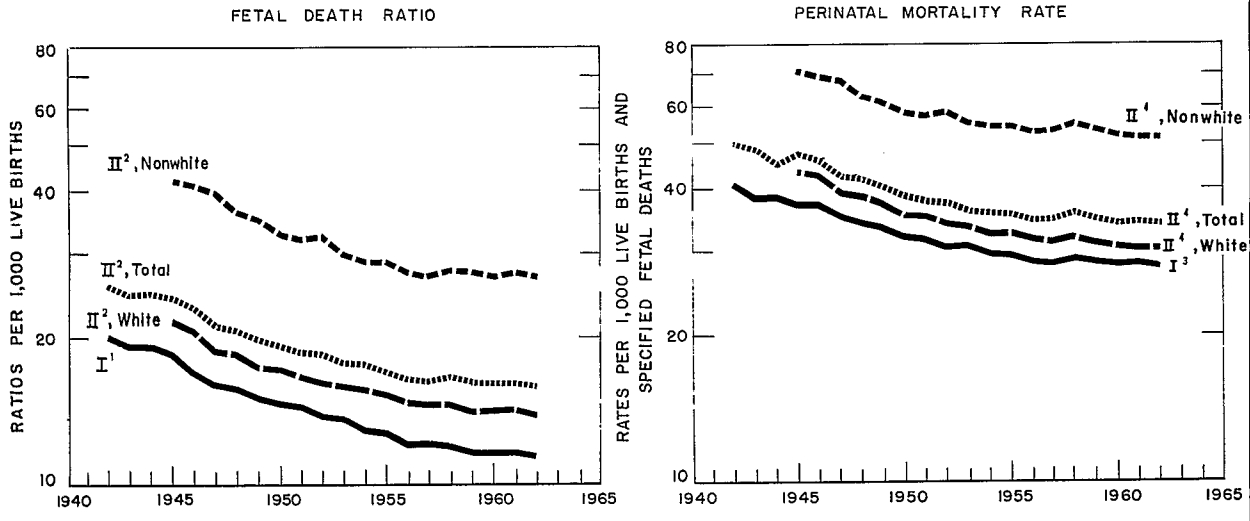
Turning first to fetal mortality, trends can be examined from 1942 for fetal deaths of 20 weeks or more gestation and for those of 28 weeks or more gestation (table 4 and fig. 7). Very much the same impression is obtained from the two sets of loss ratios. Between 1942 and the mid-1950's large decreases occurred in fetal mortality; after that the trend lines leveled off. Compared with the neonatal mortality rates, the decline in fetal loss after 1942 extended into a more recent period and was steeper.

Fetal loss trend data by sex and race are available only from 1945 and are limited to rates for all fetal deaths of 20 weeks or more gestation. With regard to male-female comparisons the observation made about infant mortality trends holds for fetal loss trends. In both cases there has been no narrowing of the gap between the mortality rates for the two sexes. Males have consistently had the higher fetal loss rates although the margin has been far less than in the total infant mortality or neonatal mortality rates.

Trends in the fetal mortality rates among the white and nonwhite populations were strikingly similar for the period 1945 to the mid-1950's, when the rates declined sharply. The rate of decline since 1956 has been negligible for both groups.

The perinatal mortality rate can be defined in a variety of ways, but conclusions about the rate of decline or when the trend changed directions are not materially altered by the definition used. Rates based on two definitions are given in this report. One definition is the most inclusive that has been proposed by any group; i.e., it includes fetal deaths of 20 weeks or more gestation and infant deaths under 28 days. For convenience it will be referred to as PMR II. The other definition, referred to as PMR I, is restricted to fetal deaths of 28 weeks or more gestation plus infant deaths under 7 days. This definition has been recommended by the American Medical Association as coming closer than PMR II to the theoretical purpose of a perinatal mortality rate.[8]

Ideally the perinatal mortality rate should be confined to fetal and infant deaths influenced by prenatal conditions and circumstances surrounding the delivery. Given the present stage of knowledge and the limited information of the vital records, the criteria for defining perinatal mortality rest on less certain grounds than is implied by this concept. In all statistical series derived from official records, the definition relies entirely on a time-of-death criterion. PMR I does have the advantage of limiting the infant death group to an age range (under 1 week) which is less affected than the balance of the neonatal period by postnatal environmental factors. Also, fetal deaths of



Percent rate of change[5]

	Total	
	1942-56	1957-62
Fetal death ratio I---	-3.8	-0.9
Fetal death ratio II--	-3.3	-0.6
	White	
	1945-56	1957-62
Fetal death ratio II--	-3.3	-0.9
	Nonwhite	
	1945-56	1957-62
Fetal death ratio II--	-4.1	[6]-0.3

Percent rate of change[5]

	Total	
	1942-56	1957-62
Perinatal mortality rate I---	-2.6	-0.7
Perinatal mortality rate II--	-2.7	-0.8
	White	
	1945-56	1957-62
Perinatal mortality rate II--	-3.0	-1.0
	Nonwhite	
	1945-56	1957-62
Perinatal mortality rate II--	-2.8	[6]-1.1

[1]Fetal death ratio I is defined as fetal deaths of 28 weeks or more gestation and a proportionate number of fetal deaths of unknown gestation per 1,000 live births.

[2]Fetal death ratio II differs from fetal death ratio I in that it includes fetal deaths of 20 weeks or more gestation plus all not stated gestation age.

[3]Perinatal mortality rate I is defined as infant deaths under 1 week plus fetal deaths of 28 weeks or more gestation and a proportionate number of fetal deaths of unknown gestation per 1,000 live births plus specified fetal deaths.

[4]Perinatal mortality rate II differs from perinatal mortality rate I in that it includes infant deaths under 28 days plus fetal deaths of 20 weeks or more gestation plus all not stated gestation age.

[5]Annual rate of change obtained by fitting least square lines to logarithms of rates for specified time period and taking anti-log of slope of fitted line.

[6]Coefficient of variation is one-third or more.

NOTE: 1959 includes Alaska; 1960 and 1961 include Alaska and Hawaii. New Jersey excluded from data by color for 1962. For 1942-44, data not available by color.

Source: Annual volumes *Vital Statistics of the United States*, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office, and special tabulations.

Figure 7. Fetal death ratios and perinatal mortality rates by color: United States, 1942-62.

788-022 O - 65 - 3

gestation ages 28 weeks or more are believed to be better reported than earlier fetal deaths. In favor of the PMR II is the fact that a longer time series of data is available for such variables as color, sex, and geographic area. This circumstance has led to the more frequent use of PMR II in this report.

In any event, wherever it is possible to examine trends by means of both PMR I and PMR II, the same conclusions are reached. The decreases in these rates paralleled each other between 1942 and 1962. Both rates declined rapidly until 1956, when they leveled off (table 5 and fig. 7). The decline continued until 1956 in the face of a leveling off in the early infant mortality rates that started several years earlier. Fetal mortality decreased enough during this period to overcome the tendency of the mortality rate in early infancy to flatten out.

No new insights are obtained about trends from the perinatal mortality rates by sex or race. There has been no reduction in the sex or racial differences in PMR II between 1945 and 1962. Male births have been subject to a 20-23 percent higher risk of perinatal death than female throughout this period. Nonwhite births have consistently had close to a 70 percent higher risk than white.

THE CURRENT STATUS OF INFANT AND PERINATAL MORTALITY

Infant Mortality

Age at death, sex of child, and color.—In 1962 the infant mortality rate in the United States was 25.3 per 1,000 live births. A large proportion of the deaths were concentrated in the first 24 hours after birth (41 percent) (table A). Another 24 percent of the deaths occurred during the balance of the first week; 7.5 percent occurred in the second through the fourth week of life. The mortality rate for the entire neonatal period was 18.3, or 72 percent of the total infant mortality rate. In later months the risk of dying decreased markedly, and the mortality rate differed little in the last 2 months of the first year of life.

A closer view of changes in mortality rates shortly after birth indicates that an important turning point in the rate of decline in the loss rate occurs when the newborn infant is 4 days old. Although there are decreases after this age, they are quite small compared with the sharp day-to-day reductions in the mortality rate immediately following birth.

Chances of dying during infancy are about 30 percent greater among boys than girls. The margin between the mortality rates for boys and girls varies appreciably as the newborn infant progresses through the first year of life, but at no point does the loss rate for females exceed the rate for males. In the immediate postpartum period (under 1 day) the margin is about 30 percent. The differential increases substantially the very next day and reaches its peak (40-50 percent) in the period 2-4 days after birth. Thereafter the margin decreases sharply to less than 7 percent in the last few months of infancy.

The infant mortality rate for the nonwhite population is almost double the rate for white (41.4 per 1,000 and 22.3 per 1,000 for the two races, respectively, in 1962). In the first 24 hours following birth, the differential is approximately 50 percent. It drops to about 30 percent at ages 2 and 3 days. But with each successive day to the end of the first week of life the differential increases sharply, and at the age of 6 days the mortality rate among the nonwhite infants is more than twice the rate among the white. The differential continues to widen after the first week. From age 3 to 8 months the rate for the former group is about three times that for the latter. The margin narrows only moderately in the balance of the first year.

It is unlikely that the progression from comparatively small differentials soon after birth to sizable differentials thereafter merely reflects the effect of reporting problems. Nationally it may well be that the early infant deaths are less completely reported as such for the nonwhite births than for the white. Nevertheless, the existence of a smaller racial differential during the neonatal period than later on in every part of the country and in large urban areas where underreporting of deaths is considered a minor problem suggests that the general picture obtained from official vital statistics is close to the true state of affairs.

Geographic areas.—Infant mortality differs greatly among geographic areas of the country (table 6). When the comparison is restricted to

Table A. Infant mortality rates by age, color, and sex: United States, 1962

[Data refer only to deaths occurring within the United States. Excludes fetal deaths. Figures by color exclude data for residents of New Jersey because this State did not require reporting of the item]

Age	Total			White			Nonwhite		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
	Rates per 100,000 live births in specified color-sex groups								
Under 1 year	2,531.1	2,857.7	2,188.8	2,233.7	2,543.7	1,907.3	4,135.9	4,568.5	3,693.0
Under 28 days	1,832.0	2,086.8	1,565.0	1,685.9	1,935.6	1,423.0	2,605.1	2,893.7	2,309.7
Under 1 day	1,035.9	1,170.7	894.2	959.1	1,084.1	827.6	1,434.1	1,616.9	1,247.0
Under 1 hour	198.6	209.8	187.0	184.8	192.8	176.4	264.8	290.5	238.5
1-23 hours	837.1	961.0	707.2	774.4	891.4	651.2	1,169.3	1,326.4	1,008.5
1 day	262.0	301.6	220.6	247.4	291.3	201.2	337.8	358.0	317.0
2 days	173.1	206.9	137.7	165.2	200.9	127.6	215.4	242.8	187.4
3 days	77.4	92.1	62.1	73.3	87.7	58.2	100.8	119.2	82.0
4 days	43.6	51.2	35.7	39.3	47.7	30.5	66.1	69.3	62.8
5 days	31.2	35.4	26.8	27.7	31.5	23.6	50.2	57.0	43.2
6 days	22.8	24.7	20.8	19.4	21.2	17.5	41.6	44.1	39.1
7-13 days	91.5	100.0	82.7	77.4	85.6	68.8	168.8	181.2	156.1
14-20 days	53.0	58.6	47.2	42.7	47.5	37.7	109.1	116.8	101.3
21-27 days	41.5	45.8	37.1	34.3	38.0	30.3	81.2	88.4	73.8
28-59 days	161.5	188.2	133.5	129.3	152.1	105.2	337.6	385.1	289.0
2 months	132.4	149.8	114.3	104.5	120.2	87.9	289.3	317.3	260.6
3 months	96.8	106.0	87.1	74.7	82.9	66.2	219.8	235.7	203.5
4 months	71.4	77.0	65.4	53.7	57.7	49.3	169.3	185.2	153.0
5 months	55.6	57.6	53.6	41.3	42.6	39.9	133.4	140.2	126.5
6 months	44.3	46.1	42.5	34.7	36.8	32.5	93.7	95.2	92.1
7 months	35.7	39.7	31.6	28.2	31.2	25.0	77.5	88.1	66.6
8 months	30.4	33.2	27.4	23.6	25.1	22.1	68.1	79.2	56.8
9 months	26.0	27.6	24.2	21.1	22.7	19.4	52.4	54.5	50.2
10 months	23.1	23.3	22.9	19.1	18.7	19.6	46.1	49.3	42.0
11 months	21.9	22.3	21.5	17.6	18.1	17.2	43.6	45.0	42.3

Source: Annual volume Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

the white race, the range among the rates is quite small. Despite the variation in economic composition, in degrees of urbanization, and in medical resources, only about 19 percent separates the geographic division (Mountain) with the highest rate (25.7 per 1,000) from the division (West North Central) with the lowest rate (21.6 per 1,000) (infant mortality rates for 1959-61). Six of the nine geographic divisions have rates that are separated by less than 10 percent. In the other three divisions (East and West South Central and Mountain) the rates are 10-20 percent above the figures in the areas with the lowest rates. Only 15 percent separated the neonatal mortality rate for white infants in the high area from the rate in the low area. During the postneonatal period the rates diverge, and the margin between low and high areas increases to almost 40 percent.

The situation is entirely different among nonwhite births. The total infant mortality rate ranges from 30.4 per 1,000 in the Pacific division of States to 48.7 per 1,000 in the Mountain division. The composition of the nonwhite population is, however, very different in these two areas. Over a third of the nonwhite persons in the Pacific area are Oriental, and three-fourths in the Mountain division are American Indian. In the other divisions all but a small proportion are Negro. When the comparison is confined to these divisions, the gap between low and high is still

larger than that among the white infants. This is due to major geographic differentials in the postneonatal rates for nonwhite infants. Rates in the South Atlantic and East South Central parts of the country (19.2 per 1,000 and 19.8 per 1,000, respectively, in 1959-61) are almost twice the rates in the New England and Middle Atlantic areas (10.3 per 1,000 and 11.2 per 1,000, respectively). The variation among the neonatal rates (excluding those for the Mountain and Pacific divisions) is negligible by comparison.

Generally a geographic area with a comparatively low rate among white infants also has a comparatively low rate among the nonwhite; this is also true for high rates. A more important observation is that infant mortality is far greater everywhere among the nonwhite children. The gap is narrowest in the Pacific division, where Oriental persons represent a substantial proportion of the nonwhite population.[h] But here, too, the margin—34 percent—is large.

Pursuing the issue of geographic variability in infant mortality rates on the basis of smaller aggregates of population than geographic division leads to a number of inferences that are highly relevant to the present discussion. Taking the State as the unit, it is clear that with only a few exceptions the State rates for white births cluster very closely around the national average; for nonwhite births the spread is substantial (table 7). In every State with sufficient numbers of births to make the comparison (except Hawaii), infant mortality in the nonwhite group is considerably above the rate in the white. These findings are consistent with what has already been pointed out for the geographic divisions. They support the fact that geography does not alter certain fundamental properties of the infant mortality rate at the present time—i.e., an underlying similarity in the level of the rate for the white population when large areas are the unit of analysis and a wide gap between the loss rates for white and nonwhite children almost everywhere.

This is also confirmed when other geographic aggregates are examined. Comparison of mortality rates for metropolitan counties with those for nonmetropolitan counties as well as for cities classified by size leads to the same conclusion (table 8). As a further test infant mortality rates in the 51 cities with a population of 250,000 or more in the 1960 census have been compared. For white infants the lowest rate was 20.3 per 1,000; the highest, 29.6. Five sixths of the cities fell in the narrow range of 20.3-25.5 (data for 1960-61). In about half of the cities the rate among the nonwhite infants was at least 50 percent above the figure for the white. It should be noted that the cities are scattered throughout the country—in the North, South, East, and West.

In the previous discussion variation in the infant mortality rate for white infants has been characterized as relatively small where States, aggregates of States, or individual cities are considered. This should not obscure the fact that within each of the areas there are subregions or neighborhoods (as in the case of cities) with loss rates that deviate widely from overall averages. A more detailed approach to the question of geographic variability in infant mortality would lead to groupings of areas based on demographic, economic, and medical resource indices and to a clearer identification of special problem areas.

Cause of death.—Despite important limitations cause-of-death data are of some help in clarifying the nature of the loss in infancy. With the concentration of infant mortality in the first few days of birth a large proportion of the deaths are not clearly the culmination of a known, specific disease process. About two of five of the deaths are ascribed to a generalized state such as immaturity, unqualified and postnatal asphyxia, and atelectasis or to ill-defined diseases peculiar to early infancy. In almost another 10 percent of the cases the cause of death is birth injury, which combines many different circumstances and often does not reflect the underlying cause of death as much as the known, immediate mechanism which caused the death. Actually almost the entire set of conditions included under the general heading certain diseases of early infancy is, in a sense, vague and probably subject to considerable variation from place to place, from one population group to another, and in what the physician records as the particular cause of death. This restriction

[h] Infant mortality rates are lower among Oriental persons than among white. The higher rate among the nonwhite population in the Pacific division is due entirely to excess mortality among the other nonwhite persons in the area.

Table B. Average annual infant mortality rates for selected causes of death, by age at death: United States, 1959-61

Cause of death (7th Revision—International Classification of Diseases)	Under 1 year	Under 28 days	Under 1 day	1-6 days	7-27 days	28 days-11 months
	Rates per 10,000 live births					
All causes	259.0	187.1	103.1	63.9	20.2	71.9
Infective and parasitic diseases (001-138)	3.4	0.5	0.0	0.1	0.3	2.9
Influenza and pneumonia, including pneumonia of newborn (480-493,763)	31.0	8.6	1.1	3.4	4.1	22.4
All other diseases of respiratory system (470-475,500-527)	6.2	0.7	0.2	0.2	0.3	5.5
Gastritis and duodenitis, etc.[1] (543,571,572,764)	6.9	1.1	0.0	0.1	1.0	5.8
All other diseases of digestive system (530-542,544-570,573-587)	3.8	2.4	0.8	0.9	0.6	1.4
Congenital malformations (750-759)	36.4	23.9	9.5	8.9	5.5	12.5
Birth injuries (760,761)	23.9	23.9	15.9	7.4	0.6	0.0
Intracranial and spinal injury at birth (760)	7.5	7.5	3.1	4.0	0.5	0.0
Other birth injury (761)	16.4	16.4	12.8	3.4	0.2	0.0
Postnatal asphyxia and atelectasis (762)	45.7	45.0	27.4	16.4	1.2	0.7
Hemolytic disease of newborn (770)	5.0	5.0	3.3	1.5	0.2	0.0
Immaturity unqualified (776)	45.4	45.1	31.3	12.2	1.6	0.3
Neonatal disorders arising from certain diseases of mother during pregnancy, etc.[2] (765-769,771-774)	27.5	25.0	11.8	10.8	2.4	2.5
Symptoms and ill-defined conditions (780-793,795)	5.8	2.4	1.0	0.8	0.6	3.4
Accidents (E800-E962)	8.8	1.4	0.2	0.5	0.8	7.4
Residual (140-468,590-749,E963-E985)	9.2	2.5	0.7	0.8	1.0	6.7
Certain diseases of early infancy (760-776)	157.1	153.5	90.6	51.8	11.1	3.6

[1] Includes gastritis and duodenitis; gastroenteritis and colitis, except ulcerative, age 4 weeks and over; chronic enteritis and ulcerative colitis; diarrhea of newborn.

[2] Includes neonatal disorders arising from certain diseases of the mother during pregnancy; ill-defined diseases peculiar to early infancy; immaturity with mention of other subsidiary condition; and other diseases peculiar to early infancy not already shown. Ill-defined diseases peculiar to early infancy accounted for 62 percent of these deaths.

Source: Special tabulations of the Division of Vital Statistics, National Center for Health Statistics, Public Health Service, U.S. Department of Health, Education, and Welfare.

is of lesser importance for the other causes of death although here, too, uncertainty as to the cause of death does occur. Also, how physicians resolve the problem may vary geographically and by population subgroup.

Diseases of the respiratory system predominate among the more specific causes of infant deaths. Approximately 14 percent of the deaths under 1 year in 1959-61 were in this category, with influenza and pneumonia accounting for the bulk of the deaths (tables B and 9). Closely following the respiratory group as a principal cause of death are congenital anomalies; 14 percent of all infant deaths were classified as having been caused by a malformation. All of the diseases of the digestive system accounted for only 4.1 percent

of the infant deaths, and the infective and parasitic disease category was responsible for an even smaller proportion of the mortality (1.3 percent).

The relative importance of the various causes of death shifts radically as the infant advances in age. In a matter of several days the overwhelming concentration among causes that reflect the influence of conditions present before the birth or that occur during the birth is attenuated. At ages 7-27 days certain diseases of early infancy accounts for only about half of the deaths; in the postneonatal period this category is of negligible significance. The infectious diseases, particularly pneumonia and influenza, dominate the causes of death after the first 4 weeks. With regard to mortality due to congenital malformations the rate remains comparatively high throughout infancy.

Cause-of-death data give the strong impression that no special group of conditions is responsible for the excess mortality among males during infancy. The rate for every major cause of death, whether biological or environmental in origin, was substantially higher among males than females. To be sure, the relative margin varied from one cause-group to another; e.g., the difference between rates for congenital malformations was under 20 percent, and the difference between rates for birth injuries was especially large (40 to 50 percent). But the basic observation remains: male infants had a distinctly higher mortality rate than female infants in all important cause-of-death categories. Among the comparatively low frequency causes one stands out as an exception to the rule. This is hemolytic disease of the newborn. Here the difference between the rates for males and females is negligible.

Less consistency is found when cause-of-death rates are compared for white and nonwhite infants. Although styles of reporting causes of death may differ for these two population groups, it is clear that infectious diseases of all types are more common causes of death both early in infancy and later on among the nonwhite births than the white. Compared with the margin for these causes, the rates for birth injuries and other digestive diseases are quite similar for the two races. In two cause categories, congenital anomalies and hemolytic diseases, the rates are higher among white than nonwhite infants.

Fetal and Perinatal Mortality

As previously discussed, national data on fetal mortality are most extensive for fetal deaths of 20 weeks or more gestation. About 85 percent of the population in the United States lives in areas covered by laws that limit fetal death reporting to this gestational age. In most of the other areas, reporting is required for all products of conception without regard to gestational age. Unless otherwise stated, measures of fetal loss discussed below refer to fetal deaths of 20 weeks or more gestation (plus fetal deaths of unknown gestation age).

The fetal death ratio in 1961 was 16.1 per 1,000 live births (table 4). This almost equals the neonatal death rate (18.4). The male-female differential in fetal loss was 12 percent; this is considerably less than the differential found in the neonatal mortality rate (32 percent). On the other hand, the margin between the white and nonwhite races is much greater for fetal loss (91 percent) than for neonatal deaths (55 percent).

Fetal death ratios for geographic divisions have a wider dispersion around their national average than is the case for neonatal death rates (tables 5 and 6). Even so, the range from high to low is not extraordinary in the white population; in the nonwhite the range is 57 percent among the divisions whose nonwhite populations are almost exclusively Negro. This assessment of the variation among geographic divisions is based on an adjustment of the ratios for the Middle Atlantic division of States. The white and nonwhite ratios are higher in this area than anywhere else. This is due to an artifact of reporting. Because of special promotional campaigns to obtain reports of all fetal deaths, New York City, which is contained in the Middle Atlantic division, has an especially high ratio for fetal deaths in the category 20 weeks or more gestation and gestation not stated (28.0 per 1,000 live births in 1959-61). Excluding the New York City experience from the Middle Atlantic division lowers the 1959-61 ratios to 15.8 for the geographic area. With these adjustments the areas that emerge as having the highest fetal death ratios are the South Atlantic and East South Central. These are the two divisions that also had the highest neonatal death rates.

No new insights are gained from the perinatal mortality rates. This, of course, results from the similarity in the direction of differences in fetal and early infant loss rates for the variables sex, race, and geographic area. Compared with mortality rates for early infancy, the perinatal mortality rates show a narrower male-female margin, a larger white-nonwhite differential, and greater geographic variation.

Other Selected Parameters of Infant Mortality

Birth weight.—One of the most important threads that runs through any consideration of infant mortality is the critical role of the maturity of the infant at birth. For years the primary measure used in statistical studies to classify the newborn infant by developmental maturity has been weight at birth. From the beginning the imperfections of this measure have been recognized. A major source of dissatisfaction arose from the clinical observation that a particular birth weight reflects different levels of maturity in various population subgroups. In favor of relying on birth weight has been the comparative ease of collecting on a mass scale reasonably uniform data subject to less error than such other measures of maturity as gestation age and heel-to-crown length. There is good reason to continue to exert efforts to improve the reporting of gestation age; in fact, moves in this direction are increasingly being made by offices of vital statistics. Such improvement will not mean that birth weight will be replaced by gestation age but rather that additional classifications will become available for the study of high-risk groups of infants. Although the main brunt of the analysis that follows is borne by the birth weight item, some indication of what may be learned through the joint use of birth weight and gestation age data is also provided.

It is often desirable to discuss the relationship of birth weight to many parameters in terms of all children who weighed 2,500 grams or less and the remaining children who weighed more than 2,500 grams. Until recently the terms premature and immature were applied to the former group. In view of the literal interpretation of these terms and the recognition that birth weight has serious shortcomings as a criterion for prematurity, the phrase low birth weight has come into favor. As used here, this phrase refers to infants with birth weights of 2,500 grams (5½ pounds) or less.

Based on data for a recent period (1960), 7.7 percent of the infants have low birth weights, i.e., 2,500 grams or less (table C). Very small babies (1,500 grams or less) represent about 1.1 percent of all live births. A somewhat higher proportion weigh 1,501-2,000 grams (1.4 percent). With increasing weight the proportion rises sharply, and 5.1 percent, or two-thirds of all those weighing 2,500 grams or less, are in the category 2,001-2,500 grams. The modal weight group 3,001-3,500 grams contains 38 percent of the live-born infants. Above this weight the decrease is rapid, and only 1.6 percent are born at the very high weights 4,501 grams or more.

Members of plural sets represent 2.0 percent of all live births, but they account for 14 percent of the children weighing 2,500 grams or less at birth. Over half of the children in multiple deliveries (54 percent), as compared with 6.8 percent among single births, are at these low weights. This is by far the largest differential between two groupings of births in the proportions that are at low birth weights. Nevertheless, differences of great significance in assessing the problem of early infant mortality are found among many other variables. Female babies are more likely than male infants to have low birth weights. An interesting feature of this relationship is that the entire excess in low birth weights is concentrated in the 2,000-2,500-gram weight group. Under 2,001 grams the proportions are similar for males and females.

Racial differences in birth weight are marked. The likelihood of a nonwhite infant being born at low birth weights where major problems of obstetric and pediatric care exist is almost twice as great as for a white infant.

The only set of national data available on the relationship of birth weight to mortality was compiled by the National Vital Statistics Division (NVSD) from a special study of the experience in January-March 1950.[9] There is reason to believe that the associations have not changed materially since this study. As previously stated, in making comparisons between subgroupings of the population, similar birth weights may often involve children with quite dissimilar physical developments.

Among infants weighting 2,500 grams or less at birth, 174 in 1,000 died within 4 weeks after birth (table D). This rate is extremely high in

Table C. Percent distribution of live births, by birth weight and selected characteristics: United States, 1950 and 1960

Birth weight	Total	Plurality		Sex		Color	
		Single	Plural	Male	Female	White	Nonwhite
1960	Percent distribution						
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1,000 grams or less	0.5	0.5	4.7	0.6	0.5	0.5	1.0
1,001-1,500 grams	0.6	0.5	5.4	0.6	0.6	0.5	1.1
1,501-2,000 grams	1.4	1.2	14.0	1.4	1.5	1.3	2.5
2,001-2,500 grams	5.1	4.6	29.5	4.5	5.7	4.5	8.3
2,501-3,000 grams	18.5	18.3	29.6	15.8	21.3	17.3	25.3
3,001-3,500 grams	38.0	38.5	13.9	36.3	39.8	38.1	37.1
3,501-4,000 grams	26.8	27.3	2.6	29.5	23.9	28.2	18.9
4,001-4,500 grams	7.5	7.6	0.3	9.2	5.6	8.0	4.6
4,501 grams or more	1.6	1.6	0.0	2.1	1.0	1.6	1.3
2,500 grams or less	7.7	6.8	53.7	7.1	8.4	6.8	12.8
2,501 grams or more	92.3	93.2	46.3	92.9	91.6	93.2	87.2
Median birth weight	3,310	3,320	2,440	3,370	3,250	3,340	3,150
1950							
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1,000 grams or less	0.5	0.4	4.0	0.5	0.5	0.4	0.6
1,001-1,500 grams	0.6	0.5	5.9	0.6	0.6	0.6	0.9
1,501-2,000 grams	1.4	1.2	14.1	1.4	1.5	1.3	2.0
2,001-2,500 grams	5.1	4.6	30.0	4.5	5.7	4.8	6.8
2,501-3,000 grams	18.3	18.1	29.0	15.6	21.2	17.8	21.4
3,001-3,500 grams	37.9	38.4	13.8	36.2	39.6	38.3	35.3
3,501-4,000 grams	26.8	27.3	2.7	29.6	23.9	27.5	22.7
4,001-4,500 grams	7.5	7.6	0.3	9.3	5.6	7.6	6.9
4,501 grams or more	1.9	2.0	0.1	2.5	1.3	1.7	3.3
2,500 grams or less	7.6	6.6	54.1	7.0	8.3	7.2	10.4
2,501 grams or more	92.4	93.4	45.9	93.0	91.7	92.8	89.6
Median birth weight	3,310	3,330	2,440	3,380	3,250	3,320	3,250

Source: Annual volumes Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

comparison with the rate for all other infants, 7.8 per 1,000. In fact, although children with low birth weights represent only 7.7 percent of all the newborn infants, deaths among these children account for two-thirds of the total number of neonatal deaths.

Only a very small proportion of the children under 1,001 grams (1 of 8) lived through the first 28 days. Chances of survival improved considerably with a moderate increase in weight, but a little over half of those weighing 1,001-1,500 grams also died. Mortality continued to decline steeply with each added 500 grams of weight, and neonatal deaths at 2,001-2,500 grams amounted to 50.4 per 1,000 infants. Substantial decreases were recorded well into the higher weight groups;

Table D. Neonatal mortality by birth weight and selected characteristics: United States, January-March 1950

[Excludes data for Massachusetts]

Birth weight	Total	Plurality		Sex		Color	
		Single	Plural	Male	Female	White	Nonwhite
	Rates per 1,000 live births of specified birth weight						
Total	20.0	18.3	98.6	22.7	17.1	18.9	26.7
1,000 grams or less	871.7	871.7	871.5	894.2	848.0	883.3	821.4
1,001-1,500 grams	551.3	562.3	503.7	621.8	478.2	562.1	507.0
1,501-2,000 grams	211.0	228.9	145.4	265.0	160.5	214.6	195.7
2,001-2,500 grams	50.4	52.8	32.9	67.4	36.6	50.6	49.5
2,501-3,000 grams	12.6	12.6	11.3	16.6	9.5	12.0	15.4
3,001-3,500 grams	6.7	6.7	10.4	8.1	5.3	6.2	9.7
3,501-4,000 grams	5.6	5.6	[1]18.7	6.4	4.6	4.9	10.5
4,001-4,500 grams	7.5	7.4	[1]38.1	7.7	7.2	6.7	12.5
4,501 grams or more	14.2	14.2	-	13.7	15.1	12.0	20.2
2,500 grams or less	173.7	173.4	175.6	213.9	138.9	175.8	164.7
2,501 grams or more	7.8	7.7	11.8	9.1	6.4	7.1	11.9

[1]Rates based on less than 20 deaths.

NOTE: Figures for birth weight not stated are distributed.

Source: Shapiro, S. Influence of birth weight, sex, and plurality on neonatal loss in the United States. Am. J. Pub. Health 44:1142-1153, Sept. 1954.

the optimum birth weight for the survival of infants was 3,501-4,000 grams (5.6 deaths per 1,000 live births). Additional weight, particularly when it brought the weight above 4,500 grams, was, on the average, decidedly disadvantageous.

Because of the heavy preponderance of plural births at the low weights, the neonatal mortality rate for babies born in multiple sets was five to six times the rate for single births. On a weight-specific basis the mortality risk among plural births was actually lower than among single births between 1,001 and 3,000 grams. Above this point single births had a major advantage.

During the neonatal period the mortality risk for males and females differed greatly at almost every weight level. The prognosis was considerably better for girls than for boys at most birth weights. Neonatal mortality rates for females at weights between 1,001 and 4,000 grams were one-half to three-fourths of those for the males. Only in the highest weight group (4,501 grams or more) was the rate lower for males. Thus, despite a less favorable weight distribution girls had a lower total neonatal mortality rate than did boys.

Below 2,001 grams the nonwhite infants had a better chance of survival than did the white. The mortality rates for the two groups differed only slightly at 2,001-2,500 grams. At all higher weights the mortality risk among nonwhite births was the greater, with the gap between the rates for the two race groups becoming relatively wider at each successive level through 3,501-4,000 grams and then narrowing slightly.

Birth weight and gestation age.—The contribution that can be made by having both birth weight and gestation age data available has been demonstrated in a recent report from the Cooperative Study of Child Development, Oakland,

788-022 O - 65 - 4

California. Reference to one of the observations of this report will tend to underline the value of joint consideration of gestation age and birth weight.

In developing the gestation age and birth weight data, a five-point classification system has been devised by Drs. Yerushalmy and van den Berg.[10] This separates births of 3½ pounds or less, regardless of gestation age, into a very high risk category. The remaining births are placed in one of four categories through the joint use of two classes of birth weight (3 pounds 9 ounces to 5 pounds 8 ounces and 5 pounds 9 ounces or more) and two classes of gestation age (less than 37 weeks and 37 weeks or more).[i] The effect on neonatal mortality rates of the particular combination used is striking (table E). There is a three-fold increase in the neonatal mortality rate for those satisfying only the gestation age criterion for immaturity; the rate is at least doubled again for infants meeting only the birth weight criterion; and there is a further three-fold increase for infants meeting both criteria, even when excluding the very small babies of 3½ pounds or less. After the neonatal period the gradient diminishes, but large differences in mortality risk among the various classes persist throughout the first year of life. These findings suggest once again that detailed exploration of correlates of pregnancy loss could more profitably be executed on the basis of the two variables than by means of one or the other.

Prior pregnancy experience and age of mother.—No parameters of pregnancy loss have been as completely or as repetitively explored as parity and age of mother. The reason is quite simple. These are items that appear on vital records, and, therefore, tabulations based on large numbers of births can be obtained to satisfy many of the interests of epidemiologists, clinicians, and program agencies. In the current period of intensive study of pregnancy loss new sources of data are being developed through research projects conducted outside the orbit of repetitive, official vital statistics. The consistency of overlapping

[i] The term immaturity is applied to births of 5 pounds 8 ounces or less and to those of less than 37 weeks' gestation.

Table E. Neonatal and postneonatal mortality rates according to birth weight and length of gestation for white single live births: New York City, 1957-1959

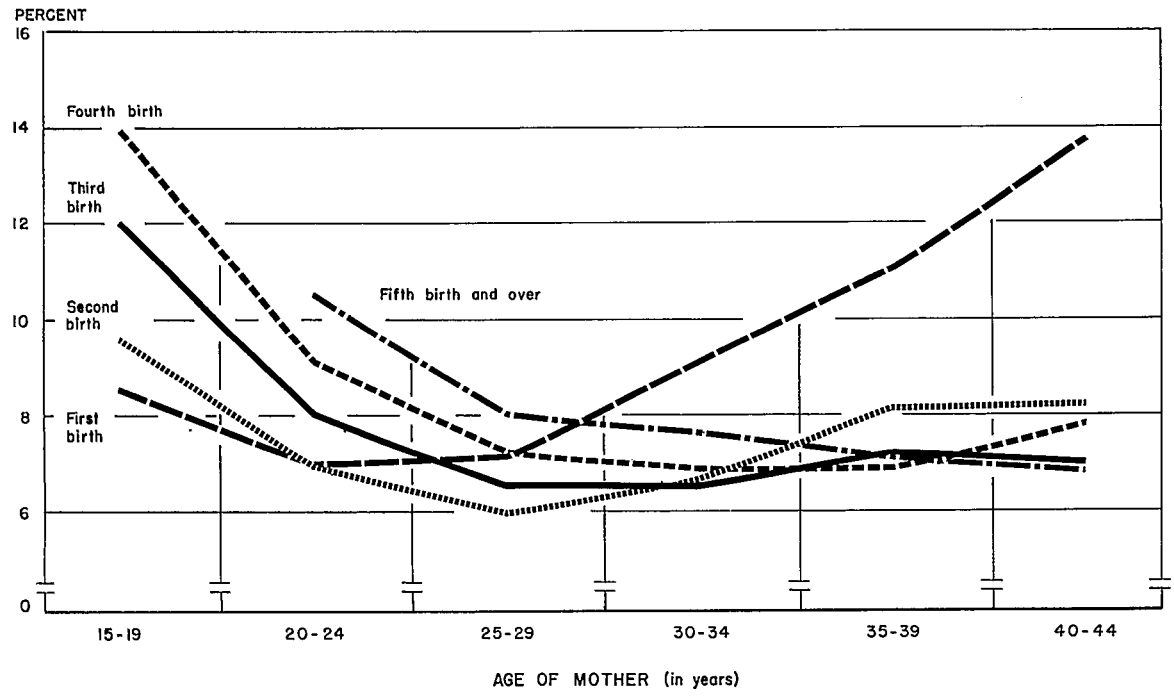
Birth weight, grams (lb., oz.)	Gestation (weeks)	Neonatal deaths per 1,000 live births	Postneonatal deaths per 1,000 survivors of neonatal period
Total number of deaths		4,922	1,706
Group I 1,588 (3,8) or less	All gestations	656.2	44.4
Group II 1,617 to 2,500 (3,9 to 5,8)	<37	93.7	16.8
Group III 1,617 to 2,500 (3,9 to 5,8)	37 or more	30.3	11.3
Group IV 2,524 (5,9) or more	<37	13.7	7.7
Group V 2,524 (5,9) or more	37 or more	4.7	4.1
Total		14.1	4.9
Total immature; I-IV	...	79.9	11.4
By gestation; I, II, IV	...	100.4	11.4
By birth weight; I-III	...	135.9	14.9
By birth weight and gestation; I, II	...	260.2	20.6

Source: Yerushalmy, J., van den Berg, B. J., Erhardt, C. L., and Jacobziner, H.: Birth weight and gestation as indices of "immaturity"—neonatal mortality and congenital anomalies of the "immature." A. M. A. J. Dis. Child. 109: 51, Jan. 1965.

findings is so high that the full range of information could be viewed as additive despite its diversity in time and place.

The NOVS study of live births early in 1950 probed into the association between the birth order, age of mother and prior fetal loss, and the incidence of low birth weight and neonatal mortality.[11] It was found that the rate of low birth weight varied only moderately by birth order (table 10). The rate was highest among first births and births of fifth and higher order (7.7 per 100). This was not much greater than the low figure found among second order births (6.9). Excluding births to mothers at ages 15-19 years where the risk was particularly high (9.0 per 100), the variation by age of mother was also modest. The rate was at a minimum at ages 25-29 years (6.7) and then increased moderately to a high of 7.7 after age 35 years.

Interaction of birth order and age of mother results in a far greater variation in the rates of low birth weight than is indicated when each of these parameters is considered separately (fig. 8). The rate among first births was at its lowest point among women 20-24 years of age. From age 30-34 on the risk increased sharply and about 1 of 8 of the first-born infants to women 40-44 years old weighed 2,500 grams or less. Rates for the other birth orders followed, in general, an inverted J-shaped curve, with the highest rates usually



NOTE: Figures for birth weight, birth order, and age of mother not stated are distributed. Total-birth order refers to number of children ever born to mother, including fetal deaths. Excludes data for Massachusetts.

Source: National Office of Vital Statistics: Weight at birth and survival of newborn, by age of mother and total-birth order, by J. Loeb. *Vital Statistics—Special Reports*, Vol. 47, No. 2. Public Health Service. Washington, D.C., 1958.

Figure 8. Percent of live births at birth weights of 2,500 grams or less, by age of mother and total-birth order: United States, January-March 1950.

found at the very young ages 15-19 years. An interesting feature of the birth order rates is that their narrowest margin occurred at ages 30-34 years.

Intervening variables unquestionably exert an important influence on the relationships discussed. Illegitimacy, which is particularly high under 20 years of age, may provide part of the answer to why the rates for low birth weights are so high among these young women.[12] The explanation for the sizable increase under age 30 in the risk of low birth weight that accompanies increasing birth order (except for first births) is more uncertain. On the surface, the demographic parameters that are implicated include socioeconomic status, child spacing, and prior fetal loss. However, parity and age may have biological significance independent of these variables.

The importance of prior pregnancy outcome in assessing the risk in the current pregnancy is unequivocal (table F). The proportion of children weighing 2,500 grams or less at birth was more than 1½ times as high among births of women who had reported at least one prior fetal death as among other births (10.0 and 6.2 per 100 single live births, respectively). Birth order differentials do not explain these relationships. On the contrary, the increase in the risk of low birth weight among births preceded by a fetal death is more marked when comparisons are made by birth order than when birth order is ignored.

As might be expected, the associations between low birth weight and birth order and age of mother are generally paralleled by the neonatal mortality rates (table 11 and fig. 9). The loss rate among first births was moderately high among women 15-19 years of age. It dropped sharply to a low point at ages 20-24 and climbed rapidly as age increased beyond 30 years. Second order births among women aged 25-29 had a particularly favorable loss rate. In fact, the lowest neonatal mortality rate for any age-birth order group was in this category (14.3 per 1,000 live births as compared with the rate of 20.0 for all birth orders and ages combined).

Although the patterns of neonatal mortality rates have some similarity to those of the rates for low birth weights, there are several notable

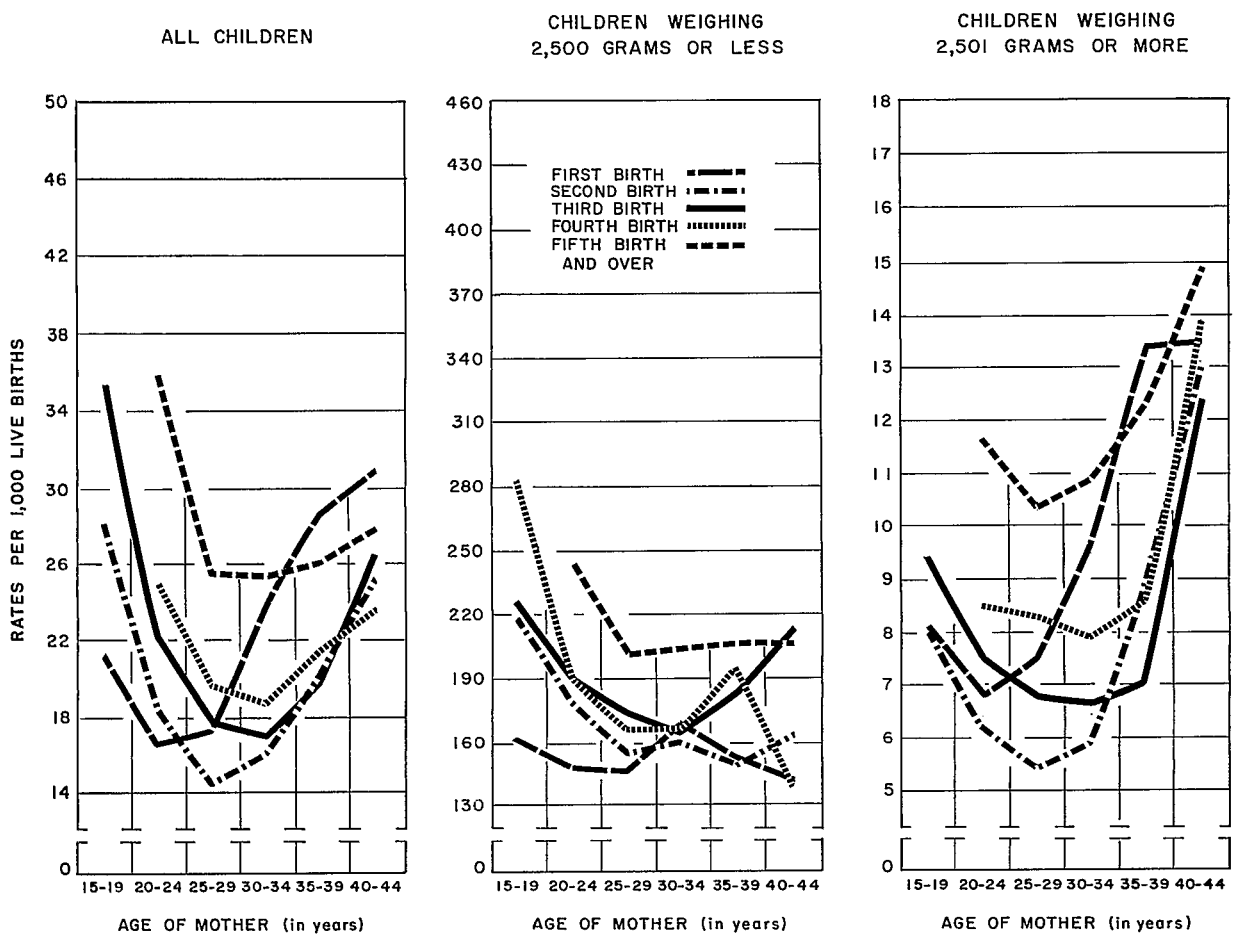
Table F. Percent of single live births at birth weights of 2,500 grams or less, by total-birth order, outcome of previous deliveries, and color: United States, January-March 1950

[Total-birth order refers to number of children ever born to mother, including fetal deaths. Excludes data for Massachusetts]

Birth order	Total			White			Nonwhite		
	Total	Prior fetal deaths		Total	Prior fetal deaths		Total	Prior fetal deaths	
		None	1 or more		None	1 or more		None	1 or more
	Percent of current live births at birth weights 2,500 grams or less								
Total	6.4	6.2	10.0	6.0	5.9	10.0	8.6	8.4	10.1
First	7.3	-	-	6.8	-	-	11.4	-	-
Second	6.0	5.9	10.5	5.6	5.5	9.9	9.1	8.9	13.8
Third	5.9	5.7	10.5	5.6	5.4	10.4	7.8	7.5	10.7
Fourth	6.1	5.7	10.2	5.9	5.5	10.1	7.0	6.5	10.8
Fifth and over	5.9	5.4	9.5	5.7	5.1	9.7	6.6	6.0	9.1

NOTE: Figures for birth weight and birth order not stated are distributed.

Source: National Office of Vital Statistics: Weight at birth and survival of newborn, by age of mother and total-birth order, by J. Loeb. Vital Statistics—Special Reports, Vol. 47, No. 2. Public Health Service. Washington, D.C., 1958.



NOTE: Based on deaths under 28 days among children born Jan. 1 to Mar. 31, 1950. Rates per 1,000 live births in specified group. Total-birth order refers to number of children ever born to mother, including fetal deaths. Figures for birth weight, birth order, and age of mother not stated are distributed. Excludes data for Massachusetts.

Source: National Office of Vital Statistics: Weight at birth and survival of newborn, by age of mother and total-birth order, by J. Loeb. *Vital Statistics—Special Reports*, Vol. 47, No. 2. Public Health Service. Washington, D.C., 1958.

Figure 9. Neonatal mortality rates by birth weight, age of mother, and total-birth order: United States, January-March 1950.

differences. Between ages 20 and 39 the relative margins among the neonatal death rates by birth order are greater than those among the low birth weight rates. Fifth and higher order births with their high mortality at every age of mother contribute greatly to this situation. Another difference is that the shape of the curves for neonatal death rates more nearly approximate a "U" than a reversed "J," as was the case for the prematurity rates. In other words, the risk for mortality definitely swings up after age 30 regardless of the birth order. The reason for this is found in the mortality experience among babies born weighing more than 2,500 grams. Here the mortality curve is J-shaped for every birth order. The turning points occur at different ages, but the picture is the same—exceptionally high mortality after 35 years of age. Again first births are an exception,

Table G. Neonatal mortality rates among single live births, by birth weight, color, total-birth order, and outcome of previous deliveries: United States, January-March 1950

[Based on deaths under 28 days among children born January 1-March 31, 1950. Total-birth order refers to number of children ever born to mother, including fetal deaths. Excludes data for Massachusetts]

Color and birth order	Birth weight of current live birth								
	All birth weights			2,500 grams or less			2,501 grams or more		
	Total	Prior fetal deaths		Total	Prior fetal deaths		Total	Prior fetal deaths	
		None	1 or more		None	1 or more		None	1 or more
	Rates per 1,000 live births in specified group								
Total									
Total	18.3	17.6	35.8	173.4	168.8	237.6	7.7	7.5	13.3
First	18.4	-	-	17.2	-	-	27.6	-	-
Second	16.2	15.8	34.6	173.4	171.3	223.3	6.3	6.1	12.4
Third	17.8	16.9	33.0	185.9	180.6	233.0	7.2	7.1	9.6
Fourth	19.1	17.2	38.9	183.6	170.9	259.4	8.4	8.0	13.8
Fifth and over	23.4	21.3	36.5	212.6	205.5	236.9	11.4	10.8	15.5
White									
Total	17.3	16.6	36.1	176.7	172.0	250.1	7.1	6.9	12.4
First	17.2	-	-	156.1	-	-	7.0	-	-
Second	15.4	15.0	32.0	175.6	173.6	228.1	5.9	5.8	10.5
Third	17.4	16.6	32.6	192.1	186.5	242.3	7.0	6.9	8.3
Fourth	18.1	16.3	39.5	182.6	168.6	270.4	7.9	7.4	13.7
Fifth and over	22.7	20.4	38.9	226.2	217.9	256.9	10.5	9.8	15.6
Nonwhite									
Total	24.4	23.5	34.9	159.5	154.9	204.0	11.7	11.3	15.9
First	27.6	-	-	136.6	-	-	13.6	-	-
Second	23.3	22.3	47.5	161.6	159.0	206.1	9.4	9.0	22.0
Third	20.4	19.2	34.7	157.6	153.8	190.8	8.8	8.3	15.8
Fourth	23.4	21.8	36.8	187.3	179.8	224.5	11.1	10.7	14.0
Fifth and over	25.1	23.4	32.4	184.1	178.2	201.6	13.8	13.5	15.3

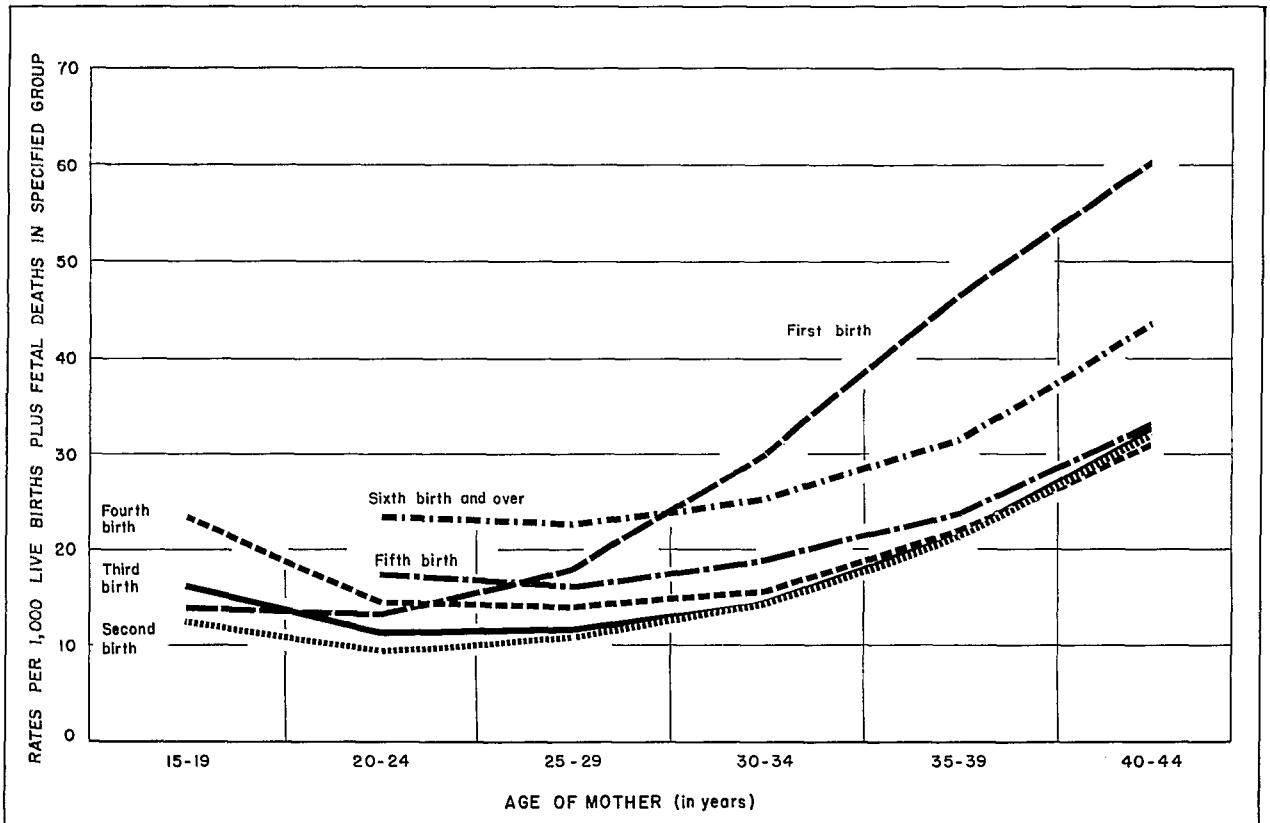
NOTE: Figures for birth weight and birth order not stated are distributed.

Source: National Office of Vital Statistics: Weight at birth and survival of newborn, by age of mother and total-birth order, by J. Loeb. Vital Statistics—Special Reports, Vol. 47, No. 2. Public Health Service. Washington, D.C., 1958.

with the sharp increase in mortality occurring in the early 30's.

Among the low birth weight infants the pattern is not nearly as clear and definite as among children with birth weights over 2,500 grams. What is apparent is that for second, third, and fourth order births, there is little variation in the neonatal mortality rates at most ages. Also, except at the more advanced ages fifth and higher order births have the highest mortality rate.

Children born to mothers who had a previous pregnancy ending in a fetal death had in the neonatal period twice the mortality rate of the other children (table G). This increased mortality risk was present at all birth orders. Only part of the increased risks was due to a higher rate of pre-



NOTE: Data for Massachusetts are not included because this State did not require the reporting of birth order. Figures for birth order not stated and for age of mother not stated are distributed. Includes only fetal deaths for which the period of gestation was given as 20 weeks, or 5 months, or more or was not stated. Total-birth order refers to number of children ever born to mother, including fetal deaths.

Source: Annual volumes *Vital Statistics of the United States*, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

Figure 10. Average fetal death rates by age of mother and total-birth order: United States, 1960-61.

maturity. In general, neonatal mortality among both the prematurely born and the mature infants was greater among children born to mothers who had a previous fetal loss.

As in the case of neonatal deaths, fetal mortality (at 20 weeks gestation or later) is strongly related to age of mother and birth order (table 12 and fig. 10). The most favorable loss rates are found among gravida 2 and 3 women in their 20's, who accounted for 30 percent of all pregnancies of 20 weeks or more gestation. More generally the low fetal mortality rate for women of a specified gravidity was at about the same age as occurred in the case of neonatal mortality.

The extent to which the number of prior fetal deaths is a factor in subsequent reproductive loss has been explored on the basis of vital statistics for white single births in upstate New York during 1959 and 1960 (table H).[13] Both neonatal and fetal mortality (20 weeks or more gestation) rose steeply as the number of prior fetal deaths increased. The neonatal mortality rate went from 14.4 per 1,000 live births where there was no prior fetal death to 129.3 per 1,000 live births where 3 or more fetal deaths preceded the current pregnancies. The corresponding fetal death rates showed a much bigger spread: 11.8 to 221.4.

Perinatal mortality rates provide even clearer evidence of the high risk associated with prior fetal loss. Almost a third of the women who had 3 or more previous fetal deaths had their pregnancies terminate with a perinatal death. This

Table H. Neonatal, fetal, and perinatal mortality rates for white single births, by total-birth order and prior fetal deaths: Upstate New York, 1950-52 and 1959-60

Birth order[1]	Prior fetal deaths					
	Total	None	1 or more	1	2	3 or more
Deaths under 28 days[2]	1959-60					
Total	15.1	14.4	36.8	33.1	49.0	129.3
First	14.5	14.5	-	-	-	-
Second	14.4	14.1	38.0	38.0	-	-
Third	14.3	13.7	36.4	32.8	[5]132.3	-
Fourth and over	16.8	15.3	37.1	32.4	42.0	129.3
Fetal deaths, 20 weeks or more[3]						
Total	13.4	11.8	61.9	48.2	141.0	221.4
First	12.9	12.9	-	-	-	-
Second	9.3	8.8	46.0	46.0	-	-
Third	11.6	10.5	51.0	48.3	[5]116.8	-
Fourth and over	18.6	14.8	67.1	48.6	143.0	221.4
Perinatal deaths[4]						
Total	28.3	26.1	96.4	79.8	183.1	322.1
First	27.2	27.2	-	-	-	-
Second	23.6	22.9	82.3	82.3	-	-
Third	25.8	24.2	85.5	79.6	[5]233.7	-
Fourth and over	35.0	29.8	101.3	79.4	179.0	322.1
Deaths under 28 days[2]	1950-52					
Total	16.3	15.6	40.3	35.9	73.4	91.3
First	15.8	15.8	-	-	-	-
Second	15.0	14.7	34.0	34.0	-	-
Third	16.2	15.3	37.6	35.1	[5]97.0	-
Fourth and over	19.9	17.5	43.8	37.2	69.8	91.3
Fetal deaths, 20 weeks or more[3]						
Total	15.8	14.3	64.6	55.3	109.8	226.5
First	16.6	16.6	-	-	-	-
Second	11.3	10.4	64.8	64.8	-	-
Third	15.4	13.8	51.1	46.4	151.9	-
Fourth and over	23.0	18.1	71.2	56.5	103.0	226.5
Perinatal deaths[4]						
Total	31.8	29.7	102.3	89.3	175.1	297.0
First	32.1	32.1	-	-	-	-
Second	26.1	24.9	96.6	96.6	-	-
Third	31.3	28.9	86.8	79.9	234.2	-
Fourth and over	42.5	35.3	111.8	91.6	165.7	297.0

[1]Birth order refers to number of births the mother has had, including fetal deaths.
[2]Rates per 1,000 live births in specified group.
[3]Rates per 1,000 live births plus fetal deaths in specified group.
[4]Fetal deaths of 20 weeks or more gestation (and not stated) plus infant deaths under 28 days per 1,000 fetal deaths plus live births in specified group.
[5]Rate based on less than 20 deaths.

Source: Special tabulations of New York State Health Department data.

is an extreme situation, but women with 2 prior fetal deaths also had an especially high risk with 1 of 6 of their current pregnancies ending in a perinatal death. The full significance of these figures can be appreciated when it is realized that all fetal deaths under 20 weeks gestation are excluded.

Total Suboptimal Pregnancy Outcome

Infant and perinatal mortality rates provide only a partial view of the total loss and disability associated with pregnancy. They are the best documented measures of loss and historically have attracted most attention. However, as the attack against mortality centers increasingly around conditions that affect the development of the fetus, the desirability of including the total spectrum of loss and congenital defects among children becomes apparent. It is this perspective that has led some investigators to postulate a continuum of pregnancy wastage involving different types of loss that have similar etiologies.[14]

Special studies now in progress are beginning to produce data designed to measure the components of this loss and disability and to uncover clues to their etiology. Selected for presentation here are several observations drawn from research with which one of the authors (S.S.) is associated. The data represent a small trickle in the flow of information that can be expected from the intensive investigations of the National Institute of Neurological Diseases and Blindness, the Cooperative Study of Child Development in Oakland, California, the Fetal Life Study at Babies Hospital (New York City), Pregnancy Outcome Study (H.I.P.), and other research projects.

Fetal loss.—It is well-known that fetal loss of 20 weeks or more gestation is only a small fraction of the total volume of fetal deaths at all gestational ages. Precisely how many women become pregnant each year and how many of these pregnancies end with a dead conceptus is unknown. Even in an area such as New York City, where determined efforts have been made to obtain complete reporting, it is clear that many fetal deaths remain unreported. There are many reasons for this, including the possibilities that the woman herself may not have been aware that she was pregnant or that the pregnancy may have terminated so early and with so little discomfort that a physician was not seen.

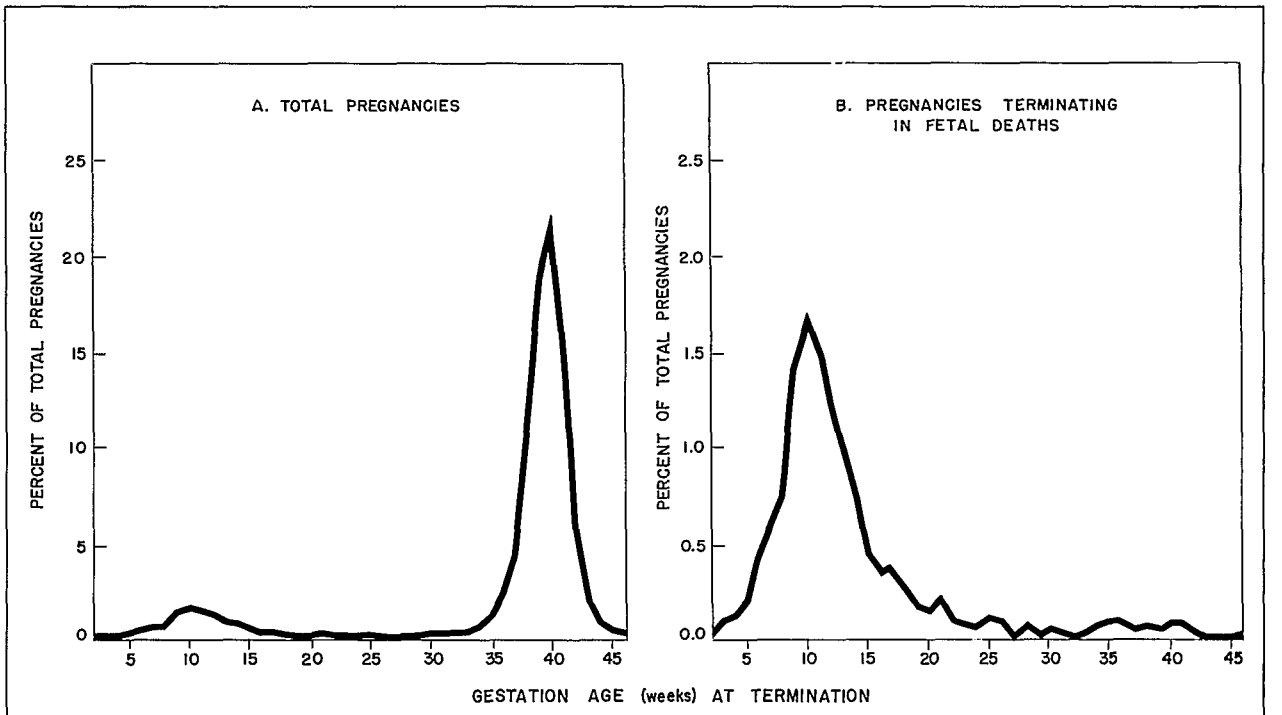
By applying life-table techniques in local area studies,[j] Erhardt[15] and French and Bierman[16] have independently estimated the magnitude of the fetal loss problem as being more than 20 percent of the pregnancies. No study has produced this high a figure directly from reported events. However, in a recent investigation of a population insured for comprehensive medical care (H.I.P. in the New York City area), it was found that about 14 percent of the pregnancies known to the physicians terminated in a fetal death.[17 18] Because of the methodology it was concluded that this was close to the limit of reporting accuracy that might be reached in a large-scale study. A restriction on the generalizability of rates obtained from this study is that it is known that women under the care of H.I.P. obstetricians have lower prematurity and perinatal mortality rates than do other patients of private physicians in New York City. Nevertheless, distributions and relationships coming from the study clarify a number of the issues in fetal and infant mortality which cannot readily be dealt with through official vital statistics.

Almost half of the fetal deaths in the H.I.P. study were at gestation ages under 12 weeks, another 32 percent were at ages 12-19 weeks, and 12 percent were at 20 weeks or more gestation. The probability that a "medically known" pregnancy will terminate in a fetal death at a particular gestation age appears to follow a bimodal distribution. The first peak is at about 10 weeks; the other, after 39 weeks (fig. 11). There is probably little reason to question the general form of the curve except for the early gestation ages. Prior to 10 weeks the rates are of value for medical care programs only as a reflection of what the physician is seeing, and this, of course, is of considerable importance. As mentioned earlier, estimates of the true state of affairs suggest that the risk of a fetal death is greatest prior to 10 weeks gestation.

New insights into the relevance of age of mother and birth order to the risk of fetal loss at all

[j] Erhardt's study was based on a special inquiry among physicians and clinics in New York City; French and Bierman's investigation was located in Kauai, Hawaii.

788-022 O - 65 - 5



Source: Shapiro, S., Jones, E. W., and Densen, P. M.: A life table of pregnancy terminations and correlates of fetal loss. *Milbank Mem. Fund Quart.* 40:7-45, Jan. 1962.

Figure II. Distribution of pregnancies by gestation age at termination: Health Insurance Plan, 1958-59.

gestational ages are provided by this study's material. Elevated risks at ages over 30 and at the higher birth orders were found in the H.I.P. study among fetal deaths under 12 weeks and at 12-19 weeks' gestation as well as at 20 weeks or more. The overall impression is that with only minor exceptions the pattern of risk shown by national vital statistics for occurrences at 20 weeks gestation or later is a continuation of similar patterns of risk at earlier gestation ages. One possible exception concerns gravida 1 women who appear to have a lower risk than gravida 2 women early in pregnancy (under 12 weeks' gestation) (table I).

Congenital anomalies.—Information is beginning to accumulate about congenital malformations. Until recently there was considerable underestimation of the magnitude of the problem. Vital statistics could not be expected to do anything more than provide information on those severe anomalies that were detectable at time of birth or reported on the death certificate. With the appearance of a report on congenital anomalies by McIntosh and associates in 1954 it became clear that the problem was of similar magnitude to low birth weight.[19] In their study of a clinic population (Babies Hospital, Sloan Hospital in New York City) about 8 anomalies were diagnosed per 100 children. The H.I.P. study had a very similar finding, 7 anomalies per 100 children. Both of these figures refer to definite anomalies diagnosed by the time the child reached 2 years of age. They omit conditions, principally orthopedic defects, about which there might be some question as to whether they are malformations.

An index of suboptimal pregnancy terminations.—A loss-disability index which covers the total range of mortality and defects related to

prenatal circumstances has been derived from the experience in the H.I.P. investigation.[20] Although it must be interpreted as an understatement of the situation in the general community, it is high indeed.[k] The index shows that about one-fourth (24 percent) of all pregnancies that come to medical attention end in either a fetal death (14 percent) or in a live-born child who either (a) dies during the neonatal period (0.8 percent), (b) has a significant anomaly[l] that requires medical care or will interfere with normal functioning (4.5 percent), or (c) has a low birth weight (4.0 percent). In the last three percentages shown, children are counted only once even if, for example, they died and had a congenital anomaly and a low birth weight.

The magnitude of special risks of all types in the current pregnancy that might be associated with how the last prior pregnancy terminated is now becoming clearer. The H.I.P. study indicated that throughout the pregnancy, from the earliest weeks on, women whose previous pregnancy had ended in a fetal death were twice or three times as likely to have their current pregnancy end in a fetal death as the other women. The influence of prior pregnancy experience was about the same

[k]The understatement is due to the type of population studied and the fact that the measure refers to single births among women 19-40 years of age. Also, no adjustment is made for the understatement of very early fetal deaths.

[l]The study was restricted to conditions diagnosed in the normal course of providing medical care during the first 2 years of the child's life. Neurological damage that becomes manifest later is, therefore, not included.

Table I. Fetal death rates by period of gestation, age of mother, and gravidity: Health Insurance Plan, 1958-59

[Single and plural deliveries included]

Age of mother at LMP and gravidity	Total pregnancies[1]	Period of gestation			
		Total	Under 12 weeks	12-19 weeks	20 weeks or more
		Rates per 1,000 pregnancies in specified group[2]			
Total[1]	6,844	141.7	67.9	48.9	19.4
Age of mother					
Under 20 years	161	124.2	a	a	a
20-24 years	1,385	96.8	40.4	40.6	14.9
25-29 years	2,222	115.2	52.2	39.9	16.3
30-34 years	1,812	156.2	71.7	57.7	20.2
35 years or more	1,190	219.3	120.2	64.9	29.6
Gravidity					
1	1,504	97.1	41.9	36.1	17.3
2	1,869	107.0	55.1	35.7	14.1
3	1,499	138.1	63.4	56.3	18.9
4 or more	1,898	186.5	93.3	62.8	27.3

[1]Totals include pregnancies with age of mother, gravidity, and/or gestation age not stated.

[2]Rates specific for gestation age are based on total number of pregnancies less the number terminating prior to specified age.

[a]Rate not computed, less than 15 deaths.

Source: Shapiro, S., Jones, E. W., and Densen, P. M.: A life table of pregnancy terminations and correlates of fetal loss. Milbank Mem. Fund Quart. 40:7-45, Jan. 1962.

whether one examined the situation by age of mother or birth order (table J).

One other observation from this study is of interest to the present discussion (table K). It was found that women whose last prior pregnancy ended in either a fetal death or low birth weight infant had relatively high reproductive loss or damage in the current pregnancy (i.e., fetal mortality plus neonatal death, low birth weight, and congenital anomalies). Furthermore, there was a tendency for successive pregnancies to repeat themselves with regard to the type of loss or disability incurred. If the last pregnancy ended in a low birth weight infant, the excess in loss-disability in the current pregnancy was heavily weighted with low birth weights; if the prior outcome was a fetal death, the loss-disability excess was heavily weighted with fetal deaths. This finding is consistent with results from other investigations.[21]

The high-risk group just discussed has an appreciable impact on the overall rate of pregnancy loss and disability. Women in this category accounted for 1 of 6 of the pregnancies in the H.I.P. study. If their experience had paralleled that of the other women, the total loss-disability rate would have been 19.4 percent instead of 23.7 percent.

THE 1950 DECADE

Previous sections of this report have dealt with the trend and current status of the infant, fetal, and perinatal mortality rates. The discussion that follows is concerned with the 1950 decade, when the trend in infant mortality assumed

Table J. Fetal death rates, by outcome of last prior pregnancy, age of mother, and gravidity: Health Insurance Plan, 1958-59

[Multigravidae only. Single and plural deliveries included]

Age of mother at LMP and gravidity	Outcome of last prior pregnancy		
	Total[1]	Live birth	Fetal death
	Rates per 1,000 pregnancies in specified group		
Total	127.9	110.2	222.2
Age of mother			
20-24 years	105.5	83.9	157.9
25-29 years	115.7	93.1	151.4
30-34 years	153.3	111.2	284.5
35 years or more	199.3	155.0	257.6
Gravidity			
Total-2 and 3	120.8	100.3	186.5
2	107.0	91.6	156.3
3	138.1	111.6	216.5
4 or more	186.5	131.2	255.4

[1] "Not stated" are included in totals but are not shown separately.

Source: Shapiro, S., Jones, E. W., and Densen, P. M.: A life table of pregnancy terminations and correlates of fetal loss. Milbank Mem. Fund Quart. 40:7-45, Jan. 1962.

Table K. Pregnancy loss disability for single deliveries, by outcome of last prior pregnancy: Health Insurance Plan, 1958-60

Outcome of last prior pregnancy	Outcome of current pregnancy							Loss-disability index[2]
	Total pregnancies	Fetal deaths		Live births				
		Total	12 weeks or more gestation	Total live births	Deaths under 4 weeks	2,500 grams or less	"S" anomaly[1]	
		Rate per 100 pregnancies[3]			Rate per 100 live births			
Total[4]	5,984	14.4	6.9	5,123	0.98	5.9	5.5	23.7
Gravida 1								
Total[4]	1,193	9.7	5.3	1,077	0.56	7.4	4.4	19.9
Gravida 2 and 3								
Total[4]	3,025	12.4	6.1	2,651	0.87	5.4	5.3	21.4
Live birth	2,671	11.3	5.5	2,368	0.93	4.9	5.2	20.0
Premature[5]	183	8.7	4.6	167	a	16.8	9.0	30.0
Mature	2,371	10.1	5.2	2,132	0.94	4.0	5.0	18.0
Fetal death	338	19.5	11.3	272	a	8.8	5.5	30.5
Gravida 4 or more								
Total[4]	1,700	18.5	8.9	1,386	1.52	5.7	6.7	28.2
Live birth	1,256	14.7	6.7	1,071	1.49	5.8	6.7	24.9
Premature[5]	68	14.7	9.4	58	a	24.1	a	41.2
Mature	1,108	12.4	5.7	970	1.34	4.9	6.8	22.2
Fetal death	388	26.6	15.5	285	a	5.6	5.6	34.8

[1]Live-born children with one or more severe or significant congenital anomalies diagnosed before 2 years of age. Anomalies included are those that will probably make a difference in the child's life by affecting his survival or by necessitating parental, medical, surgical, educational, and/or public attention not required by a majority of the individuals at the same age.

[2]Loss-disability index is the total number of pregnancies that terminated in either a fetal death (of any gestational age), a low birth weight child, a child who died in the neonatal period, or a child who has an "S" anomaly per 100 pregnancies.

[3]Rates relate to pregnancies at risk in specified gestation age range.

[4]Not stated are included in totals but are not shown separately.

[5]Determined primarily from obstetrical notes recorded at first prenatal visit. Entries were, for the most part, in terms of birth weight.

[a]Rates not computed, 5 or fewer deaths.

Source: Shapiro, S., Ross, L. J., and Levine, H. S.: Relationship of selected prenatal factors to pregnancy outcome and congenital anomalies. Am. J. Pub. Health 55:268-282, Feb. 1965.

the slowest rate of decline on record in the United States. Two questions are explored: first, to what extent does the lack of progress in reducing the total infant mortality rate reflect changes that occurred during the 1950-60 decennium in parameters of infant loss? and second, how did the high-risk groups fare; did any of them deviate from the general pattern of small decreases in this period? But first a brief review of the demographic and economic changes that took place in the 1950's is presented in the following paragraphs.

Most indicators of socioeconomic status point toward a major improvement during the 1950's in the living standards of the population as a whole. These changes followed impressive gains in the 1940's. Educational attainment increased, and family income rose (even after taking into account the rise in the cost of living) (Appendix table I). The only countertrend for the country as a whole was in the illegitimate birth rate, which rose appreciably in this period (Appendix table II).

The birth rate increased during World War II and rose sharply in the immediate postwar period; it is only in the past few years that a decrease has begun (Appendix table III). To a great extent, the maintenance of a high birth rate was due to the rate at which families were increasing in size with the birth of four, five, and additional children (Appendix table IV). Also, age at marriage continued to decrease. Despite these changes more of the women aged 14-44, including those with preschool children, were in the labor force in 1960 than previously (Appendix table V).

Large-scale shifts in the geographic distribution of the population, thereby rivaling the massive movement in the previous decade, occurred during the 1950's. Half of the population in 1960 were living in a house different from the one they occupied 5 years earlier. Nine percent moved to another county in the same State, and 9 percent moved to another State (Appendix table VI). The movement was out of rural areas and into urban centers in every section of the country. By 1960 about 70 percent of the population was living in a city or the urbanized area around a city (Appendix table VII). Increasing proportions of the population took up residence in the West, and in 1960 almost one in six persons lived in this region (Appendix table VIII).

Changes in Parameters of Infant Loss and Their Effect on Trend

Sufficient information is available to examine this issue, although not as intensively as would be desired, for several of the parameters previously considered. Other parameters, such as child spacing and socioeconomic status, would unquestionably add greatly to the understanding of events during the 1950's, but there is no direct evidence of these variables through mortality rates. Although all of the indicators of socioeconomic status point toward improvement, what is not known is whether the distribution of live births has also shifted toward greater proportions in the higher status groups or whether the differentials in infant mortality among the various socioeconomic classes have changed.[m]

The variables that can be studied include race, birth-order—age-of-mother, geography, and birth weight. With regard to race nonwhite persons have consistently had higher birth rates than have white persons for as long as vital statistics have been available. As compared with the previous decade, racial differentials in the birth rate increased during the 1950's. But since white births still represented a large majority of all births, the effect of the increased birth rate differentials on changes in the infant mortality rate was negligible. If the racial composition of the live births had not altered, the infant mortality rate would have decreased between 1949-51 and 1959-61 by about 14 percent, which is almost the same as the decrease based on the observed rates (13 percent).

The influence of changes in birth-order—age-of-mother distributions among live births has also been examined. Two circumstances of potential importance for the infant mortality rate were operating during the 1950's. As mentioned, age at marriage continued to go down, and there was a persistent trend toward higher birth orders. The

[m]No studies have been conducted in the United States, either locally or nationally, on the trend in infant mortality by socioeconomic status. Also, data are not available for differentials in infant mortality among the various socioeconomic groups for a recent time period. However, in a study of fetal deaths and infant mortality during 1950-52 in upstate New York, Chase demonstrated that fetal, neonatal, and postneonatal death rates varied inversely with socioeconomic level.[22] Occupation of the child's father was used as the socioeconomic indicator.

net result was that the age-of-mother—birth-order distribution of births has been more unfavorable for survival of the newborn infant in recent years than in 1950; a small part of the slowdown in the rate of decline of the neonatal death rate[n] could be attributed to this factor. If all other conditions had remained stationary except the distribution of births by birth-order—age-of-mother, the neonatal mortality rate for the United States would have increased by 6 percent between 1950-51 and 1960-61 instead of decreasing by the observed 8 percent. Thus, if age-of-mother—birth-order had not changed, a decrease of about 13 percent in the neonatal rate might have been expected. This is still far below the decrease that occurred during the 1940 decade (28 percent).

Taking this approach to evaluating how changes in age-of-mother—birth-order distributions affected the neonatal mortality rate for white infants indicates that the overall decrease between 1950-51 and 1960-61 would have been 16 percent, instead of the 11 percent actually observed, if it had not been for the more adverse distributions. The decrease in the previous decade was 27 percent. Among nonwhite infants the changes in distribution of these two variables resulted in only a 1-percent reduction in the decline of the neonatal rate. In summary, the shift toward a greater proportion of births being in relatively poor-risk age-of-mother—birth-order categories exerted a small but noticeable deterring effect on the downward trend in the neonatal mortality rate for the United States.

The basic figures in the above analysis follow:[o]

	Neonatal mortality rates per 1,000 live births		
	Total	White	Nonwhite
Adjusted 1950-51-	19.9	18.8	26.4
Expected 1960-61-	21.0	20.0	26.7
Observed 1950-51-	20.3	19.2	27.4
Observed 1960-61-	18.6	17.1	26.6

Geographic changes in the distribution of the population might be expected to have an important effect on infant mortality rates, particularly since at the beginning of the 1950 decennium there was considerable variability in the rate among geographic areas and since a high degree of population mobility characterized the 1950's. Nevertheless, as shown below, when the average rates for 1949-51 are applied to the 1959-61 births classified by groupings of geographic areas, the resulting figures are in almost all cases below the observed rates for 1949-51.

	Infant mortality rates per 1,000 live births		
	Total	White	Nonwhite
Observed 1949-51----------	29.6	27.1	45.5
Observed 1959-61----------	25.9	22.8	42.5
Expected 1959-61			
(a) Based on 9 major geographic divisions----	29.4	27.1	44.6
(b) Based on metropolitan-nonmetropolitan groupings of counties-	28.3	25.9	43.3

These data lead to the conclusion that without the geographic shifts the decline in the white and nonwhite rates might have been slightly less than did occur. It could be argued that for the nonwhite infants in particular the altered distribution of births by geographic area was accompanied by improvement in registration completeness and possibly by an increased likelihood that a death in early infancy would be reported as both a live birth and death instead of as a fetal death.

Other questions can be raised about the effect of mobility on trends. To what extent and how

---

[n]This issue could be tested only in relation to the neonatal mortality rate, since mortality rates by age-of-mother–birth-order were available on a national scale only for the neonatal period.

[o]"Expected" rates were obtained by applying the neonatal mortality rates by birth-order–age-of-mother from the special study of January-March 1950 to the appropriate subgroups in 1960-61. "Adjusted" rates for 1950-51 were obtained in a similar manner. The adjustment was required since the birth-order–age-of-mother rates were for January-March 1950. Rates exclude Massachusetts, where birth order data are not collected. "Observed" rates also exclude Massachusetts.

quickly does an in-migrant group adopt the medical care practices of persons of like economic and social circumstances who are already in the community? Also, is the migrant group sufficiently selected economically and socially to modify the composition of the areas from which they come and the composition of the areas to which they migrate? Available data provide evidence that these questions are highly pertinent.

The change in infant mortality rates among the nonwhite infants has been examined for cities of 500,000 or more persons in 1960. The average rates for 1950-51 and 1960-61 were compared in each of the 19 cities which had more than a third increase in their nonwhite population during the 1950's. In 10 of these cities the rate increased. Rates for white infants do not lend themselves as easily to this type of analysis, but some cities have had an increase in the infant mortality rate among white children. The role of changing composition of the populations of the cities is certainly worthy of further study.

By far the strongest discriminating variable in neonatal mortality is weight at birth. Changes in birth weight distributions which result in even moderate increases or decreases in low birth weight groups could have an important effect on neonatal mortality. Between 1950 and 1960 there was no change in any respect in the birth weight distribution for white and nonwhite births combined. When the two race groups are considered separately, changes in opposite directions are found. The distribution for white infants showed a small decrease in the proportion of low birth weight babies, while the distribution for nonwhite infants showed a marked increase. Application of neonatal mortality rates for January-March 1950 to 1950 and 1960 detailed distributions of live births by birth weight results in the following neonatal rates:[o]

	Neonatal mortality rates per 1,000 live births		
	Total	White	Nonwhite
Adjusted-1950--	19.8	18.6	27.2
Expected-1960--	20.9	18.6	32.8

From these figures it is clear that the changes in birth weight among white children were too small to have an effect on the trend in the neonatal mortality rates for white infants. The increasing number of low birth weight infants among the nonwhite births, however, exerted a strong brake during the 1950's on the rate of decline in the neonatal mortality rate in this group.

Changes in High Mortality Risk Groups

The slower rate of decline in the nonwhite infant mortality rate has already been considered, but it is worth returning to this point and drawing it to a conclusion within the context of the current discussion. In a real sense the nonwhite infants have represented a high mortality risk group. Events during the 1950's widened the margin between the mortality rates for white and nonwhite children both in early infancy and later on. This is clearly seen in the following figures:

	Percent decrease in rates from 1949-51 to 1959-61	
	White	Nonwhite
Infant mortality-------	16	7
Neonatal mortality-----	12	3
Postneonatal mortality-	26	11

	Percent excess of nonwhite over white rates	
	1959-61	1949-51
Infant mortality-------	86	68
Neonatal mortality-----	56	43
Postneonatal mortality-	180	133

Perhaps the most impressive departure from the general pattern of small decreases in infant mortality during the 1950 decade was the substantial decrease in mortality among white infants in areas that had comparatively high rates. The East and West South Central and Mountain geographic divisions had the highest infant mortality rates in the country in the period 1949-51. During the next 10 years their rates for white infants decreased by about 25 percent in contrast with reductions ranging from 8-17 percent in the other areas. The only geographic division that experi-

enced a sizable decrease in the nonwhite rate was the Mountain area. Here the nonwhite group, a majority of which was Indian, had the exceptionally high rate of 94.4 per 1,000 live births in 1949-51; in 1959-61 the rate was 48.7.

The closing of the geographic gap in infant mortality among white births resulted almost entirely from major strides in reducing postneonatal mortality in geographic divisions where these rates were exceptionally high in 1949-51. Postneonatal rates in the East South Central, West South Central, and Mountain divisions were reduced by 40-50 percent during the 1950's and are now much closer than they have ever been to the rates in the other divisions. Among nonwhite births the situation differed greatly. Omitting the Mountain division, the geographic variability was not reduced for either the neonatal or postneonatal rates. Actually the range between high and low areas increased for the postneonatal rates.

The sizable reduction in infant mortality differentials among white births just discussed was not simply a continuation of events in the 1940's. During this earlier period neonatal and postneonatal mortality rates decreased by about the same relative amounts in all areas. As a result, the gaps between high and low geographic divisions changed little between 1939-41 and 1949-51. Among nonwhite births the outstanding characteristic of the 1940 decade was the sizable reductions that occurred in both the neonatal and postneonatal mortality rates in all geographic areas. As indicated above, except for the Mountain area the changes in the 1950 decade were negligible by comparison.

Other aggregates of geographic areas support the view that there has been a general reduction in geographic variation in the infant mortality rates among white births (table 8). At the beginning of the 1950's the rates among white children were about a fifth higher in nonmetropolitan counties than in metropolitan counties. During the next 10 years the mortality rate in nonmetropolitan counties was reduced by 20 percent as compared with only 9 percent in metropolitan counties, and the gap between the rates for white infants in the two areas was more than cut in half. Among nonwhite infants there was little change in mortality in either sets of areas, and the rate in nonmetropolitan counties remained substantially above the rate in metropolitan counties.

One of the more critical variables to consider in a discussion of high-risk groups is birth weight. In the absence of national data on changes that have occurred during the 1950's in the mortality by birth weight, it is necessary to utilize the experience of upstate New York. While the observations based on data for this area cannot be generalized for the country as a whole, they are indicative of what can and does happen in a large area where the rate of decline in infant mortality slowed down during the 1950's. Upstate New York is also interesting because of its major programs in maternal and child health and the improvement in mortality among low birth weight infants that occurred between 1945 (when the neonatal death rate in this birth weight group was 228 per 1,000 live births) and 1950 (when the rate was 183 per 1,000).[13]

Assessment of changes in the 1950 decade is based on mortality rates in the two time periods 1950-52[24] and 1959-60[23] (table L). With regard to the highly vulnerable group of low birth weight infants it is clear that mortality risks shortly after birth were not lowered. This was true for the white and nonwhite races. In fact, among the nonwhite races the neonatal mortality rate for the birth weight group 2,500 grams or less was appreciably higher in the more recent period than at the beginning of the 1950 decade. This excess is primarily due to an increase in the proportion of infants who were born at very low birth weights where the mortality rates are extremely high. To a lesser extent, the same situation was found among white children. Despite these circumstances the main conclusion holds: during the 1950's there was apparently no decrease in neonatal mortality among infants at low birth weights (see adjusted mortality rates in table L).

Once the neonatal period was passed, babies weighing under 2,501 grams at birth had a better chance of surviving to the end of the first year of life in the more recent period 1959-60 than previously. The reduction in mortality was substantial and was shared by white and nonwhite

788-022 O - 65 - 6

Table L. Infant mortality rates for single births, by birth weight, color, and age at death: Upstate New York, 1950-52 and 1959-60

Birth weight and color	1959-60[1]			1950-52		
	Total[2]	Under 28 days[2]	28 days-11 months[3]	Total[2]	Under 28 days[2]	28 days-11 months[3]
White						
Total[4]	19.0	15.1	4.0	21.6	16.3	5.4
1,000 grams or less	954.2	950.9	a	944.8	941.2	a
1,001-1,500 grams	565.4	549.3	35.8	566.5	544.2	48.8
1,501-2,000 grams	216.6	203.3	16.7	228.5	207.3	26.6
2,001-2,500 grams	54.1	43.4	11.2	55.0	43.0	12.6
2,501-3,000 grams	14.9	9.5	5.5	16.8	10.2	6.7
3,001-3,500 grams	7.0	3.7	3.3	9.6	4.9	4.7
3,501 grams or more	6.2	3.5	2.7	8.0	4.4	3.7
2,500 grams or less	183.7	172.7	13.4	178.0	164.2	16.5
2,501 grams or more	8.3	4.8	3.3	10.4	5.8	4.7
Nonwhite						
Total[4]	37.4	27.7	9.9	35.8	23.9	12.2
2,500 grams or less	194.6	173.4	25.7	179.7	150.7	34.2
2,501 grams or more	15.0	7.0	8.1	17.5	7.6	10.0

[1]Mortality rates for 1959-60 adjusted to birth weight distributions in 1950-52 follow (adjustment is made by applying mortality rates by 500-gram intervals for 1959-60 to the distributions in the earlier period):

		Total	Under 28 days	28 days-11 months
White:	2,500 grams or less	175.8	164.7	13.3
	2,501 grams or more	8.3	4.8	3.5
Nonwhite:	2,500 grams or less	175.0	153.0	25.8
	2,501 grams or more	15.0	7.0	8.0

[2]Rates per 1,000 live births in specified group.
[3]Rates per 1,000 survivors of neonatal period.
[4]Not stated birth weights are included in totals but not distributed in 1950-52. Three percent of infant deaths had birth weight not stated; in 1959-60 the figure was 1 percent.
[a]Rates not computed, less than 20 deaths.

Source: Unpublished data for 1959-60 received from Dr. A. Gittlesohn, New York State Department of Health; unpublished data for 1950-52 received from Dr. J. Yerushalmy, University of California, School of Public Health.

infants. Among the children born weighing over 2,500 grams, decreases in mortality occurred during both the neonatal and postneonatal periods. The gains were much greater in the white group than the nonwhite. Among white infants it appears that the improvement was more marked above 3,000 grams than in the weight class 2,501-3,000 grams. This is of interest since it further supports the impression that the most impressive gains occurred in those weight groups that already had the most favorable chances of surviving.

The upstate New York data also provide an opportunity to look at another variable that distinguishes between comparatively high- and low-risk pregnancies. This is "prior fetal loss." The time periods involved are the same as mentioned above. Whether one examines neonatal or fetal mortality in the current pregnancy, the impression is that the gap between the poor-risk groups (i.e., pregnancies preceded by at least one fetal death) and the others did not close (table H).

SUMMARY—MORTALITY RATES

The persistence of a slow rate of decrease in infant mortality over what is now more than a decade has led to the current examination of trends and present status of infant and perinatal mortality. Many of the parameters of loss in pregnancy are studied with a twofold objective: first, to clarify events in the 1950's when the infant mortality rates leveled off; and second, to define once more the high-risk groups in the population. A summary of available data on these issues follows:

1. Until about 1950 there were large reductions in infant mortality. The decreases were greater after the first few weeks of life than shortly after birth, but the improvement in mortality at all ages was significant. Every area of the country and both the white and nonwhite populations shared in the sizable reductions in the loss rate. A major contributory factor to the sharp decline in the death rate was the lowering of mortality from infectious diseases of all types.
2. During the 1950's and the early 1960's the decline in the infant mortality rate slowed down appreciably. The specific year when this change occurred differed by age at death, but the general conclusion is the same—the major declines that formerly characterized the mortality rates are no longer being experienced at any stage during infancy, including the postneonatal period. This reflects lack of change in the rates for most of the important causes of death. There were, however, continued declines in the rates for infective diseases and for infections of the digestive system. Increases occurred in the rate for respiratory diseases other than influenza and pneumonia. The rates for both white and nonwhite infants have leveled off, but the slowdown in the rate of decline has been more marked among the nonwhite infants.

   Decreases in the infant mortality rate during the 1950's were small in all geographic areas. Nevertheless, areas that were comparatively high in their rates at the beginning of the decade showed a larger decrease in their infant death rates. The gap between rates in the metropolitan and nonmetropolitan areas narrowed, and the rates in geographic divisions (representing aggregates of States) varied less at the end of the 1950 decade than formerly.

   Infant mortality increased in many large cities. Nonwhite infants especially were affected by this increase, but in some cities white infants also had a higher rate in 1960-61 than 10 years earlier. The widespread increase in infant mortality among nonwhite births in cities appears to be related to the movement of many nonwhite persons to major cities during the 1950's. Large-scale migration was common in all population groups, but among white persons the movement frequently was from the central city to the suburban areas.
3. Changes in racial or geographic composition of births do not explain the slow decline in the infant mortality rate. More important is the increase in the propor-

tions of births in the comparatively high-risk groups of very young mothers and women with many pregnancies. However, if this factor were eliminated, the decrease in the mortality rate during the 1950's still would lag far behind the decrease in the 1940's.

The distribution of births by birth weight hardly changed for the country as a whole. Changes were in opposite directions in the two race groups. Among white babies the proportion that were 2,500 grams (5½ pounds) or less decreased slightly; among nonwhite babies the proportion increased markedly. The latter exerted a strong brake on the rate of decline in the neonatal mortality rate among nonwhite infants.

4. High-risk groups identifiable through vital statistics all showed little improvement in the 1950's in the infant mortality rates. This held for low birth weight groups, children born to mothers who previously had a fetal death, and nonwhite infants.

The situation in high-risk groups as compared with more favored groups follows:

a. Nonwhite infants have almost twice as high a death rate as white infants. The differential is relatively small shortly after birth, but it rapidly increases as postnatal environmental conditions become the dominant factors. The loss rate in every part of the country is greater among nonwhite than white infants.
b. Infants weighing 2,500 grams or less at birth have a neonatal death rate that is about 22 times the rate for the other babies, and they account for two-thirds of all the neonatal deaths. Chances of survival improve with increasing weight to reach an optimum in the birth weight class 3,501-4,000 grams.
c. Pregnancies among women who previously had a pregnancy which terminated in a fetal death are at least twice as likely to end in a neonatal or fetal death as are pregnancies among other women. Very young mothers and women with many prior pregnancies also represent high risks with respect to neonatal and fetal mortality.

II. MEDICAL RESOURCES AND HEALTH PROGRAMS

PERSONNEL, FACILITIES AND SERVICES, AND FINANCING OF CARE

Physicians

Obstetrical and infant care in the United States is characteristically rendered through arrangements between the individual practicing physician and the pregnant woman with all but 3 percent of the deliveries performed by physicians in hospitals. Outside the larger cities, where hospital clinics are available for outpatient prenatal and postnatal care, even indigent and medically indigent patients receive their care through individual arrangements under the sponsorship of a public welfare or other official agency. Other types of arrangements for obstetrical and infant services cover only a small proportion of the population.

Whatever the pattern of obstetrical and pediatric services, any assessment of the trends in these services must first consider the quantity and training of medical manpower available for all types of medical care. The overall ratio of physicians to total population—about 138 per 100,000 population—has remained essentially unchanged between 1949 and 1962 (table M).[25] However, the ratio of physicians in private practice to population has declined from 101 to 90 per 100,000. About half of this decline is balanced by an increase in the ratio of physicians in other full-time practice from 15.2 to 20.6 per 100,000 population; the other half is related to an almost identical increase in the number of graduate physicians still in training.

Table M. Ratio of physicians to total population and percent distribution, by type of practice: United States 1949 and 1962

Type of practice	1962[1]	1949[2]
	Ratios per 100,000 population	
Total	136.9	138.3
Private practice	89.8	100.9
Full-time specialists	52.6	36.8
Part-time specialists	6.7	15.4
General practitioners	30.5	48.7
Other full-time practice[3]	20.6	15.2
Training programs[3]	20.0	15.7
Retired, not in practice	6.5	6.5
	Percent distribution	
Total	100.0	100.0
Private practice	65.6	72.9
Full-time specialists	38.4	26.6
Part-time specialists	4.9	11.1
General practitioners	22.3	35.2
Other full-time practice[3]	15.1	11.0
Training programs[3]	14.6	11.4
Retired, not in practice	4.7	4.7

[1]Includes 50 States, District of Columbia, and Puerto Rico and outlying areas.
[2]Includes the 48 States and the District of Columbia.
[3]Includes Federal and non-Federal physicians and all interns and residents.

NOTE: Population includes Armed Forces overseas.

Source: Adapted from Division of Public Health Methods: Medical specialists, by P. Q. Peterson and M. Y. Pennell. Health Manpower Source Book, Section 14. PHS Pub. No. 263. Public Health Service. Washington. U.S. Government Printing Office, 1962.

These changes are reflected in the percentage distribution of physicians by the nature of their practice. In the interval between 1949 and 1962 the percentage of physicians in private practice declined from 72.9 to 65.6. The decrease in the percentage of general practitioners and part-time specialists far outweighed even the sharply increased proportion of full-time specialists in private practice.

Of more direct pertinence to obstetrical and pediatric care are the ratios of general practitioners and of specialists in obstetrics-gynecology and pediatrics to the specific segments of the population served (table N). Between 1949 and 1962 the number of obstetrician-gynecologists per 100,000 deliveries almost doubled, going from 140 to 271. This figure would be more meaningful if it could be related to the trend in the proportion of specialists in academic work and training programs, but information of this kind is not available. In any event, the increase in the availability of specialist manpower has been almost completely offset by the striking decrease from 1,999 to 1,340 in the number of general practitioners per 100,000 deliveries.

Definitive assessment of the actual amount of physicians' time available for obstetrical care would require information not currently available

Table N. Ratio of general practitioners and full-time specialists in obstetrics-gynecology and in pediatrics to specified population and birth groups: United States, 1949 and 1962

Population group	1962[1]	1949[2]
	Ratios per 100,000 in specified population group	
General practitioners		
Total population	30.5	48.7
Fetal deaths[3] and live births	1,340.0	1,998.6
Children under 15 years	97.7	179.5
Specialists in obstetrics-gynecology		
Total population	6.2	3.4
Fetal deaths[3] and live births	270.8	139.8
Specialists in pediatrics		
Total population	5.6	2.9
Children under 15 years	17.8	10.7

[1]Includes 50 States, District of Columbia, and Puerto Rico and outlying areas.
[2]Includes the 48 States and the District of Columbia.
[3]Fetal deaths of 20 weeks or more gestation or gestation not stated.

NOTE: Data for specialists include those in private practice, hospital service (other than interns and residents), teaching, administration, research, and preventive medicine; data for general practitioners refer to those in private practice. Population includes Armed Forces overseas.

Source: Adapted from Division of Public Health Methods: Medical specialists, by P. Q. Peterson and M. Y. Pennell. Health Manpower Source Book, Section 14, PHS Pub. No. 263. Public Health Service. Washington. U.S. Government Printing Office, 1962.

on the proportion of time general practitioners devote to obstetrics and similarly the proportion of time that obstetrician-gynecologists devote to the obstetrical aspects of their specialty. Broad assumptions can be made on these points: general practitioners devote about 10 percent of their time to obstetrical care, and obstetrician-gynecologists devote 60 percent of their time to obstetrics. On the basis of these two assumptions the ratio of physician time to the number of deliveries has increased only slightly between 1949 and 1962.

Other factors must also be considered in attempting to quantitate trends in medical manpower in relation to changing obstetrical needs. The decline in the percentage of deliveries performed by untrained midwives from 4.5 percent of the total in 1950 to 1.8 percent in 1962 (table O) points to a corresponding increase in the proportion of deliveries by physicians. It is also likely that physicians in general practice have reduced the proportion of their time devoted to obstetrical care, particularly in those localities in which the concentration of specialists has increased most rapidly. Part of the impact of these factors tending to reduce the ratio of manpower to deliveries would be offset by the increase in the proportion of physicians still in training, but the care given by interns and residents still requires supervision by other physicians. Furthermore, the broadened concept of obstetrical care that is attracting attention, especially with respect to the meticulous and time-consuming diagnostic and therapeutic services required by women with a history of relative infertility or previously complicated deliveries, makes increased demands on the time of specialists in obstetrics-gynecology.

About 20 years ago the goal was suggested that "in the United States *all* maternity patients

Table O. Percent distribution of live births, by person in attendance and color: United States, 1940, 1950, 1960, 1962

Year and color	Total[1]	Physician in hospital[2]	Not in hospital	
			Physician	Midwife
	Percent distribution			
Total				
1962	100.0	97.2	0.9	1.8
1960	100.0	96.6	1.2	2.0
1950	100.0	88.0	7.1	4.5
1940	100.0	55.8	35.0	8.7
White				
1962[3]	100.0	99.0	0.5	0.3
1960	100.0	98.8	0.7	0.4
1950	100.0	92.8	5.9	1.1
1940	100.0	59.9	36.5	3.1
Nonwhite				
1962[3]	100.0	86.9	2.7	9.9
1960	100.0	85.0	3.5	11.0
1950	100.0	57.9	14.3	26.1
1940	100.0	26.7	24.1	48.0

[1] Includes other and not stated, not shown separately.
[2] It is assumed that all births in hospitals are attended by physicians.
[3] Figures by color in 1962 exclude data for residents of New Jersey because that State did not require reporting of the item in that year.

Source: Annual volumes Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office, and special reports.

should have advice and treatment throughout the maternity cycle by or under the immediate supervision of a doctor of medicine recognized as a specialist in obstetrics."[26] Recent estimates by Hellman[27] throw some light on the extent to which this goal is being achieved. Using a conservative figure of an annual average of 200 deliveries for all diplomates of the American Board of Obstetrics and Gynecology, whether in private practice, academic life, or administration, he estimated that 17.2 percent of the births during the 1950-54 period were attended by diplomates and that this would rise to 27.1 percent of the births in the 1960-64 period. He envisioned only a slight further increase in this percentage to a peak of 29.2 percent in 1970-74 and a decline in the percentage thereafter. At the same time a continued decrease in the proportion of general practitioners in attendance at deliveries would, according to this forecast, be accompanied by a corresponding increase in the proportion of deliveries in ward services of hospitals.

The number of pediatricians per 100,000 children under 15 years of age has increased from 10.7 in 1949 to 17.8 in 1962 (table N). However, medical care of children is still largely related to the availability of general practitioners. If it is estimated that general practitioners devote about 20 percent of their time to the care of children under 15 years of age, then the availability of medical manpower for the care of this segment of the population will have declined from 46.6 to 37.3 physicians per 100,000 children under 15 years during the 13-year interval prior to 1962. The actual decline would probably be even greater, as in the case of obstetrical care, since general

practitioners in areas having a high proportion of pediatricians would tend to devote a smaller fraction of their time to the care of children than would general practitioners in other areas.

One index of the quality of medical care available is the proportion of physicians in a specialty who are diplomates of their respective specialty boards. Of the full-time specialists in obstetrics-gynecology in clinical practice about half (48.8 percent) are diplomates of the American Board of Obstetrics and Gynecology (table P).[25] Among obstetricians in other full-time practice only 36.7 percent were Board diplomates in 1961. Full-time pediatricians as a group have a higher proportion of diplomates (licentiates) of the American Board of Pediatrics. Among those in clinical practice fully 62.8 percent fall in this group, and those in full-time practice rank only a fraction of a percentage lower.

The distribution of obstetricians is highly variable in different regions of the United States. The number of specialists in obstetrics-gynecology per 100,000 deliveries ranges from a high of 398 in the Northeast to a low of 234 in the South (table Q).[25] The North Central region had only a slightly higher proportion of specialists in obstetrics-gynecology than the South, with the West in an intermediate position. Specialists in pediatrics showed a similar type of distribution. Again the Northeast had the highest level with 26.0 pediatric specialists per 100,000 children under 15 years of age. However, the North Central region, with 14.6 pediatricians per 100,000 child population, had a definitely smaller concentration than the South, with 15.6.

Physicians in private practice are overwhelmingly solo practitioners. While the number of medical groups in the United States increased by 214 percent between 1946 and 1959 (368 to 1,154), the number of physicians in group practice still constituted only 7 percent of the active, practicing physicians in the country.[28] The highest proportion of physicians in group practice is found west of the Mississippi River.

The supply of physicians for maternal and child health programs does not appear to be keeping pace with the increasing needs in this field. An annual average of about 14 physicians were majoring in maternal and child health in schools of public health in the decade starting with the 1951-52 academic year.[29] There were 76 majors during the second half of this period and 68 during the first half, but the number during the 1960-61 academic year (11) was considerably lower than in the preceding 3 years.

As of January 1962 17 percent of the positions of directors of State maternal and child health programs were unfilled.[29] Of those filled, 27 percent were certified by the American Board of Preventive Medicine, 9 percent by the Board of Pediatrics, and 5 percent by the Board of Obstetrics and Gynecology.

Table P. Diplomate status of full-time specialists in obstetrics-gynecology and in pediatrics, exclusive of those in training: United States, 1961

Type of specialist	Percent diplomates		
	Total	Among those in clinical practice	Among those in other full-time practice
Obstetrics-gynecology	48.1	48.8	36.7
Pediatrics	62.7	62.8	62.3

Source: Adapted from Division of Public Health Methods: Medical specialists, by P. Q. Peterson and M. Y. Pennell. Health Manpower Source Book, Section 14. PHS Pub. No. 263. Public Health Service. Washington. U.S. Government Printing Office, 1962.

Table Q. Ratio of full-time specialists in obstetrics-gynecology and in pediatrics to specified population and birth groups: United States and geographic regions, 1961

Population group	United States	North-east	North Central	South	West
Specialists in obstetrics-gynecology	Ratios per 100,000 in specified population group				
Total population	6.7	8.7	5.7	5.8	7.3
Fetal deaths[1] and live births	283.9	397.8	238.9	234.2	300.6
Specialists in pediatrics					
Total population	5.8	7.5	4.6	5.2	6.6
Children under 15 years	18.5	26.0	14.6	15.6	20.6

[1]Fetal deaths of 20 weeks or more gestation or gestation not stated.

NOTE: Data for specialists include non-Federal physicians and interns and residents. Population is 1961 estimated population exclusive of Armed Forces abroad. Data from the 1960 census used for the population under 15 years of age.

Source: Adapted from Division of Public Health Methods: Medical specialists, by P. Q. Peterson and M. Y. Pennell. Health Manpower Source Book, Section 14. PHS Pub. No. 263. Public Health Service. Washington. U.S. Government Printing Office, 1962.

Nurses

It is generally agreed that there is a continuing shortage in nursing personnel at all levels of training even though the ratio of nursing personnel to total population has increased during the past decade (table R). The shortage of nurses, as evidenced by a high proportion of vacancies in nursing positions, may, in large measure, be traced to a decrease in the proportion of women entering the nursing field, an increasing demand for nursing services, and a decline in the work week of nursing personnel toward a national standard of 40 hours. Professional nurses, i.e., registered nurses or nurses with a bachelor's degree or higher, have increased from 249 to 298 per 100,000 population, an increase of 20 percent, between 1950 and 1962.[30] During this period the ratio of practical nurses has increased by one-third, from 91 to 122 per 100,000 population; the proportionate increase in nurses' aides, orderlies, and other attendants—147 to 222 per 100,000 population—has been even greater than that of practical nurses.

Table R. Ratio of nursing personnel to population, by type of nurse: United States, 1950 and 1962

Type of nurse	1962	1950
	Ratios per 100,000 total population	
Total	642	487
Professional	298	249
Practical	122	91
Aides, orderlies, and attendants	222	147

Source: Adapted from Division of Public Health Methods: Manpower in the 1960's. Health Manpower Source Book. Section 18. PHS Pub. No. 263. Public Health Service, Washington. U.S. Government Printing Office, 1964.

Marked regional variations are found in the ratios of professional and practical nurses to population (table S). The ratio of professional nurses to population was twice as high in the Northeast as in the South, with the other regions of the country at a level about halfway between these two extremes. The distribution of practical nurses, however, was practically the same throughout the country, the variation being within the very narrow limits of a low of 111 per 100,000 population in the North Central States to a high of 122 per 100,000 in the West.[30 31]

Table S. Ratio of professional and practical nurses in practice to population: United States and geographic regions, 1960 and 1962

Region	Professional nurse 1962	Practical nurse 1960
	Ratios per 100,000 population	
Total----	298	114
Northeast------	396	115
North Central--	290	111
South----------	209	113
West----------	321	122

Sources: Division of Public Health Methods: Manpower in the 1960's. Health Manpower Source Book, Section 18. PHS Pub. No. 263 (1964), and Surgeon General's Consultant Group on Nursing: Toward Quality in Nursing, Needs and Goals. PHS Pub. No. 992 (1963); Public Health Service. Washington. U.S. Government Printing Office.

The number of public health nurses, including nurses employed by boards of education, has exceeded the growth of the population. The number increased from 25,800 to 34,700 between 1954 and 1962, representing an increase from about 16 to 19 in the number of nurses employed for such public health work per 100,000 population.[30] A major part of this increase appears to have resulted from the increased number of nurses employed by boards of education.[32] There are also indications that referrals to public health nurses for routine services in the area of maternal and child health care are decreasing.

Midwives

As previously indicated, the untrained midwife is rapidly disappearing from the American scene. In contrast to 8.7 percent in 1940 and 4.5 percent in 1950, in 1962 midwives were in attendance at only 1.8 percent of live births in the United States (table O). In 1962 midwife deliveries constituted 9.9 percent of the total among nonwhite and only 0.3 percent among white persons. Actually a large majority of all midwife deliveries (84 percent) were in the nonwhite population. Furthermore, it is the rural nonwhite population, mainly in the South, that accounts for most of the midwife deliveries.

At the present time the use of the well-qualified nurse-midwife in the actual conduct of deliveries is still largely experimental in the United States. Only 86 nurse-midwives completed the training program in the 5-year period through 1963, and only 13 of these took positions in this country in which they actually performed deliveries.[27] The nature and extent of the role of the well-qualified nurse-midwife in helping to meet anticipated needs in the field of obstetrics must await future developments.

Hospitals

Since the launching of the Hill-Burton program in 1946 the expansion of hospital facilities has proceeded at a pace more rapid than any earlier period in the Nation's history. The rate of increase in general hospital beds has exceeded even the rapid rate of growth of the population. Between 1948 and 1962 the number of hospital beds has increased from 3.2 to 3.6 per 1,000 population (table T).[33] This was the result of a net annual increase of about 7,000 beds over the needs from the increase in population.[34]

The increase in the ratio of general hospital beds to population has differed in each region of the country. The ratio in the South, starting from the lowest level of any region in 1948, increased by 27 percent to 3.3 beds per 1,000 population in 1962, equal to the ratio in the West in the same year. The number of beds in the Northeast and the West barely kept pace with the increase in population, while the North Central region increased by 18 percent in the ratio of beds to population.

The quality of hospital facilities has also improved. Whereas only 59.4 percent of the general hospital beds were considered acceptable under Hill-Burton planning in 1948, fully 80.3 percent fell into the acceptable category in 1962.

Table T. Ratio of general hospital beds to total population and ratio of bassinets to live births: United States and geographic regions, 1948 and 1962

Region	General hospital beds per 1,000 population[1]		Bassinets per 1,000 live births[1]	
	1962	1948	1962	1948
Total	3.6	3.2	23.9	23.5
Northeast	4.0	3.8	26.3	29.9
North Central	3.9	3.3	25.3	26.1
South	3.3	2.6	22.3	17.6
West	3.3	3.2	21.1	22.1

[1]Short-term general and special hospitals exclusive of short-term Federal hospitals and psychiatric hospitals.

Source: American Hospital Association, Journal of the: Hospitals, Guide Issues, Aug. 1949 and Aug. 1963.

However, even today there are areas without acceptable general hospital beds.[34]

Emphasis in the Hill-Burton program for general hospital beds has been on the needs of the smaller communities and the rural areas of the country which had been more poorly served by hospitals than had been the cities. The obsolescence of hospital facilities in the major metropolitan areas, coupled with the influx of lower socioeconomic groups into the core cities and the flight of middle- and upper-income groups to the suburbs and beyond, has recently resulted in a shift in emphasis toward the large centers of population.

Information on the absolute number of obstetrical beds or on the ratio of obstetrical beds to deliveries is not currently available. The nearest approximation is the information on hospital bassinets which is published annually in the *Journal of the American Hospital Association.* The number of bassinets per 1,000 live births increased slightly from 23.5 to 23.9 between 1948 and 1962 (table T). Actually the South was the only region to show an increase during this period. Even with its increase in bassinets the South in 1962 still ranked ahead of only one other retion, the West, in the ratio of bassinetts to live births.

In the past few years the decline in the crude birth rate and the leveling off in the absolute number of births, accompanied by a shorter length of hospital stay after delivery, have at times resulted in underutilization of obstetrical beds in some areas. Even though the outlook during the next decade is for a new increase of sizable proportions in the number of births and, as a result, pressure on obstetrical facilities, the current lull has reactivated interest in admitting selected gynecological patients to the obstetrical service when it is not possible to use flexible partitioning of the hospital corridor to permit proper contraction or expansion of the obstetrical service.

A greater problem is the heavy pressure on obstetrical ward services in large cities. Lesser[35] has cited instances in which municipal hospitals in large cities have been forced to discharge patients 24 to 72 hours after delivery

because of overcrowding of their facilities. Inadequacy of facilities has been a longtime characteristic of rural areas, but the growth of the problem in large cities is a relatively new phenomenon.

Financing of Care

Expenditures for health and medical care in the United States more than doubled in the decade from 1950 to 1960: they rose from about 12.4 billion dollars in the 1949-50 Federal fiscal year to about 26.5 billion in 1959-60 (table U).[36] This represented an increase from 4.7 to 5.4 percent in the proportion of the gross national product devoted to health and medical care expenditures.

As might be anticipated from the rising standard of living for broader segments of the population, the rise in private expenditures was at a more rapid rate than that of public expenditures. The proportion of private expenditures increased from 73.1 to 76.5 percent of the total during the decade even though governmental expenditures increased from $3.3 to $6.2 billion, an increase of 87 percent. State and local expenditures have increased more rapidly than have Federal Government expenditures.

The proportion of expenditures for identifiable maternal and child health services at all levels of government fared better than most other public expenditures. The increase from $29.8 to $139.4 million in the decade from 1950

Table U. Percent distribution of private and governmental expenditures for health and medical care by type of expenditure: United States, fiscal years 1949-50 and 1959-60

Type of expenditure	1959-60	1949-50
Total (in millions)	$26,503	$12,365
Total (percent)	100.0	100.0
Private expenditures	76.5	73.1
Public expenditures	23.5	26.9
State and local government	13.9	15.4
Federal Government	9.6	11.5
Public expenditures (percent)	100.0	100.0
General medical and hospital care	34.9	35.3
Defense Department facilities	9.3	10.0
Medicare	0.9	-
Public assistance	7.9	-
Maternal and child health services	2.2	0.9
School health (educational agencies)	1.6	0.9
Medical research[1]	6.3	1.7
Other health and medical services	27.9	33.5
Medical facilities' construction	8.9	17.6
Percent of gross national product	5.4	4.7

[1]Includes medical research carried on by Veterans Administration.

Source: Division of Community Health Services: Medical care financing and utilization. Health Economics Series, No. 1. PHS Pub. No. 947. Public Health Service. Washington. U.S. Government Printing Office, 1962.

to 1960 raised the proportion of all public expenditures devoted to identifiable maternal and child health services from 0.9 to 2.2 percent of the total. These are only a fraction of the total public expenditures for maternal and child health purposes, since they do not include the costs of hospital inpatient and outpatient care and other services which cannot readily be extracted from the costs of general hospital care in various government programs. Despite the greater availability of govermental funds in support of public health services, the economic burden of these services is especially heavy in families with lower incomes (table V). While the families with annual incomes of less than $2,000 spent $165 for health services in 1957-58 in comparison to an average expenditure of $411 in the families with incomes of $7,500 and over, the former represented 13 percent of family income in contrast to only 3.9 percent in the higher income level. In fact, an inverse relationship between family income and the percentage of income devoted to personal health services exists throughout the income scale. Five years earlier—1952-53—the situation was similar. An important change did occur, however, in the percentage of income devoted to health purposes. At each income level, particularly above $2,000, this figure increased appreciably.[37]

Health insurance is gradually covering an increasing proportion of the costs of personal health services. In 1952-53 insurance benefits for maternity care were received by 45 percent of the families in which a delivery occurred, and by 1957-58 this proportion had risen to 55 percent.[38] As a consequence, the extent to which voluntary health insurance met physicians' fees for obstetrical services received in the country as a whole rose moderately from 25 percent to 30 percent in this period. Taking into account expenditures for all personal health services related to maternity care (i.e., physicians, hospitals, drugs, and other items), there was an increase from 30 to 38 percent in the proportion of costs met by health insurance. These percentages are twice the comparable figures for benefits to cover all private expenditures on health (15 percent in 1952-53 and 19 percent in 1957-58). In view

Table V. Annual mean gross charges incurred for personal health services and charges as percent of family income, by family income group: United States, 1952-53 and 1957-58

Family income	Annual mean gross charges per family		Percent of income	
	1957-58	1952-53	1957-58	1952-53
Total	$294	$207	5.5	4.8
$2,000 or less	165	130	13.0	11.8
$2,000-$3,499	226	152	8.4	6.1
$3,500-$4,999	287	207	6.4	5.4
$5,000-$7,499	336	259	5.4	4.7
$7,500 or more	411	353	3.9	3.0

NOTE: Data based on national sample surveys conducted by National Opinion Research Center, University of Chicago. Health insurance premiums excluded from data.

Source: Anderson, O. W., Collette, P., and Feldman, J. J.: Family expenditure patterns for personal health service, 1953 and 1958: nationwide surveys. HIF Research Series, No. 14. New York. Health Information Foundation, 1960.

of the spread of health insurance with varying degrees of coverage to about three-fourths of the population, by now (1964) the proportions given for 1957-58 may have been exceeded by a considerable margin.

Some idea of the costs of hospital obstetrical care is obtainable from the experience under the Federal Medicare Program for dependents of personnel in the Armed Forces. The average length of hospital stay in 1959 was 4.9 days.[36] At an average per diem charge of $30.92 the average hospital cost per case was $151.52, exclusive of Medicare administration costs. The costs of physicians' fees for care during the maternity cycle must be added to this to obtain the total charge per case.

MATERNAL AND CHILD HEALTH PROGRAMS AND SERVICES

The many hazards to which the fetus and infant may be vulnerable—genetic disorders, environmental deprivation, oxygen deficiencies, hormonal and enzyme imbalances, infections, and metabolic disorders, to mention a few—call for a multidisciplinary approach to the problem of perinatal and later infant wastage. The acquisition and dissemination of knowledge about the classic art of obstetrics, of knowing when and how to intervene and when it is best to support the patient without intervention, is only one important aspect of the total attack on the problem; the solution to this problem must consist of a broad program in maternal and child health.

The application of the rapid scientific and technical advances of recent years has been uneven. In some instances, as in the screening of newborn infants for phenylketonuria, testing and application of a significant, new development proceeded simultaneously. In contrast, some of the highly sophisticated techniques for the evaluation of women with certain suspected metabolic or endocrinologic disorders can be developed initially in only a few medical centers. As matters now stand, the application of some of these services to broad population groups may be deferred indefinitely. For the most part, new research developments are probably applied more rapidly today than at any time in the past.

Changes in patterns of living, particularly in transportation, have introduced an apparent contradiction in the provision of health services. On the one hand, the improvement in roads and the ease of movement in most rural areas have obviated the need for a physician in every hamlet. This makes possible the development of hospitals large enough to provide more complex services for broad geographic areas. At the same time, planning over these wider areas to avoid duplication of expensive facilities and services becomes an urgent need.

On the other hand, many of the underprivileged groups, even in the large cities, cannot or will not take advantage of medical services not in the immediate vicinity of their homes. This is often due to a variety of highly involved circumstances which may be generally characterized as economic, educational, or cultural, or to specific conditions such as lack of care for other children in the absence of the mother. These problems are increased when the services are overcrowded or impersonal. One approach to help overcome this problem is to bring the less complicated services close to their intended recipients.

General Health Services

The level of the community's general health services, the foundation on which specialized maternal and child health services must be built, directly affects the health of mothers and children.

Environmental health services.—Over the past several decades the provision of safe milk and water supplies has been the major factor in the marked reduction in mortality from diarrheal diseases in infancy. This hazard has been reduced to such a low point in many communities that some pediatricians are advocating the preparation of infant feedings with unboiled tap water for use in the home. Pasteurization of milk and control of bovine tuberculosis have made human tuberculosis of the bones and joints a rarity; this contrasts with the situation after the turn of the century when entire institutions were devoted to the care of children with this condition. New prob-

lems, such as those of water supply and sewage disposal in suburban housing developments, continue to arise. Air pollution, while far from a new problem, has recently been linked as a possibly significant factor in the health of infants as well as elderly persons.

The potential damage from medical uses of radiation to present and future generations of infants and children has provided the chief impetus to the development of radiation control programs at the national, State, and city levels. Stricter controls are being applied to prevent radiation scatter and to protect the gonads. Major areas of the country, however, still lack effective radiologic health programs.

Community nursing services.—This public health responsibility has traditionally been divided between voluntary visiting nurse services and the official nursing services of health departments. The former, found mainly in the metropolitan areas, have concentrated on bedside nursing. The trend toward consolidation of the two types of agencies has been slow and spotty.

The slight increase in the number of public nurses, other than those employed by boards of education, was not sufficient between 1950 and 1960 to maintain the earlier ratio of public health nurses to total population. The discrepancy would have been even greater if the ratio were calculated on the basis of public health nurses to number of deliveries.

The public health nurse is the vital link in reaching the high-risk groups early in pregnancy and in maintaining and insuring care for women who have had an unfavorable outcome of a previous pregnancy. The need to concentrate limited public health nursing manpower on those health problems which are most acute has resulted in decreased attention on home visiting for routine prenatal and newborn care. Furthermore, the rising demands for bedside nursing care may distract attention from the needs of even the high-risk groups of pregnant women unless special emphasis is placed on the latter.

Nutrition programs.—Nutrition programs directed mainly toward pregnant women may be relatively ineffective because they may not reach the most vulnerable groups. For example, women who have late or no prenatal care remain outside the scope of the programs. Also, the early age at which the first pregnancies now occur suggests that any nutritional inadequacies during adolescence would carry over into pregnancy, and limited, unbalanced diets and food fads are frequent among adolescent girls at all social levels in this country.

Health programs for migrant-worker families.—The migrant farm worker and his family suffer the general disadvantages of being on one of the lowest rungs of the economic ladder. In addition, their constant transiency interferes with their ability to make use of local health services. For these reasons special grants of Federal funds have been made available to the States for special health programs for migrants and their families. Maintaining the continuity of health care as the migrant laborer and his family follow the crops still presents a major problem.

Specialized Health Programs for Mothers and Infants

Prenatal and postpartal health supervision.—It has been estimated that a great majority of the women delivered by private obstetricians have had regular prenatal care from the first trimester of pregnancy.[35] The prenatal visits, which are spaced more closely together as term approaches, include routine medical examinations and laboratory tests. This highly personalized type of routine care has probably been the major factor in the decline in toxemias and other serious complications of pregnancy.

Maternal health programs of the past, often utilizing itinerant clinics, concentrated on promoting regular prenatal care through health education and the provision of demonstration prenatal care services. The Federal Emergency Maternity and Infant Care Program of World War II attempted to meet needs in a wartime period.

The problem today appears to be focused among the indigent and medically indigent groups in major metropolitan centers and some rural areas. In most of the large cities and in many of moderate size prenatal and postpartal care for these groups is provided mainly through outpatient clinics housed in either municipal or voluntary hospitals. The same population shifts that

have increased the pressure on inpatient facilities have operated on outpatient clinics as well. In some areas the pressure has become so great that clinic patients may have to spend an entire day for a single prenatal visit. While there are many factors that interfere with the provision of adequate prenatal care to women in the lower socioeconomic groups, gross inadequacy in the volume of clinic services is undoubtedly an important element in discouraging prenatal care among groups which may not be highly motivated to seek care in the first instance. In major municipal hospitals in widely scattered areas of the country, between 20 and 45 percent of the women had no prenatal care at all and first came to the hospital after labor had started.[26]

Increased Federal funds for maternity and infant care have been one response to these growing urban problems. Under the Social Security Act the Children's Bureau had $25 million available in Federal fiscal year 1962-63 for grants to the states for maternal and child health services. In recognition of the need for expanded and improved obstetrical services for deprived segments of the population and with particular emphasis on the bearing these services have on the prevention of mental retardation, Congress provided for a gradual increase in the annual appropriation to a level of $50 million over a period of 7 years. It also established a new 5-year program of grants for obstetrical and pediatric care for high-risk groups, starting with $5 million in fiscal year 1964 and rising to an annual level of $30 million during 1966 through 1968. An additional amount was appropriated for program-oriented research in the maternal and child health field.

Special projects are being developed for the provision of obstetrical care through the expansion of basic hospital facilities and in special circumstances the development of new clinics in depressed neighborhoods. The latter, so-called satellite clinics staffed by personnel from the parent hospital in which delivery is to take place, help insure continuity of care throughout the maternity cycle. In these special projects the hospital and clinic services are closely coordinated with available public health nursing and other public health services.

In those States with a large proportion of rural-midwife deliveries State and local health departments have conducted programs in which nurse-midwives provide supervision and limited training of the essentially untrained midwives. Medically manned clinics have also been provided for midwives' patients who present suspected complications of pregnancy.

In many centers throughout the country specially organized facilities are available for the study of problems of infertility regardless of the specific cause. Usually multidisciplinary in character these clinics utilize the services of a variety of paramedical personnel and provide the opportunity to conduct sophisticated laboratory studies; their staff often serves in a consultative capacity to the primary physician.

For women who have suffered unfortunate outcomes in previous pregnancies, organized preconceptional clinics are available in a few medical centers. These services are also usually provided on a selective, consultative basis for the more difficult clinical problems, since many conditions inimical to fetal welfare can be handled through the diagnostic and therapeutic armamentarium in the office of the physician or in conventional out-patient clinics. The extent to which the elaborate biochemical, endocrinologic, and other laboratory studies are available throughout the country is not known, but the full range of needed laboratory procedures is probably to be found almost exclusively in medical centers having a research interest in these problems.

New approaches are being taken to the related question of family planning for medical and socioeconomic reasons. For the most part, voluntary efforts still provide the major support for family planning, but the health or welfare departments in an increasing number of States and localities are supporting services which offer a choice of methods in accordance with the wishes and conscience of the recipients.

Hospital care.—Many of the problems relating to delivery care have been discussed under hospital facilities. Most organized community maternal health programs for individual patients stop at the hospital entrance. Since the termination of the Federal Maternity and Infant Care Program shortly after World War II only a few, relatively limited State and local programs have covered hospitalization of women presenting complications of pregnancy. This situation prom-

ises to change sharply with the spread of the new projects under the Maternity and Infant Care Grants.

Most State maternal and child health programs include some type of supervision of hospital obstetrical services (including newborn nurseries) or of the newborn nurseries alone. While originally motivated by the desire to control puerperal infections and epidemic diarrhea of the newborn infant, these supervisory services have been broadened to cover the total management of the hospital maternity and newborn units. Prepackaged infant formulas have been a recent innovation for the newborn nursery. The introduction of screening for phenylketonuria on a routine basis promises to be the prototype of a battery of screening tests for genetically determined disorders of metabolism which in the absence of early and adequate treatment could lead to death, mental retardation, or a permanent physical disability. At least two States have mandated testing the newborn for phenylketonuria.

For nearly three decades maternity mortality conferences have been conducted in individual hospitals or on a community-wide basis to review the factors involved in maternal deaths. These conferences are a first step in preventing a repetition of the circumstances surrounding maternal deaths. This technique has been extended in the past few years to the study of perinatal deaths.

Care of infants of low birth weights.—In the past 20 years many hospitals have developed specially equipped and staffed newborn nurseries for infants of low birth weight. When these nurseries have been set up to care for infants brought in from other hospitals in the surrounding area, they have often been referred to as premature centers. Programs for transporting infants to the premature centers, often with payment for care provided at the centers, are conducted by State health departments and some health departments in large cities.

As discussed previously, the impact of such care on the birth weight-specific death rates of these infants appears to have leveled off. Further major declines in the birth weight-specific fatality rates do not appear likely in the near future unless there is a new breakthrough in infant care. In any event, the high incidence of low birth weight infants among certain segments of the population suggests that there are controllable factors leading to premature delivery and low birth weight which, if regulated, offer the greatest promise of long-term results in the prevention of death and disability.

Surveillance of records.—The recent thalidomide tragedy has projected dramatically the need for a continuing mechanism for the prompt detection of unusual events affecting infants. A system of surveillance of the incidence of congenital malformations reported on live-birth certificates and other vital records [39] has been considered a first step toward a more inclusive approach to an ongoing review of fetal and neonatal deaths by hospital and geographic area.

Patterns of Care

Diversity, complexity, and change are the outstanding characteristics in the patterns of health care in this country today. The basic relationship of the individual to a physician for services financed directly by the individual is strongly affected by the growing trend toward medical specialization. The rapidly expanding fund of medical knowledge enables each specialty to offer service of greater depth within its special area of competence. The public is generally eager to take advantage of these services and often directly seeks out a specialist for a particular medical problem. Greater understanding of what modern medical care has to offer has led to the development of new methods and arrangements for meeting the costs of medical care. In these situations the primary physician may, on occasion, not be readily identifiable.

The services provided or financed by government proceed simultaneously under Federal, State, and local auspices. To describe these as levels of services would not present a fair picture of the interrelationships involved, since both Federal and State programs in many cases cover services to individuals in their home communities without involvement of any local governmental jurisdiction. In other instances Federal or State funds, or both, may be made available to local jurisdictions as outright grants or to supplement local funds.

To complicate the picture further, voluntary agencies and private foundations have been prom-

inent in almost every field of health, and each agency and foundation has its own policies. Some limit their activities to health education; others, to the support of research. Still others promote and support special clinical facilities and services or finance individual patient care. Coordination of these services is needed if continuity of care is to be attained in the best interest of the patient.

SUMMARY—MEDICAL RESOURCES AND HEALTH PROGRAMS

Changes in the availability and use of medical personnel, facilities and services, and the financing of medical care as related to obstetrics and pediatrics are reviewed briefly in this section. Maternal and child health programs and services are discussed primarily in terms of the current situation. Highlights follow:

Medical Manpower and Facilities

1. Large increases have occurred during the past 10-15 years in the availability of specialists in the fields of maternal and child health. The ratio of the number of obstetricians-gynecologists to the number of deliveries has doubled since 1949, and the ratio of pediatricians to children under 15 years of age rose sharply. Offsetting these increases is the marked reduction in the corresponding ratios for general practitioners. Accordingly the ratio of medical manpower (specialist and general practitioner) to the number of deliveries increased only slightly since 1949; the ratio in the case of children decreased.
2. The distribution of specialists in obstetrics-gynecology and pediatrics varies greatly with geographic region. The highest ratios of these specialists to the number of deliveries and the number of children under 15 years of age, respectively, are in the Northeast. The South has the lowest ratio in obstetrics, and the North Central region has the lowest ratio in pediatrics.
3. Nursing personnel are still in short supply although there have been increases in recent years in both professional nurses and practical nurses. The supply of public health nurses per 100,000 population has risen, mainly due to increases in nurses employed by boards of education.
4. The long-term trend toward increased use of hospitals at time of confinement has continued to the present. All but 3 percent of the deliveries are now performed by physicians in the hospital. Deliveries by untrained midwives are almost entirely confined to nonwhite women, but even in this group they account for only 1 of 10 deliveries.
5. Major expansion has taken place in hospital facilities since World War II. This has affected all parts of the country. Initially the emphasis in hospital construction was on the needs of smaller communities and rural areas; recently attention has shifted to large centers of population. Hospitals in many large cities face an acute problem related to population changes. Migration has resulted in greater concentration of low socioeconomic groups in some of the large cities. This has increased pressures on prenatal clinics and obstetrical ward services.

Financing of Medical Care

1. Expenditures for health and medical care more than doubled in the 1950 decade. The proportion of the gross national product devoted to health and medical care expenditures rose from 4.7 percent (1950) to 5.4 percent (1960). About three-quarters of the expenditures for health and medical care are met from the private sector of the economy. In 1957-58, the most recent period for which national data are available, the economic burden of personal health services was heaviest in families with low incomes.
2. Health insurance coverage has become widespread. Three of four persons today have basic insurance which provides coverage in varying degrees of in-hospital, surgical, and obstetrical costs. No recent data are available concerning the

extent to which health insurance is meeting costs of maternity care. In 1957-58 38 percent of the total expenditures for medical, hospital, and other health services related to maternity were met by insurance (i.e., for insured and uninsured persons combined). About 30 percent of the physician charges for obstetrical services were covered by health insurance.

Maternal and Child Health Programs

1. Changes in scope of emphasis of many general health services at the community level have an impact on the health of mothers and children. Included among these services are radiation control programs, efforts to deal with air pollution and other environmental health problems, and special programs for migrant-worker families. Limited public health nursing manpower has resulted in decreased attention on home visiting for prenatal and newborn care.
2. A large majority of the patients of private physicians receive regular prenatal care from the first trimester of pregnancy. Substantial segments of women who are delivered in general service wards of municipal and voluntary hospitals obtain little or no prenatal care prior to the delivery. Programs are being focused on the indigent and medically indigent groups in the major metropolitan centers and in some rural areas. Special projects supported by Federal funds are concentrating on the expansion of facilities and on new means of providing medical care in low-income areas.
3. Special facilities are becoming more numerous for the study of problems of infertility and for dealing with problems of repeated pregnancy loss. Also, new approaches to the question of family planning are being adopted.
4. Hospitals and health agencies are engaged in programs concerned with prematurely born infants and the adoption of new advances in medicine. No information is available on how widespread the implementation of these programs has been.

III. PERSPECTIVE ON FUTURE COURSE OF INFANT MORTALITY

The outstanding characteristic of the trend in the infant mortality rate in the United States since 1950 has been the lack of large-scale reductions in the rate for any segment of the population. This is true whether one considers geography, race, or such parameters of infant mortality as prior pregnancy history and birth weight. High-risk groups have fared worse in this regard than the better advantaged groups. But even if all groups had experienced similar reductions in their death rates, the decrease in the total infant mortality rate would have lagged far behind the improvement during the 1940's. This situation raises a number of provocative questions about the immediate past and the potentials for the future.

Why is it that during a period of great economic advancement and expanding allocation of economic resources to medical care (i.e., from 1950 to date) the infant mortality rate has undergone only minor reductions? Given the present state of medical knowledge and practice, is the irreducible minimum in infant mortality being approached, or are there prospects for further reductions in the mortality rate? Are new orientations for dealing with the problem of infant mortality indicated?

There seems to be no question that we are dealing with a difficult paradox when economic and medical care advances in the 1950's are contrasted with what happened to the infant mortality rate. Reductions in the proportion of the population in the low socioeconomic classes and migration of population groups from rural areas with high mortality rates and relatively poor medical facilities to large urban centers where highly trained physicians and large medical institutions are located could logically have been expected to result in major decreases in infant mortality. In the 1940's, when similar conditions

prevailed, infant mortality did decline markedly. There were a number of differences, however, between these two periods.

During the 1940's maternal and child health programs at the State and local levels were greatly strengthened, and infant mortality was a prime target of health department activities. The Federal Emergency Maternity and Infant Care Program, designed to meet the urgent needs of wives and infants of men in the Armed Forces during World War II, helped bring regular prenatal and infant health supervision to broad segments of the population. This program ended after World War II. A large part of the reduction in infant loss was concentrated in the control of infectious diseases whose toll was still substantial at the beginning of the 1940's. In some areas the introduction of special programs for the care of prematurely born infants also had an impact on the mortality rate.

In the 1950's a general attitude that significant progress in reducing infant mortality required, above all, new insights to basic biological processes tended to dampen the fervor for action programs. The 1950's might also be characterized as a decade in which earlier medical and program advances continued without significant innovations. This occurred in the absence of major scientific breakthroughs that could have been expected to produce broad effects through immediate application.

Finally, some of the very conditions which, on the surface, might be taken as harbingers of improvement had the reverse result. An outstanding example is the migration of nonwhite persons to large metropolitan areas; in these areas, then, infant mortality increased. The explanation is complex, encompassing many social, economic, and program issues. High on the list might well be a lag in community facilities in accommodating themselves to the change and a delay in the adaptation of the in-migrant group to their new medical care and social environment.

Speculation about the possibility that an irreducible minimum in infant mortality is near generally focuses on the following conclusions: (1) most of the losses occur in early infancy, (2) many of the underlying mechanisms are poorly understood, and (3) reduction in the incidence of low birth weight is central to the problem. These are truisms; but to accept the irreducible minimum theory, one must also embrace another proposition: biological processes are involved which are not susceptible to modification through an alternation of environmental conditions. It is difficult to accept this hypothesis if environmental conditions are broadly defined to include not only general socioeconomic circumstances but also family planning, organization and availability of high quality medical care, and personal health practices of the population.

Actually the question that needs to be posed is not whether there will be further reductions in infant mortality but whether the rate of decline in the mortality rate will accelerate. Reductions in infant mortality, although small, are occurring, and the prospects are for these to continue. Close to 30 percent of the infant deaths are still attributed to factors related to identifiable environmental conditions and to conditions that may reflect quality of medical and hospital care. Decreases in the frequency of deaths from these causes alone would have a significant effect on the level of the infant mortality rate. If mortality from infectious diseases of all types (respiratory, digestive, etc.), accidents and such conditions as hemolytic disease of the newborn and neonatal disorders arising from maternal disorders (diabetes, toxemia, etc.), and ill-defined diseases of the newborn were cut in half, the infant mortality rate would decline from 25.3 per 1,000 (in 1962) to about 22.5.

Additional reductions would have to be sought primarily through decreases in the frequency of prematurity and in mortality attributed directly or indirectly to immaturity. The potential for such reductions is, of course, uncertain. But it should be recognized that only slight improvements in the rates among low-risk groups, if accompanied by a moderate closing of the gap between high- and low-risk groups, would result in lowering the overall mortality rate projected above (22.5) to about 20 per 1,000.

Attainment of an infant mortality rate of 20 per 1,000 in the United States would appear to be a realistic goal. General conditions that are expected to contribute to the movement toward this goal are continued improvements in standard of living, strengthening of medical and hospital resources, and the likely shift over the next few

DETAILED TABLES

Table 1. Infant mortality rates by age at death: United States, 1935-62

Year	Under 1 year	Under 28 days[1]	Under 1 day	1-6 days	7-27 days[1]	1-5 months	6-11 months
	Rates per 1,000 live births						
1962[2]	25.3	18.3	10.4	6.1	1.9	5.2	1.8
1961[2]	25.3	18.4	10.3	6.2	1.9	5.2	1.8
1960[2]	26.0	18.7	10.3	6.4	2.0	5.4	1.9
1959[2]	26.4	19.0	10.3	6.6	2.1	5.4	1.9
1958	27.1	19.5	10.2	6.9	2.3	5.6	2.0
1957	26.3	19.1	9.9	6.8	2.4	5.3	2.0
1956	26.0	18.9	9.9	6.7	2.2	5.1	2.0
1955	26.4	19.1	10.0	7.0	2.2	5.2	2.1
1954	26.6	19.1	9.6	7.1	2.3	5.3	2.2
1953	27.8	19.6	9.7	7.5	2.4	5.8	2.4
1952	28.4	19.8	9.7	7.5	2.6	6.0	2.6
1951	28.4	20.0	9.8	7.7	2.6	5.9	2.5
1950	29.2	20.5	10.2	7.7	2.7	6.0	2.7
1949	31.3	21.4	10.5	7.8	3.1	7.0	2.9
1948	32.0	22.2	10.7	8.2	3.3	6.9	3.0
1947	32.2	22.8	10.7	8.5	3.5	6.7	2.7
1946	33.8	24.0	11.4	8.6	4.0	6.8	2.9
1945	38.3	24.3	11.2	8.5	4.6	9.6	4.4
1944	39.8	24.7	11.5	8.5	4.7	10.1	4.9
1943	40.4	24.7	11.6	8.4	4.8	10.5	5.2
1942	40.4	25.7	12.3	8.5	4.8	9.9	4.8
1941	45.3	27.7	13.2	9.0	5.4	11.8	5.9
1940	47.0	28.8	13.9	9.4	5.5	12.2	6.0
1939	48.0	29.3	14.1	9.6	5.5	12.2	6.6
1938	51.0	29.6	14.1	9.6	5.9	13.8	7.7
1937	54.4	31.3	14.7	10.0	6.5	15.0	8.2
1936	57.1	32.6	15.1	10.7	6.8	15.8	8.7
1935	55.7	32.4	15.0	10.5	6.9	15.0	8.3

[1]From 1935 to 1948 these categories refer to deaths at ages "7-29 days" and "under 1 month," respectively.
[2]Includes Alaska and Hawaii.

Source: Annual volumes Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office, and special tabulations.

Table 2. Infant mortality rates by age at death and sex: United States, 1935-62

Year	Under 1 year	Under 28 days[1]	Under 1 day	1-6 days	7-27 days[1]	1-5 months	6-11 months
Male	Rates per 1,000 live births						
1962[2]	28.6	20.9	11.7	7.1	2.0	5.8	1.9
1961[2]	28.4	20.8	11.5	7.2	2.1	5.7	1.9
1960[2]	29.3	21.2	11.6	7.4	2.2	6.0	2.1
1959[2]	29.6	21.6	11.6	7.7	2.3	6.0	2.0
1958	30.2	21.9	11.4	7.9	2.6	6.2	2.1
1957	29.5	21.6	11.1	7.8	2.6	5.9	2.1
1956	29.2	21.5	11.3	7.8	2.5	5.7	2.1
1955	29.6	21.7	11.2	8.1	2.4	5.7	2.2
1954	29.8	21.7	10.8	8.3	2.6	5.8	2.3
1953	31.2	22.3	10.9	8.7	2.7	6.3	2.6
1952	31.8	22.5	11.0	8.8	2.8	6.5	2.8
1951	32.0	22.9	11.1	9.0	2.8	6.4	2.7
1950	32.8	23.3	11.5	8.9	2.9	6.6	2.8
1949	35.1	24.5	11.9	9.1	3.5	7.6	3.0
1948	35.9	25.2	12.1	9.5	3.6	7.6	3.1
1947	36.1	25.9	12.1	9.9	3.9	7.4	2.9
1946	37.8	27.2	12.9	10.0	4.3	7.5	3.0
1945	42.7	27.6	12.6	9.9	5.1	10.5	4.6
1944	44.1	27.7	12.8	9.8	5.2	11.2	5.2
1943	45.1	28.1	13.1	9.7	5.2	11.5	5.5
1942	44.9	29.1	13.9	9.9	5.3	10.8	5.1
1941	50.4	31.2	14.9	10.4	5.9	12.9	6.3
1940	52.5	32.6	15.7	10.9	6.0	13.4	6.5
1939	53.3	32.9	15.8	11.0	6.1	13.3	7.1
1938	56.7	33.4	16.0	11.0	6.4	15.1	8.2
1937	60.3	35.1	16.5	11.5	7.1	16.4	8.8
1936	63.4	36.8	17.1	12.3	7.4	17.4	9.3
1935	62.2	36.7	17.0	12.1	7.6	16.6	9.0

Table 2. Infant mortality rates by age at death and sex: United States, 1935-62—Con.

Year	Under 1 year	Under 28 days[1]	Under 1 day	1-6 days	7-27 days[1]	1-5 months	6-11 months
Female	Rates per 1,000 live births						
1962[2]	21.9	15.7	8.9	5.0	1.7	4.5	1.7
1961[2]	22.0	15.8	9.0	5.1	1.7	4.6	1.6
1960[2]	22.6	16.1	9.0	5.3	1.8	4.7	1.8
1959[2]	23.0	16.3	9.0	5.5	1.9	4.9	1.8
1958	23.7	16.8	9.0	5.9	2.0	5.0	1.9
1957	23.0	16.4	8.7	5.6	2.1	4.7	1.9
1956	22.6	16.2	8.5	5.6	2.0	4.5	1.9
1955	23.0	16.4	8.8	5.8	1.9	4.7	2.0
1954	23.2	16.3	8.4	5.9	2.1	4.8	2.1
1953	24.2	16.7	8.3	6.2	2.2	5.2	2.3
1952	24.9	17.0	8.4	6.2	2.3	5.4	2.5
1951	24.7	17.1	8.4	6.4	2.3	5.2	2.4
1950	25.5	17.5	8.8	6.4	2.4	5.4	2.6
1949	27.3	18.3	9.0	6.5	2.8	6.3	2.7
1948	27.9	19.0	9.1	6.9	3.0	6.1	2.8
1947	28.1	19.5	9.3	7.1	3.2	6.0	2.6
1946	29.5	20.7	9.9	7.2	3.6	6.1	2.8
1945	33.6	20.9	9.7	7.1	4.1	8.6	4.1
1944	35.2	21.5	10.1	7.1	4.3	9.0	4.7
1943	35.4	21.2	9.9	7.0	4.3	9.3	4.8
1942	35.7	22.1	10.6	7.1	4.3	9.1	4.5
1941	40.0	23.9	11.4	7.6	4.9	10.7	5.4
1940	41.3	24.7	12.1	7.7	4.9	11.0	5.5
1939	42.5	25.5	12.4	8.2	4.9	10.9	6.1
1938	45.1	25.6	12.2	8.1	5.4	12.4	7.1
1937	48.3	27.3	12.8	8.5	5.9	13.4	7.5
1936	50.5	28.2	13.0	9.0	6.2	14.2	8.1
1935	48.9	27.9	12.8	8.8	6.3	13.4	7.6

[1]From 1935 to 1948 these categories refer to deaths at ages "7-29 days" and "under 1 month," respectively.
[2]Includes Alaska and Hawaii.

Source: Annual volumes Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office, and special tabulations.

Table 3. Infant mortality rates by age at death and color: United States, 1935-62

Year	Under 1 year	Under 28 days[1]	Under 1 day	1-6 days	7-27 days[1]	1-5 months	6-11 months
White	Rates per 1,000 live births						
1962[2]	22.3	16.9	9.6	5.7	1.5	4.0	1.4
1961[2]	22.4	16.9	9.5	5.8	1.6	4.1	1.4
1960[2]	22.9	17.2	9.6	6.0	1.7	4.2	1.5
1959[2]	23.2	17.5	9.5	6.2	1.7	4.2	1.5
1958	23.8	17.8	9.5	6.4	1.9	4.4	1.6
1957	23.3	17.5	9.3	6.3	2.0	4.2	1.6
1956	23.2	17.5	9.3	6.3	1.9	4.1	1.6
1955	23.6	17.7	9.3	6.6	1.8	4.2	1.7
1954	23.9	17.8	9.0	6.8	2.0	4.3	1.8
1953	25.0	18.3	9.1	7.1	2.1	4.7	2.0
1952	25.5	18.5	9.2	7.1	2.2	4.8	2.1
1951	25.8	18.9	9.3	7.3	2.3	4.8	2.1
1950	26.8	19.4	9.7	7.4	2.3	5.1	2.3
1949	28.9	20.3	10.1	7.5	2.7	6.0	2.5
1948	29.9	21.2	10.3	7.9	2.9	6.1	2.7
1947	30.1	21.7	10.4	8.2	3.2	5.9	2.4
1946	31.8	23.1	11.2	8.4	3.6	6.1	2.6
1945	35.6	23.3	11.0	8.1	4.1	8.5	3.9
1944	36.9	23.6	11.2	8.1	4.3	9.0	4.3
1943	37.5	23.7	11.4	7.9	4.4	9.3	4.5
1942	37.3	24.5	12.1	8.1	4.4	8.7	4.1
1941	41.2	26.1	12.9	8.4	4.8	10.2	4.9
1940	43.2	27.2	13.6	8.8	4.8	10.8	5.2
1939	44.3	27.8	13.8	9.1	4.9	10.7	5.7
1938	47.1	28.3	13.9	9.0	5.3	12.2	6.6
1937	50.3	29.7	14.5	9.4	5.9	13.4	7.2
1936	52.9	31.0	14.9	10.0	6.1	14.1	7.7
1935	51.9	31.0	14.8	9.9	6.3	13.5	7.4

Table 3. Infant mortality rates by age at death and color: United States, 1935-62--Con.

Year	Under 1 year	Under 28 days[1]	Under 1 day	1-6 days	7-27 days[1]	1-5 months	6-11 months
Nonwhite	Rates per 1,000 live births						
1962[2]	41.4	26.1	14.3	8.1	3.6	11.5	3.8
1961[2]	40.7	26.2	14.2	8.3	3.8	11.0	3.5
1960[2]	43.2	26.9	14.4	8.5	4.0	12.1	4.2
1959[2]	43.7	27.5	14.5	8.8	4.2	12.1	4.1
1958	45.7	29.0	14.3	10.0	4.7	12.4	4.3
1957	43.7	27.8	13.9	9.3	4.6	11.6	4.3
1956	42.1	27.0	13.7	8.9	4.4	10.9	4.1
1955	42.8	27.2	13.9	9.1	4.2	11.3	4.3
1954	42.9	27.0	13.3	9.4	4.4	11.3	4.6
1953	44.7	27.4	12.9	9.8	4.7	12.3	5.0
1952	47.0	28.0	12.8	10.2	5.0	13.3	5.7
1951	44.8	27.3	12.7	10.0	4.6	12.2	5.3
1950	44.5	27.5	13.0	9.8	4.8	11.7	5.2
1949	47.3	28.6	12.8	10.1	5.7	13.5	5.3
1948	46.5	29.1	12.9	10.4	5.7	12.3	5.0
1947	48.5	31.0	13.5	11.2	6.2	12.4	5.1
1946	49.5	31.5	13.4	11.0	7.2	12.5	5.4
1945	57.0	32.0	12.7	11.3	8.0	17.3	7.8
1944	60.3	32.5	13.2	11.3	8.0	18.4	9.4
1943	62.5	32.9	13.2	11.7	8.0	19.2	10.3
1942	64.6	34.6	14.4	12.0	8.3	19.7	10.2
1941	74.8	39.0	15.7	13.5	9.8	23.0	12.8
1940	73.8	39.7	16.0	13.7	10.0	22.5	11.5
1939	74.2	39.6	16.2	13.5	9.8	22.2	12.5
1938	79.1	39.1	15.8	13.4	9.9	24.9	15.1
1937	83.2	42.1	16.1	14.7	11.3	26.0	15.1
1936	87.6	43.9	16.4	15.6	11.9	27.9	15.9
1935	83.2	42.7	16.2	14.8	11.6	25.8	14.7

[1]From 1935 to 1948 these categories refer to deaths at ages "7-29 days" and "under 1 month," respectively.

[2]Includes Alaska and Hawaii. New Jersey excluded from data for 1962; color not reported on vital record.

Source: Annual volumes Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office, and special tabulations.

Table 4. Fetal death ratios by gestation, sex, and color: United States, 1942-62

Year	Fetal death ratio I[1]	Fetal death ratio II[2]								
		Total			White			Nonwhite		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
1962[3]	11.5	15.9	16.8	15.0	13.9	14.6	13.3	26.7	28.9	24.5
1961[3]	11.6	16.1	17.0	15.2	14.1	14.7	13.5	27.0	29.4	24.6
1960[3]	11.6	16.1	16.9	15.2	14.1	14.7	13.5	26.8	29.1	24.4
1959[3]	11.7	16.2	17.0	15.3	14.2	14.8	13.5	27.3	29.6	25.0
1958	11.9	16.5	17.4	15.6	14.5	15.1	13.9	27.5	30.1	24.9
1957	12.0	16.3	17.3	15.4	14.5	15.2	13.8	26.8	29.2	24.4
1956	12.1	16.5	17.4	15.5	14.6	15.3	13.9	27.2	29.4	24.9
1955	12.6	17.1	18.0	16.2	15.2	15.8	14.5	28.4	31.0	25.8
1954	12.9	17.5	18.4	16.4	15.5	16.3	14.7	28.9	31.2	26.5
1953	13.4	17.8	18.7	16.8	15.9	16.6	15.1	29.6	32.2	27.0
1952	13.8	18.3	19.4	17.2	16.1	16.8	15.3	32.2	35.6	28.9
1951	14.3	18.8	20.0	17.6	16.7	17.6	15.8	32.1	35.4	28.7
1950	14.6	19.2	20.5	17.9	17.1	18.0	16.1	32.5	36.0	28.9
1949	15.1	19.8	21.1	18.5	17.5	18.5	16.6	34.6	38.0	31.2
1948	15.5	20.6	21.8	19.4	18.3	19.3	17.2	36.5	39.6	33.3
1947	16.1	21.1	22.5	19.6	18.7	19.8	17.4	39.6	43.1	36.0
1946	17.2	22.8	24.3	21.2	20.4	21.7	19.1	40.9	44.6	37.2
1945	18.5	23.9	25.5	22.3	21.4	22.6	20.1	42.0	46.3	37.6
1944[4]	19.0	24.5	---	---	---	---	---	---	---	---
1943[4]	19.3	24.5	---	---	---	---	---	---	---	---
1942[4]	20.1	25.6	---	---	---	---	---	---	---	---

[1]Fetal death ratio I is defined as fetal deaths of 28 weeks or more gestation and a proportionate number of fetal deaths of unknown gestation per 1,000 live births.

[2]Fetal death ratio II differs from fetal death ratio I in that it includes fetal deaths of 20 weeks or more gestation plus all not stated gestation age.

[3]Hawaii not available by sex for 1959. Therefore, 1959 does not include Hawaii but includes Alaska. Alaska and Hawaii included beginning 1960. New Jersey excluded from data by color for 1962; color not reported.

[4]For 1942-44, data not available by color or sex.

NOTE: Fetal deaths with sex not stated distributed proportionately.

Source: Annual volumes Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office, and special tabulations.

Table 5. Perinatal mortality rates by sex and color: United States, 1942-62

Year	Perinatal mortality rate I[1]	Perinatal mortality rate II[2]								
		Total			White			Nonwhite		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
1962[3]	27.7	33.7	37.0	30.2	30.4	33.4	27.2	51.4	56.2	46.4
1961[3]	28.0	34.0	37.0	30.6	30.6	33.5	27.5	51.8	56.9	46.7
1960[3]	28.2	34.3	37.5	30.8	30.9	33.9	27.8	52.2	57.5	46.9
1959[3]	28.4	34.6	38.0	31.1	31.2	34.3	27.9	53.5	58.5	48.4
1958	28.9	35.4	38.6	32.0	31.9	34.8	28.7	55.0	60.3	49.6
1957	28.5	34.8	38.2	31.3	31.6	34.7	28.3	53.2	58.2	47.9
1956	28.6	34.8	38.2	31.2	31.6	34.8	28.3	52.8	58.1	47.3
1955	29.3	35.6	39.0	32.1	32.4	35.5	29.1	54.1	59.4	48.7
1954	29.5	35.9	39.4	32.2	32.8	36.1	29.4	54.3	59.5	48.9
1953	30.3	36.7	40.2	33.0	33.6	37.0	30.1	55.3	60.3	50.2
1952	30.8	37.4	41.1	33.6	34.1	37.4	30.6	58.4	64.8	51.8
1951	31.5	38.1	42.0	34.1	35.0	38.5	31.3	57.6	64.2	50.8
1950	32.2	39.0	42.9	34.8	35.8	39.5	32.0	58.1	64.4	51.7
1949	33.1	40.5	44.6	36.1	37.2	41.0	33.2	61.1	67.5	54.4
1948	34.1	41.9	46.1	37.5	38.7	42.6	34.6	63.3	69.3	57.2
1947	35.1	42.9	47.3	38.4	39.6	43.7	35.3	67.9	74.4	61.2
1946	36.9	45.8	50.3	41.0	42.6	46.9	38.0	69.6	76.2	62.9
1945	37.8	47.2	51.8	42.3	43.7	48.0	39.2	71.0	78.6	63.2
1944[4]	38.6	44.5	---	---	---	---	---	---	---	---
1943[4]	38.8	48.1	---	---	---	---	---	---	---	---
1942[4]	40.5	50.0	---	---	---	---	---	---	---	---

[1]Perinatal mortality rate I is defined as infant deaths under 1 week plus fetal deaths of 28 weeks or more gestation and a proportionate number of fetal deaths of unknown gestation per 1,000 live births plus specified fetal deaths.

[2]Perinatal mortality rate II differs from perinatal mortality rate I in that it includes infant deaths under 28 days plus fetal deaths of 20 weeks or more gestation plus all not stated gestation age.

[3]Hawaii not available by sex for 1959. Therefore, 1959 does not include Hawaii but includes Alaska. Alaska and Hawaii included beginning 1960. New Jersey excluded from data by color for 1962; color not reported.

[4]For 1942-44, data not available by color or sex.

NOTE: Fetal deaths with sex not stated distributed proportionately.

Source: Derived from annual volumes Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office, and special tabulations.

Table 6. Average annual infant mortality rates by age at death, color, and geographic division; average annual fetal mortality ratios and perinatal mortality rates by color and geographic division: United States, selected decennium periods

Infant, fetal, and perinatal mortality; color; and decennium	Geographic division									
	United States	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
INFANT MORTALITY										
Under 1 year										
Total										
1959-61[1]	25.9	22.5	24.2	24.1	22.8	30.4	31.7	28.3	27.4	23.6
1949-51	29.6	24.3	25.8	26.6	26.1	34.0	37.4	36.2	37.1	25.3
1939-41	46.8	38.6	39.3	39.1	39.5	58.6	56.1	58.3	60.6	37.8
White										
1959-61[1]	22.8	21.9	21.8	22.3	21.6	23.7	25.3	24.2	25.7	22.7
1949-51	27.1	24.0	24.3	25.6	25.2	28.4	33.4	33.7	33.9	24.7
1939-41	42.9	38.3	37.8	38.2	38.1	49.4	50.9	54.1	56.7	37.1
Nonwhite										
1959-61[1]	42.5	37.5	41.9	38.2	41.4	46.5	46.9	43.5	48.7	30.4
1949-51	45.5	41.2	42.2	39.4	47.6	46.9	46.8	46.3	94.4	34.5
1939-41	74.3	59.2	62.8	58.3	80.5	79.7	69.7	76.1	160.1	55.1
Under 28 days[2]										
Total										
1959-61[1]	18.7	17.1	18.5	18.0	17.1	20.7	21.2	19.5	19.2	17.4
1949-51	20.7	18.6	19.6	19.4	19.3	22.4	24.1	22.6	23.3	18.7
1939-41	28.5	26.0	26.2	25.7	25.9	33.5	32.2	32.0	31.5	24.9
White										
1959-61[1]	17.2	16.7	16.8	16.9	16.5	17.9	18.7	17.6	18.9	16.8
1949-51	19.5	18.4	18.5	18.7	19.0	20.2	22.5	21.4	22.7	18.3
1939-41	27.0	25.8	25.5	25.2	25.5	30.0	30.4	29.8	30.7	24.8
Nonwhite										
1959-61[1]	26.9	27.2	30.7	26.8	26.5	27.3	27.1	26.4	23.5	21.2
1949-51	27.8	31.0	30.5	26.8	27.7	27.6	27.9	27.4	34.2	23.2
1939-41	39.4	37.0	37.6	34.8	39.2	41.6	36.9	41.0	52.4	28.1
28 days-11 months[2]										
Total										
1959-61[1]	7.2	5.4	5.7	6.0	5.7	9.7	10.6	8.8	8.2	6.3
1949-51	9.0	5.7	6.3	7.3	6.8	11.6	13.3	13.6	13.8	6.7
1939-41	18.2	12.6	13.1	13.4	13.6	25.1	23.9	26.4	29.1	12.9
White										
1959-61[1]	5.6	5.2	5.0	5.4	5.1	5.7	6.7	6.6	6.8	5.9
1949-51	7.6	5.6	5.7	6.8	6.2	8.2	10.9	12.3	11.2	6.3
1939-41	15.8	12.5	12.3	13.0	12.6	19.4	20.5	24.3	26.0	12.3
Nonwhite										
1959-61[1]	15.7	10.3	11.2	11.4	14.9	19.2	19.8	17.1	25.3	9.2
1949-51	17.7	10.2	11.7	12.6	19.8	19.2	18.9	18.8	60.2	11.3
1939-41	34.9	22.3	25.3	23.5	41.3	38.1	32.8	35.0	107.7	27.0

Table 6. Average annual infant mortality rates by age at death, color, and geographic division; average annual fetal mortality ratios and perinatal mortality rates by color and geographic division: United States, selected decennium periods—Con.

Infant, fetal, and perinatal mortality; color; and decennium	Geographic division									
	United States	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
FETAL MORTALITY										
Total										
1959-61[1]	16.1	13.6	[3]19.6	14.4	13.2	19.0	19.8	15.7	13.4	13.0
1949-51	19.3	16.5	[3]21.0	17.4	16.4	23.3	23.4	20.1	15.8	14.9
White										
1959-61[1]	14.1	13.4	[3]17.4	13.3	12.5	15.0	14.9	13.2	13.2	12.4
1949-51	17.1	16.4	[3]19.5	16.5	15.7	18.1	18.4	17.1	15.4	14.5
Nonwhite										
1959-61[1]	27.0	20.1	[3]35.8	23.2	23.1	28.5	31.5	24.8	16.6	16.9
1949-51	33.0	23.4	[3]36.9	28.4	32.6	35.2	35.2	32.0	22.9	20.4
PERINATAL MORTALITY										
Total										
1959-61[1]	34.3	30.3	[4]37.4	31.9	29.9	38.9	40.1	34.6	32.2	29.9
1949-51	39.2	34.6	[4]39.8	36.2	35.2	44.7	46.4	41.9	38.4	33.0
White										
1959-61[1]	30.9	29.7	[4]33.6	29.8	28.6	32.5	33.0	30.4	31.6	28.9
1949-51	36.0	34.2	[4]37.3	34.7	34.2	37.7	40.1	37.9	37.5	32.3
Nonwhite										
1959-61[1]	52.4	46.4	[4]64.2	48.9	48.5	54.2	56.8	49.9	39.4	37.5
1949-51	58.9	53.1	[4]65.0	53.7	58.5	60.7	61.0	57.6	55.8	42.8

[1]Include Alaska and Hawaii.
[3]1939-41 age categories are under 1 month and 1-11 months, respectively.
[4]By excluding New York City, the following fetal death ratios result for the Middle Atlantic division:

	Total	White	Nonwhite
1959-61	15.8	14.8	25.6
1950-51	18.7	17.9	30.0

[4]By excluding New York City, the following perinatal mortality rates result for the Middle Atlantic division:

	Total	White	Nonwhite
1959-61	33.5	31.2	54.9
1950-51	37.3	35.7	59.3

NOTE: Infant mortality rates are per 1,000 live births. Fetal death ratios are all reported fetal deaths of 20 weeks or more gestation (plus not stated) per 1,000 live births. Perinatal mortality rates are reported fetal deaths (20 weeks or more gestation plus not stated) plus neonatal deaths per 1,000 live births plus fetal deaths.

Source: Annual volumes Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office; annual vital statistics summary of the New York City Department of Health.

Table 7. Average annual infant mortality rates by age at death and

Area	Under 1 year			Under 28 days			28 days-11 months		
	Total	White	Nonwhite	Total	White	Nonwhite	Total	White	Nonwhite
	Rates per 1,000 live births								
United States[1]	25.9	22.8	42.5	18.7	17.2	26.9	7.2	5.6	15.7
New England	22.5	21.9	37.5	17.1	16.7	27.2	5.4	5.2	10.3
Maine	25.6	25.7	a	18.8	18.9	a	6.8	6.8	a
New Hampshire	23.4	23.4	a	17.6	17.6	a	5.8	5.8	a
Vermont	25.0	25.0	-	18.6	18.7	-	6.4	6.4	-
Massachusetts	21.8	21.3	34.3	16.6	16.3	24.0	5.2	5.0	10.3
Rhode Island	23.3	22.8	34.2	17.1	16.9	22.3	6.1	5.9	11.8
Connecticut	21.9	20.4	43.9	17.1	16.0	33.5	4.8	4.4	10.4
Middle Atlantic	24.2	21.8	41.9	18.5	16.8	30.7	5.7	5.0	11.2
New York	24.2	21.6	41.5	18.4	16.5	30.6	5.8	5.1	10.9
New Jersey	24.2	21.4	42.3	18.5	16.6	30.4	5.7	4.8	12.0
Pennsylvania	24.3	22.2	42.3	18.7	17.3	31.1	5.6	4.9	11.2
East North Central	24.1	22.3	38.2	18.0	16.9	26.8	6.0	5.4	11.4
Ohio	24.1	22.3	38.7	18.5	17.2	29.4	5.5	5.1	9.3
Indiana	23.7	22.4	38.8	17.4	16.6	26.6	6.4	5.8	12.2
Illinois	24.8	22.1	38.5	18.0	16.6	25.1	6.8	5.5	13.4
Michigan	24.1	22.5	36.9	18.3	17.2	27.2	5.8	5.4	9.7
Wisconsin	22.6	22.0	37.4	17.1	16.8	25.6	5.5	5.3	11.8
West North Central	22.8	21.6	41.4	17.1	16.5	26.5	5.7	5.1	14.9
Minnesota	21.6	21.4	30.4	16.1	16.1	17.6	5.5	5.3	12.8
Iowa	21.3	21.1	35.9	16.3	16.2	23.7	5.0	4.9	12.2
Missouri	24.6	21.6	43.5	18.1	16.3	29.2	6.5	5.3	14.3
North Dakota	23.9	23.1	43.8	18.3	18.1	23.5	5.6	5.0	20.3
South Dakota	25.4	22.3	63.5	17.7	17.0	27.3	7.6	5.4	36.2
Nebraska	22.7	22.0	36.7	17.5	17.2	24.2	5.2	4.9	12.5
Kansas	22.3	21.5	33.1	17.0	16.6	22.5	5.3	4.9	10.6
South Atlantic	30.4	23.7	46.5	20.7	17.9	27.3	9.7	5.7	19.2
Delaware	24.9	19.8	47.0	18.2	15.5	29.7	6.8	4.3	17.3
Maryland	27.2	22.1	44.4	20.0	17.2	29.7	7.1	5.0	14.6
Dist. of Columbia	36.2	29.4	39.4	27.4	23.4	29.3	8.8	6.0	10.1

color: United States, each geographic division and State, 1959-61

Area	Under 1 year			Under 28 days			28 days-11 months		
	Total	White	Nonwhite	Total	White	Nonwhite	Total	White	Nonwhite
	Rates per 1,000 live births								
South Atlantic—Con.									
Virginia	29.6	24.2	45.9	20.9	18.2	29.0	8.7	6.0	17.0
West Virginia	26.5	26.0	34.6	18.7	18.7	19.6	7.7	7.3	15.0
North Carolina	31.7	23.1	50.3	20.6	17.4	27.5	11.1	5.7	22.8
South Carolina	33.9	23.4	48.1	20.0	17.0	24.2	13.8	6.5	23.9
Georgia	31.6	23.5	46.3	20.8	17.9	26.0	10.8	5.6	20.3
Florida	30.1	24.0	46.5	21.1	18.6	27.7	9.0	5.4	18.8
East South Central	31.7	25.3	46.9	21.2	18.7	27.1	10.6	6.7	19.8
Kentucky	27.7	26.1	44.0	19.7	18.8	28.6	8.0	7.3	15.4
Tennessee	29.6	25.7	43.1	20.6	19.0	26.1	9.1	6.8	17.0
Alabama	31.7	24.0	44.6	20.8	17.9	25.8	10.9	6.2	18.9
Mississippi	39.4	24.9	51.8	24.3	19.2	28.6	15.2	5.7	23.2
West South Central	28.3	24.2	43.5	19.5	17.6	26.4	8.8	6.6	17.1
Arkansas	27.1	22.2	38.6	17.4	16.2	20.1	9.7	6.0	18.5
Louisiana	31.8	22.0	46.9	22.0	17.2	29.5	9.7	4.8	17.4
Oklahoma	24.5	22.1	39.6	17.6	16.6	23.8	6.9	5.4	15.8
Texas	28.0	25.5	42.6	19.3	18.1	26.0	8.8	7.4	16.6
Mountain	27.4	25.7	48.7	19.2	18.9	23.5	8.2	6.8	25.3
Montana	25.0	23.5	44.1	17.4	17.1	21.3	7.6	6.4	22.9
Idaho	22.7	22.5	35.2	17.1	17.1	a	5.6	5.4	a
Wyoming	27.4	26.6	50.9	20.8	20.5	29.6	6.6	6.1	a
Colorado	27.5	27.0	40.9	20.9	20.6	29.3	6.6	6.4	11.6
New Mexico	31.9	30.1	46.8	20.6	20.4	21.8	11.3	9.7	24.9
Arizona	31.9	27.5	55.3	20.1	19.5	23.6	11.7	8.0	31.7
Utah	20.0	19.4	43.1	15.0	14.9	20.5	5.0	4.6	22.7
Nevada	30.2	28.3	43.6	21.5	21.3	22.9	8.7	6.9	20.7
Pacific[1]	23.6	22.7	30.4	17.4	16.8	21.2	6.3	5.9	9.2
Washington	23.4	22.5	37.8	17.0	16.7	22.6	6.3	5.8	15.2
Oregon	23.7	23.4	32.0	16.8	16.8	17.6	6.9	6.6	14.4
California	23.4	22.6	29.7	17.3	16.8	21.6	6.1	5.8	8.1
Alaska	40.0	26.8	66.9	23.3	20.0	30.0	16.7	6.8	36.8
Hawaii	22.9	22.1	23.3	18.0	17.6	18.2	4.9	4.5	5.1

[1]Includes Alaska and Hawaii.

[a]Rates not computed, based on less than 20 deaths.

Source: Annual volumes Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office; special tabulations of Office of Health Statistics Analysis.

Table 8. Average annual infant mortality rates by age at death and color: United States, metro-

Area	Total					
	Under 1 year		Under 28 days		28 days-11 months	
	1960-61	1950-51	1960-61	1950-51	1960-61	1950-51
	Rates per 1,000 live births					
United States	25.7	28.8	18.6	20.3	7.1	8.6
Metropolitan counties[1]	24.7	26.2	18.4	19.6	6.2	6.6
Nonmetropolitan counties[1]	27.5	32.2	18.8	21.2	8.7	11.0
Cities by size[2]						
1,000,000 or more	27.1	26.0	20.1	19.9	7.0	6.1
250,000-1,000,000	27.9	27.4	20.9	21.1	7.0	6.3
100,000-250,000	26.5	27.5	19.8	20.7	6.7	6.8
Individual cities by size[3] 1,000,000 or more						
New York, N.Y.[4]	26.0	24.9	19.4	19.2	6.5	5.7
Chicago, Ill.[4]	28.4	25.4	19.8	18.9	8.6	6.4
Los Angeles, Calif.[4]	24.1	24.8	18.3	20.1	5.8	4.7
Philadelphia, Pa.[4]	30.7	31.1	23.4	23.5	7.3	7.6
Detroit, Mich.[4]	29.4	26.9	22.6	20.2	6.7	6.7
500,000-1,000,000						
Baltimore, Md.[4]	32.6	24.8	24.3	18.6	8.3	6.2
Houston, Tex.[4]	27.2	28.7	19.0	23.6	8.2	5.1
Cleveland, Ohio[4]	29.5	25.6	23.4	19.5	6.0	6.1
Washington, D.C.[4]	36.0	30.4	27.3	24.5	8.6	5.9
St. Louis, Mo.[4]	32.0	25.7	23.8	19.2	8.3	6.6
Milwaukee, Wis.[4]	24.8	25.4	19.4	20.0	5.4	5.4
San Francisco, Calif.[4]	23.8	21.7	17.8	17.2	6.0	4.5
Boston, Mass.[4]	24.5	25.2	18.5	20.1	6.0	5.0
Dallas, Tex.[4]	27.6	26.9	21.1	21.3	6.5	5.6
New Orleans, La	32.4	30.1	23.7	23.3	8.7	6.8
Pittsburgh, Pa	29.1	26.4	23.4	22.4	5.8	4.0
San Antonio, Tex.[4]	30.3	38.0	21.0	22.4	9.3	15.5
San Diego, Calif.[4]	25.7	29.3	19.3	21.1	6.4	8.2
Seattle, Wash.[4]	23.6	25.2	17.1	19.8	6.5	5.5
Buffalo, N.Y.[4]	25.9	25.6	20.1	20.1	5.9	5.6
Cincinnati, Ohio[4]	24.2	26.4	18.3	19.0	5.9	7.5
250,000-500,000						
Memphis, Tenn	30.3	33.6	22.7	24.1	7.5	9.5
Denver, Col	27.2	28.7	21.7	22.8	5.5	6.0
Atlanta, Ga	34.0	31.1	24.3	23.7	9.7	7.5
Minneapolis, Minn	24.6	24.4	18.9	20.1	5.7	4.3
Indianapolis, Ind	27.8	27.5	20.4	18.9	7.4	8.6
Kansas City, Mo.[7]	26.2	30.7	18.8	24.2	7.4	6.4
Columbus, Ohio	24.3	25.4	18.4	18.6	5.9	6.8
Phoenix, Ariz	27.0	41.6	19.1	31.2	7.9	10.4
Newark, N.J	37.4	31.1	25.9	24.5	11.6	6.6
Louisville, Ky	27.9	30.3	21.8	23.4	6.1	6.9
Portland, Oreg	24.9	20.0	18.3	16.7	6.6	3.3
Oakland, Calif	26.9	24.5	20.3	19.2	6.6	5.3
Fort Worth, Tex	27.5	31.5	18.8	25.0	8.6	6.5
Long Beach, Calif	25.6	23.3	19.0	18.5	6.6	4.7
Birmingham, Ala	29.6	31.2	21.4	23.5	8.2	7.8
Oklahoma City, Okla	26.2	25.4	20.0	19.4	6.2	6.0
Rochester, N.Y	22.9	25.3	18.0	21.5	4.9	3.7
Toledo, Ohio	23.6	26.3	17.9	19.6	5.7	6.7
St. Paul, Minn	24.1	24.0	18.0	18.1	6.1	5.8
Norfolk, Va	31.2	34.1	23.3	26.2	7.9	7.9
Omaha, Nebr	25.3	26.0	20.3	21.5	5.0	4.4
Honolulu, Hawaii[8]	21.9		17.8		4.0	
Miami, Fla	28.3	26.3	21.7	22.4	6.6	3.9
Akron, Ohio	24.9	25.6	19.5	20.6	5.4	5.1
El Paso, Tex	25.0	37.5	18.9	23.5	6.1	14.0
Jersey City, N.J	28.9	26.7	21.4	21.6	7.5	5.1
Tampa, Fla	32.9	30.3	25.6	25.6	7.3	4.7
Dayton, Ohio	29.5	29.0	22.9	23.1	6.7	5.9
Tulsa, Okla	25.9	29.5	19.5	22.1	6.4	7.4
Witchita, Kans	25.7	28.0	19.1	21.0	6.5	7.0

politan and nonmetropolitan counties, and cities over 250,000 population, 1950-51 and 1960-61

White						Nonwhite					
Under 1 year		Under 28 days		28 days-11 months		Under 1 year		Under 28 days		28 days-11 months	
1960-61	1950-51	1960-61	1950-51	1960-61	1950-51	1960-61	1950-51	1960-61	1950-51	1960-61	1950-51
Rates per 1,000 live births						Rates per 1,000 live births					
22.7	26.3	17.1	19.1	5.6	7.2	42.0	44.6	26.5	27.4	15.4	17.2
22.0	24.2	16.9	18.4	5.2	5.8	38.6	40.0	26.8	27.8	11.8	12.2
23.8	29.1	17.5	20.1	6.3	8.9	48.4	49.6	26.1	27.1	22.3	22.5
22.5	23.3	17.0	18.0	5.5	5.3	38.4	38.3	27.7	28.6	10.7	9.7
24.2	25.2	18.6	19.8	5.6	5.4	37.7	37.4	26.9	27.1	10.7	10.4
23.3	25.5	18.0	19.7	5.3	5.8	39.8	43.7	27.5	30.2	12.3	13.5
21.5	22.4	16.2	17.2	5.3	5.2	41.3	39.1	30.5	30.4	10.8	8.7
23.1	23.0	16.9	17.4	6.3	5.6	37.9	34.8	25.2	25.0	12.7	9.8
22.1	23.1	16.9	18.9	5.2	4.2	29.9	34.9	22.4	27.6	7.5	7.3
24.8	25.7	19.5	20.1	5.3	5.6	41.2	46.9	30.3	33.4	11.0	13.5
24.7	24.9	19.3	18.8	5.5	6.1	37.0	34.6	28.1	25.8	8.8	8.9
25.3	23.8	19.3	18.1	6.0	5.7	40.3	33.8	29.6	[5]23.1	10.8	[5]10.8
22.9	25.6	17.8	21.2	5.1	4.4	36.9	38.5	21.6	31.1	15.2	7.4
24.8	23.1	19.5	17.9	5.3	5.2	38.0	34.9	30.6	25.6	7.4	9.3
28.3	30.5	22.4	26.0	5.9	4.5	39.4	30.3	29.5	22.6	9.9	7.7
24.5	21.2	18.6	16.2	5.9	5.0	43.9	40.9	31.8	29.3	12.0	11.6
23.2	24.9	18.4	19.8	4.8	5.1	34.0	33.2	25.2	22.9	8.9	[5]10.3
22.8	21.2	17.0	17.1	5.8	4.1	26.3	24.1	19.6	17.9	6.7	[5]6.2
22.5	24.4	17.2	19.7	5.3	4.7	35.4	34.7	25.5	25.6	9.9	[5]7.4
23.9	24.0	19.4	18.9	4.4	5.0	36.9	44.8	25.3	35.4	11.6	[5]9.3
23.4	27.0	19.0	21.6	4.5	5.3	41.9	34.5	28.7	25.7	13.2	[5]8.8
26.2	24.1	21.7	20.6	4.5	3.5	39.2	43.6	29.0	36.3	10.2	[5]7.3
29.6	38.2	20.3	22.1	9.2	16.1	39.5	34.2	29.1	26.9	10.4	[5]7.3
24.3	28.0	18.4	20.6	5.9	7.4	35.2	44.9	25.5	[5]26.9	9.7	[5]18.0
23.0	24.0	16.8	18.9	6.2	5.1	27.9	42.6	19.7	31.4	8.2	[5]11.2
23.3	25.5	18.1	20.5	5.2	5.0	35.8	26.5	27.5	15.1	8.3	11.3
20.3	23.9	15.0	16.8	5.3	7.0	35.7	38.3	28.1	28.7	7.6	9.6
23.7	28.8	19.6	22.3	4.1	6.5	37.4	39.4	26.1	26.4	11.3	13.1
26.0	[6]---	20.8	[6]---	5.1	[6]---	38.3	[6]---	29.7	[6]---	8.6	[6]---
29.2	23.9	22.8	19.5	6.4	4.3	39.0	42.7	25.8	30.2	13.2	12.5
24.2	[6]---	18.7	[6]---	5.5	[6]---	31.2	[6]---	23.0	[6]---	[5]8.2	[6]---
24.3	25.3	17.8	18.0	6.5	7.3	38.5	40.0	28.2	24.1	10.2	15.9
22.4	28.3	16.3	23.4	6.1	4.9	37.4	44.9	26.3	29.0	11.1	15.9
22.1	23.8	17.2	18.1	5.0	5.8	33.5	34.8	23.7	21.8	9.8	[5]12.9
26.0	[6]---	18.7	[6]---	7.4	[6]---	36.7	[6]---	23.7	[6]---	12.9	[6]---
27.9	25.0	18.8	19.5	9.1	5.5	46.7	48.5	32.8	38.7	13.9	9.8
25.2	29.3	20.2	23.4	5.0	5.8	37.1	35.5	27.2	22.9	9.8	12.6
24.5	19.4	18.4	16.1	6.1	3.3	29.0	[5]33.7	18.1	[5]28.8	[5]10.9	[5]4.8
22.4	21.9	17.6	17.7	4.8	4.3	34.2	33.9	24.6	24.9	9.6	[5]9.0
21.8	28.5	16.1	22.9	5.7	5.6	48.4	50.3	29.0	38.2	19.4	[5]12.1
25.0	[6]---	18.8	[6]---	6.2	[6]---	31.1	[6]---	21.0	[6]---	[5]10.1	[6]---
23.4	26.1	18.6	21.1	4.8	5.0	36.6	37.2	24.5	26.2	12.1	11.0
22.9	24.5	17.9	18.5	4.9	5.9	41.3	32.7	29.4	26.1	11.9	[5]6.5
21.6	[6]---	17.8	[6]---	3.8	[6]---	30.0	[6]---	18.9	[6]---	11.1	[6]---
22.0	24.3	16.6	17.9	5.4	6.4	31.3	44.9	24.4	35.0	[5]6.9	[5]10.0
[6]---	[6]---	[6]---	[6]---	[6]---	[6]---	[6]---	[6]---	[6]---	[6]---	[6]---	[6]---
23.7	25.1	18.4	20.0	5.3	[5]5.1	49.2	52.0	35.0	[5]38.4	14.2	13.6
24.5	25.0	19.8	21.2	4.7	3.9	30.8	36.4	24.1	[5]25.5	[5]6.8	[5]10.9
21.9		18.5		[5]3.4		21.9		17.6		4.2	
23.9	22.1	19.8	19.0	4.2	[5]3.1	34.7	38.7	24.6	32.5	10.0	[5]6.2
21.9	22.8	17.8	19.4	4.1	3.4	39.9	48.6	28.0	30.2	11.9	[5]18.4
[6]---	[6]---	[6]---	[6]---	[6]---	[6]---	[6]---	[6]---	[6]---	[6]---	[6]---	[6]---
25.3	22.3	19.1	18.0	6.2	4.3	40.1	60.6	28.6	49.6	11.5	[5]11.0
26.5	27.3	21.7	24.1	4.8	[5]3.2	53.8	43.0	38.3	31.9	15.5	[5]11.1
24.6	27.7	19.2	22.8	5.5	4.8	42.0	37.6	32.3	24.8	9.7	[5]12.8
23.3	25.4	18.4	20.2	4.9	5.3	40.7	60.3	25.9	36.6	14.9	[5]23.8
25.0	[6]---	19.7	[6]---	5.4	[6]---	30.0	[6]---	15.6	[6]---	14.4	[6]---

See footnotes on next page.

Footnotes for table 8.

[1]Counties are classified by their Standard Metropolitan Area status as of the particular decennial census period for which the rates have been computed. The division between metropolitan and nonmetropolitan counties is based on the "Standard Metropolitan Area" definition established by the Federal Committee on Standard Metropolitan Areas (SMA). In 1950-51, except in New England, an SMA was a county or group of counties which contained at least one city of 50,000 inhabitants or more. Contiguous counties were included in the SMA if they met certain criteria of metropolitan character and social and economic integration. (In New England a special definition was applied.) In 1960-61 the definition changed mainly in that under certain circumstances an area containing two contiguous cities with a combined population of at least 50,000 qualified the area as an SMA.

[2]Cities are classified by their size as of the particular decennial census period for which the rates have been computed.

[3]Individual cities classified by size according to 1960 census. Data in 1950-51 column refer to 1950 only.

[4]Number of nonwhite inhabitants increased by at least one-third between 1950 and 1960. (Only those cities with a population of 500,000 or more are so identified.)

[5]Rate based on less than 20 deaths.

[6]Data not available by color.

[7]Based on 1960 data only.

[8]For 1950, data not available for Honolulu by place of residence.

Sources: Annual volumes Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office; 1960 Census of Population, Bureau of the Census, U.S. Department of Commerce.

Table 9. Average annual infant mortality rates for selected causes of death, by age at death, sex, and color: United States, 1959-61

Cause of death (7th Revision—International Classification of Diseases)	Under 1 year	Under 28 days	Under 1 day	1-6 days	7-27 days	28 days-11 months
	Rates per 10,000 live births of specified sex					
Male						
All causes	291.0	212.2	115.7	74.2	22.3	78.8
Infective and parasitic diseases (001-138)	3.8	0.6	0.0	0.1	0.4	3.2
Influenza and pneumonia, including pneumonia of newborn (480-493,763)	34.6	9.9	1.2	4.0	4.7	24.7
All other diseases of respiratory system (470-475,500-527)	7.1	0.8	0.2	0.3	0.4	6.3
Gastritis and duodenitis, etc.[1] (543,571,572,764)	7.5	1.2	0.0	0.1	1.1	6.3
All other diseases of digestive system (530-542,544-570,573-587)	4.4	2.7	0.9	1.1	0.7	1.7
Congenital malformations (750-759)	39.2	26.1	9.8	10.3	6.0	13.1
Birth injuries (760,761)	28.1	28.0	18.4	8.9	0.7	0.1
Intracranial and spinal injury at birth (760)	9.4	9.4	3.8	5.1	0.5	0.0
Other birth injury (761)	18.7	18.7	14.7	3.8	0.2	0.1
Postnatal asphyxia and atelectasis (762)	53.0	52.2	31.6	19.4	1.3	0.7
Hemolytic disease of newborn (770)	5.2	5.1	3.1	1.7	0.3	0.1
Immaturity unqualified (776)	50.0	49.7	35.0	13.1	1.6	0.3
Neonatal disorders arising from certain diseases of mother during pregnancy, etc.[2] (765-769,771-774)	32.0	29.1	13.6	12.9	2.7	2.9
Symptoms and ill-defined conditions (780-793,795)	6.3	2.6	1.0	1.0	0.6	3.7
Accidents (E800-E962)	9.7	1.5	0.2	0.6	0.8	8.1
Residual (140-468,590-749,E963-E985)	10.3	2.9	0.8	1.0	1.1	7.4
Certain diseases of early infancy (760-776)	179.2	175.1	102.8	60.1	12.2	4.0
Female						
All causes	225.4	160.8	89.7	53.0	18.0	64.6
Infective and parasitic diseases (001-138)	3.0	0.4	0.0	0.1	0.3	2.6
Influenza and pneumonia, including pneumonia of newborn (480-493,763)	27.3	7.3	0.9	2.8	3.6	20.0
All other diseases of respiratory system (470-475,500-527)	5.2	0.6	0.2	0.2	0.3	4.6
Gastritis and duodenitis, etc.[1] (543,571,572,764)	6.3	1.0	0.0	0.1	0.9	5.3
All other diseases of digestive system (530-542,544-570,573-587)	3.2	2.1	0.8	0.8	0.5	1.1
Congenital malformations (750-759)	33.5	21.5	9.2	7.4	4.9	12.0
Birth injuries (760,761)	19.6	19.5	13.2	5.8	0.5	0.0
Intracranial and spinal injury at birth (760)	5.6	5.6	2.3	2.9	0.4	0.0
Other birth injury (761)	14.0	13.9	10.9	2.9	0.1	0.0
Postnatal asphyxia and atelectasis (762)	38.0	37.4	23.0	13.3	1.1	0.6
Hemolytic disease of newborn (770)	4.9	4.9	3.5	1.2	0.2	0.0
Immaturity unqualified (776)	40.5	40.2	27.3	11.3	1.6	0.3
Neonatal disorders arising from certain diseases of mother during pregnancy, etc.[2] (765-769,771-774)	22.9	20.6	9.9	8.6	2.1	2.2
Symptoms and ill-defined conditions (780-793,795)	5.2	2.1	0.9	0.7	0.5	3.1
Accidents (E800-E962)	7.9	1.3	0.2	0.4	0.8	6.6
Residual (140-468,590-749,E963-E985)	8.0	2.1	0.6	0.7	0.8	5.9
Certain diseases of early infancy (760-776)	134.0	130.8	77.9	43.0	9.9	3.2

Table 9. Average annual infant mortality rates for selected causes of death, by age at death, sex, and color: United States, 1959-61—Con.

Cause of death (7th Revision—International Classification of Diseases)	Under 1 year	Under 28 days	Under 1 day	1-6 days	7-27 days	28 days-11 months
White	Rates per 10,000 live births in specified color group					
All causes	228.5	172.2	95.6	60.0	16.6	56.3
Infective and parasitic diseases----------(001-138)	2.6	0.3	0.0	0.1	0.2	2.3
Influenza and pneumonia, including pneumonia of newborn----------(480-493,763)	22.9	6.6	0.8	2.8	3.0	16.3
All other diseases of respiratory system----------(470-475,500-527)	5.3	0.6	0.2	0.2	0.3	4.6
Gastritis and duodenitis, etc.[1]----(543,571,572,764)	4.0	0.6	0.0	0.1	0.5	3.4
All other diseases of digestive system----------(530-542,544-570,573-587)	3.6	2.4	0.9	0.9	0.6	1.2
Congenital malformations----------(750-759)	37.5	25.0	10.1	9.3	5.6	12.5
Birth injuries----------(760,761)	23.4	23.3	15.7	7.1	0.5	0.0
Intracranial and spinal injury at birth------(760)	6.9	6.9	2.7	3.7	0.4	0.0
Other birth injury----------(761)	16.5	16.5	12.9	3.4	0.1	0.0
Postnatal asphyxia and atelectasis----------(762)	42.2	41.6	24.9	15.8	1.0	0.5
Hemolytic disease of newborn----------(770)	5.6	5.5	3.8	1.6	0.2	0.0
Immaturity unqualified----------(776)	39.4	39.2	27.5	10.6	1.1	0.2
Neonatal disorders arising from certain diseases of mother during pregnancy, etc.[2]-(765-769,771-774)	24.0	22.6	10.6	10.2	1.8	1.4
Symptoms and ill-defined conditions----(780-793,795)	2.8	1.1	0.5	0.4	0.3	1.6
Accidents----------(E800-E962)	7.3	1.1	0.1	0.4	0.6	6.2
Residual----------(140-468,590-749,E963-E985)	8.1	2.3	0.7	0.8	0.8	5.8
Certain diseases of early infancy----------(760-776)	141.7	139.5	83.2	48.2	8.1	2.2
Nonwhite						
All causes	425.3	268.6	143.3	85.3	40.1	156.7
Infective and parasitic diseases----------(001-138)	7.9	1.5	0.1	0.3	1.1	6.4
Influenza and pneumonia, including pneumonia of newborn----------(480-493,763)	75.3	19.2	2.2	6.5	10.4	56.1
All other diseases of respiratory system----------(470-475,500-527)	11.3	1.2	0.3	0.3	0.6	10.1
Gastritis and duodenitis, etc.[1]----(543,571,572,764)	23.0	3.9	0.0	0.3	3.6	19.1
All other diseases of digestive system----------(530-542,544-570,573-587)	4.7	2.3	0.4	1.1	0.8	2.5
Congenital malformations----------(750-759)	30.4	17.8	6.4	6.8	4.6	12.6
Birth injuries----------(760,761)	26.9	26.8	16.9	8.9	1.0	0.1
Intracranial and spinal injury at birth------(760)	11.2	11.2	4.8	5.6	0.8	0.0
Other birth injury----------(761)	15.7	15.6	12.0	3.4	0.2	0.1
Postnatal asphyxia and atelectasis----------(762)	64.8	63.5	41.2	20.0	2.3	1.3
Hemolytic disease of newborn----------(770)	2.2	2.2	0.9	1.0	0.3	0.1
Immaturity unqualified----------(776)	77.8	76.9	51.6	21.0	4.3	0.9
Neonatal disorders arising from certain diseases of mother during pregnancy, etc.[2]-(765-769,771-774)	46.7	38.0	18.2	14.0	5.8	8.8
Symptoms and ill-defined conditions----(780-793,795)	22.2	9.2	3.8	3.2	2.2	13.1
Accidents----------(E800-E962)	17.0	3.0	0.4	1.1	1.5	14.0
Residual----------(140-468,590-749,E963-E985)	15.0	3.6	1.0	1.1	1.5	11.4
Certain diseases of early infancy----------(760-776)	241.1	230.0	130.9	71.5	27.5	11.2

[1] Includes gastritis and duodenitis; gastroenteritis and colitis, except ulcerative, age 4 weeks and older; chronic enteritis and ulcerative colitis; diarrhea of newborn.

[2] Includes neonatal disorders arising from certain diseases of the mother during pregnancy; ill-defined diseases peculiar to early infancy; immaturity with mention of other subsidiary condition; and other diseases peculiar to early infancy not already shown. Ill-defined diseases peculiar to early infancy accounted for 62 percent of these deaths.

Source: Special tabulations of the National Vital Statistics Division, National Center for Health Statistics, Public Health Service, U.S. Department of Health, Education, and Welfare.

Table 10. Percent of live births at birth weights of 2,500 grams or less, by age of mother, color, and total-birth order: United States, January-March 1950

[Total-birth order refers to number of children ever born to mother, including fetal deaths. Excludes data for Massachusetts]

Age of mother and color	Total	Birth order				
		First	Second	Third	Fourth	Fifth and over
Total						
All ages	7.4	7.7	6.9	7.2	7.5	7.7
15-19 years	9.0	8.5	9.6	12.0	13.9	18.3
20-24 years	7.3	6.9	6.9	8.0	9.1	10.5
25-29 years	6.7	7.1	5.9	6.5	7.2	8.0
30-34 years	7.2	9.1	6.6	6.5	6.8	7.6
35-39 years	7.7	11.0	8.1	7.2	6.9	7.1
40-44 years	7.7	13.7	8.2	7.0	7.8	6.8
White						
All ages	7.0	7.2	6.5	6.9	7.4	7.4
15-19 years	8.0	7.6	8.6	12.5	16.7	a
20-24 years	6.9	6.5	6.5	7.8	9.2	10.7
25-29 years	6.5	6.9	5.7	6.4	7.1	8.0
30-34 years	7.0	8.9	6.4	6.3	6.8	7.3
35-39 years	7.5	10.9	8.1	7.1	6.8	6.7
40-44 years	7.5	13.1	7.9	6.5	7.6	6.7
Nonwhite						
All ages	9.7	11.8	10.1	8.9	8.3	8.5
15-19 years	12.0	12.2	11.5	11.5	12.4	16.3
20-24 years	9.6	11.1	9.6	8.6	8.7	10.2
25-29 years	8.4	11.0	8.9	8.0	7.4	7.9
30-34 years	8.8	11.6	9.8	9.1	7.5	8.3
35-39 years	9.0	13.2	8.3	9.8	8.4	8.7
40-44 years	8.9	a	13.0	16.2	10.0	7.5

[a]Rates not computed, less than 10 deaths.

NOTE: Figures for birth weight, birth order, and age of mother not stated are distributed. Figures for age of mother under 15 years of age and 45 years and over are not shown separately but are included in totals for groups.

Source: National Office of Vital Statistics: Weight at birth and survival of newborn, by age of mother and total-birth order, by J. Loeb. Vital Statistics—Special Reports, Vol. 47, No. 2. Public Health Service. Washington, D.C., 1958.

Table 11. Neonatal mortality rates by total-birth order, color, and age of mother: United States, January-March 1950

[Based on deaths under 28 days among children born January 1 to March 31, 1950. Total-birth order refers to number of children ever born to mother, including fetal deaths. Excludes data for Massachusetts]

Birth order and color	All ages	Age of mother					
		15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years
Total	Rates per 1,000 live births in specified group						
Total	20.0	23.8	19.0	17.6	20.0	23.6	27.2
First	19.1	21.2	16.6	17.3	24.1	28.7	30.9
Second	17.8	28.1	18.2	14.3	16.1	20.3	25.3
Third	19.7	35.3	22.0	17.7	16.9	19.8	26.4
Fourth	21.1	45.2	24.9	19.6	18.8	21.5	23.6
Fifth and over	26.9	68.8	35.8	25.5	25.5	26.1	28.0
White							
Total	18.9	22.3	18.0	16.7	18.9	22.6	26.4
First	17.8	19.8	15.5	16.4	22.3	28.1	29.8
Second	16.9	27.2	17.5	14.0	15.2	20.2	26.3
Third	19.3	41.4	22.5	17.1	16.8	19.9	25.5
Fourth	20.3	49.0	25.9	18.8	18.5	20.1	22.4
Fifth and over	26.0	a	37.5	25.9	24.4	24.9	26.5
Nonwhite							
Total	26.7	28.3	24.8	24.6	28.7	29.9	35.0
First	28.9	26.6	27.7	31.8	49.2	37.2	a
Second	25.4	29.9	23.5	20.3	32.6	22.5	a
Third	22.3	28.6	20.5	23.9	18.7	19.0	a
Fourth	25.0	43.2	22.9	23.6	21.7	38.3	a
Fifth and over	29.1	a	34.3	24.9	28.7	30.3	34.5

[a]Rates not computed, less than 10 deaths.

NOTE: Figures for birth order and age of mother not stated are distributed. Figures for age of mother under 15 years of age and 45 years and over are not shown separately but are included in totals for groups.

Source: National Office of Vital Statistics: Weight at birth and survival of newborn, by age of mother and total-birth order, by J. Loeb. Vital Statistics—Special Reports, Vol. 47, No. 2. Public Health Service. Washington, D.C., 1958.

Table 12. Average fetal death rates by age of mother, color, and total-birth order: United States, 1960-61

[Includes only fetal deaths for which the period of gestation was given as 20 weeks (or 5 months) or more or was not stated. Total-birth order refers to number of children ever born to mother, including fetal deaths]

Color and birth order	All ages[1]	Age of mother					
		15-19 years	20-24 years	25-29 years	30-34 years	35-39 years	40-44 years
	Rates per 1,000 live births and fetal deaths in specified group						
Total							
Total	15.8	13.7	11.9	14.2	19.0	26.8	38.5
First	15.5	13.8	13.0	17.8	30.0	46.6	60.2
Second	11.2	12.2	9.4	10.7	14.6	21.0	32.2
Third	13.2	16.3	11.3	11.5	14.5	21.4	32.2
Fourth	16.0	23.1	14.4	13.9	15.8	21.9	31.0
Fifth	19.1	47.3	17.3	16.2	18.7	23.8	33.0
Sixth and over	28.8	72.7	23.3	22.4	25.2	31.6	43.4
White							
Total	13.9	11.7	10.6	12.6	16.6	23.4	34.3
First	13.8	12.1	11.8	16.3	26.9	41.8	56.2
Second	10.1	10.0	8.5	9.9	13.3	19.2	29.7
Third	12.1	12.7	10.2	10.6	13.4	19.7	30.3
Fourth	14.7	17.4	12.6	12.7	14.6	20.3	29.4
Fifth	17.5	30.4	15.1	14.6	16.7	22.0	30.7
Sixth and over	24.0	41.2	20.3	19.0	21.0	26.3	37.5
Nonwhite							
Total	26.2	20.9	19.7	24.1	33.1	45.5	61.7
First	26.5	21.2	25.1	32.4	57.6	88.4	96.7
Second	19.0	18.3	16.4	19.5	27.9	39.3	63.3
Third	20.5	22.1	16.3	20.6	27.5	41.6	54.6
Fourth	23.3	28.7	19.5	21.7	27.9	39.0	50.0
Fifth	26.1	60.1	21.0	22.0	31.5	38.4	57.4
Sixth and over	36.5	101.0	26.2	27.7	34.4	46.4	62.4

[1]Includes data for age groups under 15 years and 45 years and over.

NOTE: Data for Massachusetts are included only in the totals by age of mother because this State did not require the reporting of birth order. Figures for birth order not stated (for States other than Massachusetts) and for age of mother not stated are distributed.

Source: Annual volumes Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

APPENDIX TABLES

Table I. Percent distribution of the population, by educational attainment and family income: United States, 1940, 1950, 1960

Educational attainment and family income	1960	1950	1940
Years of school completed	Percent distribution		
Persons 25 years and over	100.0	100.0	100.0
No school years completed	0.9	1.1	2.2
Elementary school:			
6 years or less	8.1	12.6	17.4
7-8 years	17.0	23.5	32.9
High School:			
1-3 years	21.9	20.6	18.3
4 years	32.6	26.2	17.3
College:			
1-3 years	10.1	8.7	6.5
4 years or more	9.4	7.3	5.4
Median school years completed	11.7	10.5	8.4
Family income			
All incomes	100.0	100.0	[1]100.0
$2,000 or less	13.1	29.3	49.9
$2,000-$3,999	17.8	38.6	33.1
$4,000-$5,999	23.3	19.9	
$6,000-$6,999	10.7	4.3	14.7
$7,000-$9,999	20.1	4.9	
$10,000 or more	15.0	3.1	2.3
Median family income	$5,657	$3,083	---

[1]Based on 1942 study by Office of Price Administration, which based its estimates on income of all civilian consumers except those in institutions.

NOTE: All data are for conterminous United States.

Source: Decennial census reports of Bureau of Census, U.S. Department of Commerce.

Table II. Estimated ratios of illegitimate live births, by color and illegitimacy rates: United States, 1940, 1945, and 1950-62

Year	Ratio[1]			Rate[2]
	Total	White	Nonwhite	
1962[3] [4]	58.8	27.5	229.9	21.5
1961[3]	56.3	25.3	223.4	22.6
1960[3]	52.7	22.9	215.8	21.8
1959[3]	52.0	22.1	218.0	22.1
1958	49.6	20.9	212.3	21.0
1957	47.4	19.6	206.7	20.9
1956	46.5	19.0	204.0	20.2
1955	45.3	18.6	202.4	19.3
1954	44.0	18.2	198.5	18.3
1953	41.2	16.9	191.1	17.0
1952	39.1	16.3	183.4	15.6
1951	39.1	16.3	182.8	15.1
1950	39.8	17.5	179.6	14.1
1945	42.9	23.6	179.3	10.1
1940	37.9	19.5	168.3	7.1

[1]Per 1,000 total live births in specified group.
[2]Per 1,000 unmarried female population aged 15-44 years, enumerated as of April 1 for 1940, 1950, and 1960, and estimated as of July 1 for all other years.
[3]Alaska included beginning 1959; Hawaii, 1960.
[4]Figures by color exclude data for residents of New Jersey because this State did not require reporting of the item.

Source: Annual volume Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

Table III. Live births and birth rates by color: United States, 1935-62

[Rates for 1940, 1950, and 1960 based on population enumerated as of April 1; for all other years estimated as of July 1]

Year	Number			Rates per 1,000 population[1]		
	Total	White	Nonwhite	Total	White	Nonwhite
1962[2] [3]	4,167,362	3,394,068	641,580	22.4	21.4	30.5
1961[2]	4,268,326	3,600,864	667,462	23.3	22.2	31.6
1960[2]	4,257,850	3,600,744	657,106	23.7	22.7	32.1
1959[2]	4,244,796	3,597,430	647,366	24.0	22.9	32.3
1958	4,203,812	3,572,306	631,506	24.3	23.2	32.9
1957	4,254,784	3,621,456	633,328	25.0	23.9	33.9
1956	4,163,090	3,545,350	617,740	24.9	23.8	33.9
1955	4,047,295	3,458,448	588,847	24.6	23.6	33.2
1954	4,017,362	3,443,630	573,732	24.9	23.9	33.2
1953	3,902,120	3,356,772	545,348	24.7	23.7	32.4
1952	3,846,986	3,322,658	524,328	24.7	23.9	31.3
1951	3,750,850	3,237,072	513,778	24.5	23.6	31.3
1950	3,554,149	3,063,627	490,522	23.6	22.7	31.1
1949	3,559,529	3,083,721	475,808	23.9	23.2	30.6
1948	3,535,068	3,080,316	454,752	24.2	23.5	29.3
1947	3,699,940	3,274,620	425,320	25.8	25.5	28.3
1946	3,288,672	2,913,645	375,027	23.3	23.0	25.3
1945	2,735,456	2,395,563	339,893	19.5	19.1	23.2
1944	2,794,800	2,454,700	340,100	20.2	19.8	23.6
1943	2,934,860	2,594,763	340,097	21.5	21.2	24.1
1942	2,808,996	2,486,934	322,062	20.8	20.6	23.2
1941	2,513,427	2,204,903	308,524	18.8	18.4	22.6
1940	2,360,399	2,067,953	292,446	17.9	17.5	21.7
1939	2,265,588	1,982,671	282,917	17.3	16.9	21.2
1938	2,286,962	2,005,955	281,007	17.6	17.2	21.2
1937	2,203,337	1,928,437	274,900	17.1	16.7	20.9
1936	2,144,790	1,881,883	262,907	16.7	16.4	20.1
1935	2,155,105	1,888,012	267,093	16.9	16.5	20.6

[1]For 1941-46 based on population including Armed Forces abroad.
[2]Alaska included beginning 1959; Hawaii, 1960.
[3]Figures by color exclude data for residents of New Jersey because this State did not require reporting of the item.

Source: Annual volume Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

Table IV. Birth rates by live-birth order and color: United States, selected years, 1940-60

[Rates are live births per 1,000 female population aged 15-44 years, enumerated as of April 1 for 1940, 1950, and 1960, and estimated as of July 1 for other years. Live-birth order refers to number of children born alive to mother. Figures for births of order not stated are distributed, including births that occurred in Massachusetts]

Year and color	Total	Live-birth order						
		First	Second	Third	Fourth	Fifth	Sixth and seventh	Eighth and over
Total								
1960	118.0	31.1	29.2	22.8	14.6	8.3	7.6	4.3
1955	118.0	32.7	31.7	23.0	13.3	7.2	6.3	3.8
1950	106.2	33.3	32.1	18.4	9.2	4.8	4.7	3.6
1945	85.9	28.9	22.9	13.4	7.5	4.5	4.8	4.0
1940	79.9	29.3	20.0	10.9	6.4	4.1	4.8	4.3
White								
1960	113.2	30.8	29.2	22.7	14.1	7.5	6.1	2.8
1955	113.3	32.5	31.9	22.8	12.5	6.2	4.9	2.5
1950	102.3	33.3	32.3	17.9	8.4	4.1	3.7	2.5
1945	83.4	29.0	23.3	13.2	7.0	3.9	4.0	3.0
1940	77.1	29.4	20.0	10.5	5.9	3.6	4.1	3.5
Nonwhite								
1960	153.6	33.6	29.3	24.0	18.6	14.1	18.4	15.6
1955	154.8	34.8	30.5	24.4	19.2	14.5	17.3	13.9
1950	137.3	33.8	30.3	22.9	15.3	10.4	12.6	12.0
1945	106.0	27.9	20.1	14.7	11.3	8.7	11.3	11.9
1940	102.4	28.6	19.6	14.1	10.5	7.8	10.4	11.3

NOTE: Rates for 1960 are based on registered births. Rates for all other years are adjusted for underregistration.

Source: Annual volume Vital Statistics of the United States, National Center for Health Statistics, Public Health Service, Washington, U.S. Government Printing Office.

Table V. Percent distribution of female population, by labor force status and educational attainment: United States, 1940, 1950, 1960

Labor force status and educational attainment	1960	1950	1940
Labor force status	Percent distribution		
Total female population aged 14-44 years	100.0	100.0	100.0
In labor force	36.7	33.0	30.3
Not in labor force	63.3	67.0	69.7
With own children under 6 years of age			
Married women, husband present, aged 14-44 years	100.0	100.0	---
In labor force	19.1	10.5	---
Not in labor force	80.9	89.5	---
Educational attainment: years of school completed			
Total female population aged 25-44 years	100.0	100.0	100.0
No school years completed	0.7	1.0	1.5
Elementary school:			
8 years or less	20.5	31.3	45.7
High school:			
1-3 years	22.4	21.4	19.7
4 years	39.3	31.2	20.9
College:			
1-3 years	10.2	9.0	7.3
4 years or more	6.9	6.1	4.7
Median school years completed	11.8	11.1	9.0

Source: Decennial census reports of Bureau of Census, U.S. Department of Commerce.

Table VI. Percent distribution of the population, by residence 5 years prior to census date and color: United States, 1960

Residence in 1955	Total	White	Nonwhite
	Percent distribution		
Population aged 5 years and over, 1960	100.0	100.0	100.0
Same house as in 1960	49.9	50.1	48.0
Different house in United States	47.3	47.2	48.4
Same county	29.8	28.9	37.6
Different county	17.4	18.3	10.7
Same State	8.5	9.0	4.7
Different State	8.9	9.2	6.1
Abroad	1.3	1.3	1.0
Moved, 1955 residence not reported	1.6	1.4	2.7

Source: Decennial census report of Bureau of Census, U.S. Department of Commerce.

Table VII. Percent distribution of the population, by type of area and color: United States, 1960

Type of area and color	Percent distribution
Total	
All areas	100.0
Metropolitan areas	63.0
Nonmetropolitan areas	37.0
Total	
All areas	100.0
Urban	69.9
Within urbanized areas	53.5
Central cities	32.3
Urban fringes	21.1
Outside urbanized areas	16.4
Rural	30.1
White	
All areas	100.0
Urban	69,5
Within urbanized areas	52,7
Central cities	30,0
Urban fringes	22,8
Outside urbanized areas	16,8
Rural	30,5
Nonwhite	
All areas	100,0
Urban	72,4
Within urbanized areas	58,9
Central cities	50,5
Urban fringes	8,4
Outside urbanized areas	13,5
Rural	27,6

Source: Decennial census report of Bureau of Census, U.S. Department of Commerce.

Table VIII. Percent distribution of the population, by geographic region and color: United States, 1940, 1950, 1960

Region and color	1960[1]	1950	1940
United States	Percent distribution		
All regions	100.0	100.0	100.0
Northeast	24.9	26.1	27.2
North Central	28.8	29.4	30.4
South	30.7	31.2	31.5
West	15.6	13.3	10.9
White			
All regions	100.0	100.0	100.0
Northeast	26.1	27.7	29.2
North Central	30.2	31.2	32.7
South	27.4	27.3	26.8
West	16.3	13.8	11.3
Nonwhite			
All regions	100.0	100.0	100.0
Northeast	15.4	13.2	10.5
North Central	17.6	14.9	11.2
South	56.1	65.7	74.4
West	10.8	6.3	4.0

[1]Includes Alaska and Hawaii.

Source: Decennial census reports of Bureau of Census, U.S. Department of Commerce.

U.S. GOVERNMENT PRINTING OFFICE : 1965 O - 788-022

OUTLINE OF REPORT SERIES FOR VITAL AND HEALTH STATISTICS

Public Health Service Publication No. 1000

Series 1. *Programs and collection procedures.*—Reports which describe the general programs of the National Center for Health Statistics and its offices and divisions, data collection methods used, definitions, and other material necessary for understanding the data.

Reports number 1-4

Series 2. *Data evaluation and methods research.*—Studies of new statistical methodology including: experimental tests of new survey methods, studies of vital statistics collection methods, new analytical techniques, objective evaluations of reliability of collected data, contributions to statistical theory.

Reports number 1-12

Series 3. *Analytical studies.*—Reports presenting analytical or interpretive studies based on vital and health statistics, carrying the analysis further than the expository types of reports in the other series.

Reports number 1-4

Series 4. *Documents and committee reports.*—Final reports of major committees concerned with vital and health statistics, and documents such as recommended model vital registration laws and revised birth and death certificates.

Reports number 1 and 2

Series 10. *Data From the Health Interview Survey.*—Statistics on illness, accidental injuries, disability, use of hospital, medical, dental, and other services, and other health-related topics, based on data collected in a continuing national household interview survey.

Reports number 1-23

Series 11. *Data From the Health Examination Survey.*—Statistics based on the direct examination, testing, and measurement of national samples of the population, including the medically defined prevalence of specific diseases, and distributions of the population with respect to various physical and physiological measurements.

Reports number 1-11

Series 12. *Data From the Health Records Survey.*—Statistics from records of hospital discharges and statistics relating to the health characteristics of persons in institutions, and on hospital, medical, nursing, and personal care received, based on national samples of establishments providing these services and samples of the residents or patients.

Reports number 1 and 2

Series 20. *Data on mortality.*—Various statistics on mortality other than as included in annual or monthly reports—special analyses by cause of death, age, and other demographic variables, also geographic and time series analyses.

No reports to date

Series 21. *Data on natality, marriage, and divorce.*—Various statistics on natality, marriage, and divorce other than as included in annual or monthly reports—special analyses by demographic variables, also geographic and time series analyses, studies of fertility.

Reports number 1-6

Series 22. *Data From the National Natality and Mortality Surveys.*—Statistics on characteristics of births and deaths not available from the vital records, based on sample surveys stemming from these records, including such topics as mortality by socioeconomic class, medical experience in the last year of life, characteristics of pregnancy, etc.

Reports number 1

For a list of titles of reports published in these series, write to:

National Center for Health Statistics
U.S. Public Health Service
Washington, D.C. 20201