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Trends in "Prematurity"

United States: 1950-67

An analysis of the trend in live births registered in the United States, 1950-67 by weight at birth and period of gestation, including an assessment of the quality of the data. Other factors, such as age of mother, plurality, sex, and delivery in hospitals are included insofar as they have a bearing on the trends.

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CONTENTS

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TRENDS IN "PREMATURITY" UNITED STATES: 1950-67

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INTRODUCTION

In the United States infant mortality declined rapidly and at a fairly constant rate of decline for about the first half of the 20th century (figure 1). Around midcentury, the rate of decline decelerated and appeared to level off for about a decade.[1] Data for 1966-68 suggest a reassertion of a more rapid decline, but not at the pace experienced prior to 1950.

When the data for the United States were compared with those for a group of economically and medically advanced Western European countries, it was found that the trends for some of the other countries seemed to be leveling off as well, but at considerably lower levels.[2,3] For example, as recently as 1966, the infant mortality rate for the United States (23.7 per 1,000 live births) was higher than the rate for Sweden (12.6), the Netherlands (14.7), and Australia (18.2).[3] It also appeared that the proportion of infants weighing 2,500 grams (5½ pounds) or less at birth (low birth weight infants) was higher among infants born alive in the United States than in Denmark, the Netherlands, Sweden, or New Zealand.[3,4] Nationally, the percent of low birth weight among infants was reported to have been higher in 1960 than in January-March 1950, with practically no change for white infants but a marked increase for other infants.[5] This observation, which was limited to a 3-month period in 1950 and to the year 1960, led to the present study, which covers the 18-year period 1950-67.

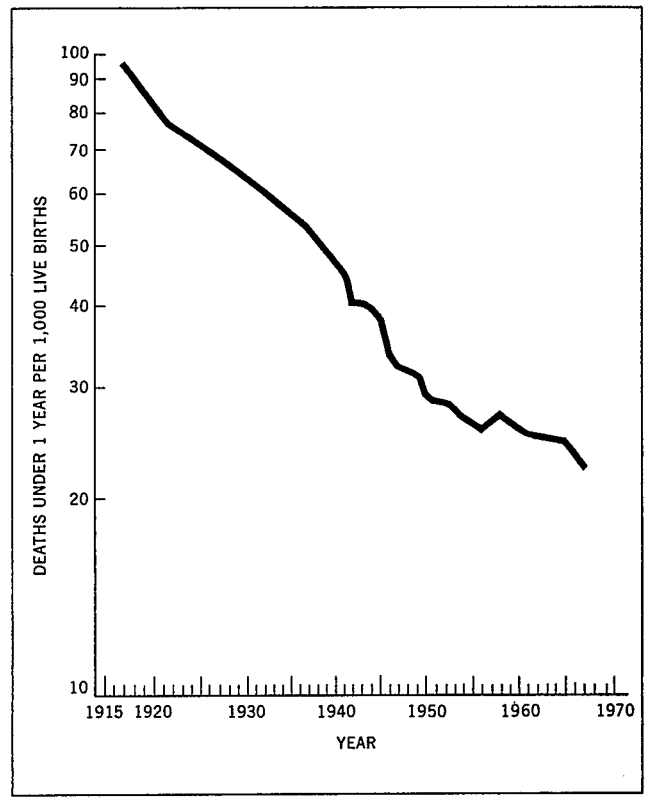

Figure 1. Infant mortality rates: United States, 1915-19 to 1967

Among the many factors affecting infant survival, physical underdevelopment and immaturity at time of birth present the greatest hazards. In the United States, the risk of death in the first year of life among infants who weigh 2,500 grams or less at birth is 17 times the risk among infants weighing 2,501 grams or more.

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Studies have shown that this relative risk far exceeds the risk associated with disadvantageous birth order, sex, age of mother, or socioeconomic level.[6] Two national studies have shown that the risk differential associated with color (a ratio of 2:1, Negro and other minority races versus white) is considerably less than that associated with low birth weight (17:1).[5,7]

Not only are infants of low birth weight subject to a greater risk of death, but they are also subject to higher morbidity, particularly of the central nervous system.[7-43] A greater prevalence of cerebral palsy, epilepsy, mental retardation, congenital anomalies, deafness, blindness, and strabismus has been found among infants of low birth weight and/or curtailed gestation than among fully developed full-term infants. None of these conditions is considered transient in nature; many of them are severe, and often they are chronic, as well as handicapping conditions.

The data on associations between low birth weight and curtailed gestation on the one hand and excess mortality and morbidity on the other require further clarification. For some of the conditions mentioned, low birth weight may be a consequence of the associated condition rather than a correlate of the causative mechanism. For example, an infant with severe congenital anomalies of the musculoskeletal system may be of low birth weight because the fetus was unable to grow to a fully developed infant after it was affected *in utero*.[38] Such an infant may, nevertheless, be full term. On the other hand, other conditions may be resultants of low birth weight and/or curtailed gestation in the etiologic sense. In either case, birth weight and the duration of gestation together are assuming increasing importance in evaluating the prognosis of newborn infants.

In view of the serious nature of the disorders associated with low birth weight, public health is directing increasing attention to the causes and consequences of impaired fetal development. The evidence has been derived from a variety of studies, some retrospective, some prospective. If prematurity among newborn infants is truly increasing, then greater numbers of infants with severely handicapping conditions may be anticipated.

Increasing proportions of infants of low birth weight have been reported in a study from one urban hospital.[32] Although an increasing trend was observed in this institution, it need not necessarily imply a nationwide trend. It may perhaps reflect a change in the composition of the hospital's clientele or in the metropolitan population. Since the close of World War II, there have been large in-migrations of Negroes and other minority groups into large metropolitan centers, and at the same time there have been out-migrations of the more affluent white population to the suburbs. Because the proportion of low birth weight infants is higher among newborn infants of minority races, the rate in a single hospital or city is affected by the proportions of the two subgroups in the population studied. While the net effect of population changes over time may result in an increase in the proportion of low birth weight infants among those born in a specific hospital or city, the nationwide proportions must be considered separately.

The present study explores the national data for the period 1950-67 and includes a critical review of the changes in the reporting of birth weight and gestation information. Trends by birth weight and gestational age are examined. The two variables are considered simultaneously for years for which published data are available.

The proportion of low birth weight infants increased slightly from 7.5 percent in 1950 to 8.2 percent in 1967. This was because the proportion among "other" infants increased markedly (from 10.2 percent to 13.6) while that among white infants remained relatively stable (around 7 percent). Using gestation data of less than satisfactory quality, a tentative conclusion was reached that there is no evidence of changes in gestation parallel to the changes in distributions of birth weight for "other" infants. Other factors such as age of mother, plurality, sex, and delivery in hospitals did not appear to explain the trends which were observed.

Infants of low birth weight or those with curtailed periods of gestation are subject to much higher mortality and morbidity than their heavier counterparts, and their number is not inconsequential: 288,000 low birth weight infants were born in 1967 alone. Particularly prominent among "premature" infants are disorders of the central nervous system and congenital anomalies. Because of their severity and the

long periods of treatment which may be required, the ultimate goal is not only the treatment of children born with these conditions but the prevention of the disorders and the prevention of "premature" birth.

A complete assessment of prematurity should include all products of conception, i.e., fetal deaths as well as live births. The two groups of pregnancy terminations are interrelated, and changes which occur in the first group have an effect on the second. As an example, advances in the reduction of fetal deaths may affect the birth weight or gestational age distribution of live births. However, fetal death data for the United States include only those events of 20 completed weeks or more of gestation, omitting about four-fifths of the fetal deaths which occur earlier in gestation. Even for fetal deaths of 20 weeks or more of gestation, there is a high degree of underregistration (perhaps 20-25 percent).[44] In addition, a large proportion of fetal death records fail to indicate the birth weight or gestational age of the fetus, and these cannot be assumed to be unbiased. Because of these limitations of the fetal death data and because fetal deaths represent only 2-3 percent of pregnancies terminating at 20 completed weeks or more of gestation, it was decided to base this study on live births only.

DEFINITIONS

"Prematurity" is a term which, in connection with newborn infants, is used generically to describe those who are not fully developed because of curtailed gestation, low birth weight, or both. During the period covered by this report, official as well as medical circles made a number of attempts to develop more quantitative descriptions of the term.

In 1948 the First World Health Assembly of the World Health Organization (WHO) adopted the following definition, which was incorporated in the "International Statistical Classification of Diseases, Injuries, and Causes of Death":

> For the purpose of this classification, an immature infant is a liveborn infant with a birth weight of 5½ pounds (2,500 grams) or less, or specified as immature. In some countries, however, this criterion will not be applicable. If weight is not specified, a liveborn infant with a period of gestation of less than 37 weeks or specified as "premature" may be considered as the equivalent of an immature infant for purposes of this classification.[45]

In 1950, the WHO Expert Group on Prematurity reported as follows:

> The Expert Group on Prematurity recognizes the necessity for uniform terminology for international usage. Since the primary goal is to lower foetal and neonatal mortality, this aim can best be achieved by providing specialized care for infants of low birth-weight. The group suggests that a premature infant be defined as one whose birth-weight is 2,500 g. (5½ pounds) or less. The limitations of this criterion are recognized, however, since data on birth-weight will not always be available and other criteria of prematurity must be used, for example, gestation. The group therefore recommends the adoption by all countries for purposes of vital statistics of the international definition of the First World Health Assembly . . . .
>
> The terms "immature" and "premature" are here used interchangeably. However, the group points out that the term "premature" is preferable to the term "immature".[46]

It should be noted that this definition differs from the earlier statement. It states that a premature infant be defined as one whose birth weight is 2,500 grams (5½ pounds) or less, and although "premature" and "immature" are used interchangeably, the term "premature" is preferred.

In 1961, the WHO Expert Committee on Maternal and Child Health noted that the definition of prematurity (birth weight of 2,500 grams or less) recommended by the WHO Expert Group on Prematurity "has been adopted almost universally and has proved very helpful in many parts of the world, especially is assessing the size of the problem."[47] The Committee further pointed out:

> There is in reality no sharp dividing line between mature and premature babies or between high and low birth weight. . . . In view of the convincing evidence showing that many of the babies included within the limits of the definition, in certain areas, are not born prematurely, the Committee recommends that the concept of "prematurity" in the definition should give way to that of "low birth weight."[47]

The definition of "low birth weight" as 2,500 grams or less has been criticized for its lack of universality. Although infants who weigh 2,500 grams or less at birth may be considered to be of low birth weight and are often preterm in the United States, in other countries a high proportion of them may be full term, but of small stature.

Within the United States, the international definitions proposed by WHO in 1950 found general acceptance in official and medical circles. For a number of years, the term "premature" was widely used for infants who weigh 2,500 grams or less at birth. However, with increased knowledge, there developed an uneasiness in medical circles about this particular definition of prematurity, and a number of professional organizations made independent attempts to revise it during the 1960's. Committees of the American Medical Association,[48,49] the American College of Obstetricians and Gynecologists,[50,51] and the American Academy of Pediatrics[52,53] have drafted definitions of terms relating to various aspects of prematurity. They have recognized the problems caused by the lack of uniformity, but as yet have not arrived at a common set of definitions.

A number of studies have indicated that infant survival and morbidity are affected by both gestation and birth weight, and independent investigations have also attempted to create new classifications encompassing both variables.[54-58] Once again, there is a lack of uniformity among them, both with regard to the statistical methods for determining classes and with regard to group limits.

Presently, it is generally agreed that words such as "premature" and "immature" as designations of quantitative classifications should be avoided. The tentative resolution of this problem has been the recommendations that both measures of maturity (gestational age and birth weight) should be expressed quantitatively rather than qualitatively and that precise quantitative terms should be used to avoid misunderstanding. At first glance, this appears to be a rational solution, and it simplifies the problem of classification and tabular presentation for statisticians. However, when these recommendations are strictly adhered to, the language becomes extremely convoluted and is difficult to follow. Therefore, in this report, certain patterns of language have been adopted for the sake of clarity and simplicity.

In this report, "prematurity" is sparingly used in its generic sense, i.e., a "premature" infant is one who is not fully developed because of curtailed gestation, low birth weight, or both.

Infants who are premature because of curtailed gestation (gestational age of less than 37 completed weeks) are designated "preterm." Registration areas in which gestational age is determined by computation from the date of the first day of the last normal menstrual period (LMP) to the date of birth are termed "areas reporting LMP." All other areas are termed "areas reporting weeks of gestation."

Infants who are premature by virtue of birth weight (2,500 grams or less at birth) are designated "low birth weight" infants.

These conventions are used for the purpose of this report and are not to be considered official terminology.

SOURCE OF DATA

The data for the present report are taken from *Vital Statistics of the United States* for the years 1950 through 1967 and are based on live births which occurred and were registered in the United States. The registration of vital events is conducted by the States in accord with State statutes. Forms for registering live births are designed and printed by the individual States, but they are usually patterned after the Standard Certificate of Live Birth recommended by the Surgeon General of the Public Health Service. Even in States where the exact format of the standard certificate is not used, the content of the record closely follows the standard certificate. Because State statutes are enacted at different points in time and because final decisions regarding the design of the certificates rest with the States, it is not always possible to have complete uniformity in national data for all items. Some States require more items of information to be recorded than others, and the structure of an individual item may vary from one State to another. The question regarding the period of gestation may request "weeks of gestation," or it may request "first day, last normal menstrual period." Responses to these two questions yield quite different statistical distributions. Although the national data contain a number of such interstate variations, it is important to emphasize that there is a high degree of uniformity in the live birth records that emanate from the State vital records systems.

In the present report, analysis of trends in prematurity will depend primarily on two items

of information from the live birth records, i.e., birth weight and period of gestation. These two characteristics will first be considered separately, and later simultaneously.

During the interval 1950-67, two revisions of the Standard Certificate of Live Birth were used. The 1949 revision of the Standard Certificate of Live Birth requested the length of pregnancy (weeks) and the weight at birth (lb., oz.). In the 1956 revision, the item on birth weight remained unchanged, and the gestation item was refined to ask for "completed weeks."

The reporting of birth weight was required on the live birth certificates of all States except Massachusetts and Connecticut in 1950 (Technical Appendix). By 1957, Massachusetts was the only State which did not include birth weight on its live birth certificates, and by 1959 the inclusion of this item was nationwide. Similarly, for period of gestation, the number of States requiring the reporting of this item has not provided nationwide coverage for this entire period. The Technical Appendix includes a list of the States which, according to *Vital Statistics of the United States,* did not require gestation information on live birth records. As recently as 1967, live birth record forms used in the State of Massachusetts and that part of Maryland outside the city of Baltimore did not include an item requesting period of gestation.

COMPLETENESS OF DATA

Each year, some live births are registered for which the birth weight or the period of gestation, although required on the birth certificate, is not stated. The percentage has changed over the years, but it is not large enough to affect the distributions to any marked degree:

Year	Birth weight	Gestation
	Percent with item not completed	
1950	[1] 2.7	[2] 3.4
1967	0.2	[3] 3.6

[1] Excludes data for Connecticut and Massachusetts.

[2] Excludes data for Louisiana and Massachusetts.

[3] Excludes data for Massachusetts and Maryland, outside Baltimore.

The data which are excluded are for States which did not request birth weight and/or gestational age on their live birth records. These data would have covered the entire weight or gestational range; and since they were a small portion of the total, they could not affect percentage distributions for the entire United States to any marked degree. The proportion of live birth records with birth weight or gestational age unspecified for the remaining States were felt to be small enough so that the omission of these records would not affect the national distributions. Therefore, for the present study of live births, the data are based on records with stated birth weight and gestational age, and it is assumed that the omissions which have been noted will not seriously affect the distributions which are shown.

ACCURACY OF DATA

Several factors contribute to inaccuracies in the data for period of gestation. First, "gestational age" is only an estimate of the true period of gestation. The true period of gestation is defined as the time from conception to birth. Because the exact time of conception cannot be determined, gestational age is used as an indicator of gestation. Gestational age is measured from the onset of the last menstrual period (LMP) to the date of birth. It is generally agreed that, on the average, conception occurs about 2 weeks after the onset of the LMP. This discrepancy of 2 weeks is recognized by medical authorities and is described in standard textbooks of obstetrics.

Second, accurate recording of gestational age is also dependent on the mother's ability to recall the date of the onset of the LMP and to furnish the information to her physician or to the hospital staff. This element of recall undoubtedly introduces some error into the recorded information. Further inaccuracies in gestational age may be introduced by the doctor or other hospital personnel when the onset of the LMP is entered in the hospital record, when the gestational age is calculated from the dates which are given, or when the information is transposed to the birth certificate.

As an illustration of the differences incurred by the two methods of recording gestational age, the distributions of live births by completed

weeks of gestation are shown for New York State in table A. The data are presented separately for New York City, where the official record requested the first day, LMP, and for the rest of the State, where the record requested completed weeks of gestation. The data demonstrate a higher proportion of records with gestation not stated when the item requests LMP (2.3 percent) than when the record requests weeks of gestation (less than 0.05 percent). A much larger discrepancy is evident in the percentage distributions in the category of 40 weeks and over; in New York City (area reporting LMP), the proportion in this group is 44.8 percent, while in the rest of the State (area reporting weeks of gestation) it is almost doubled (80.3 percent). The magnitude of this difference is largely offset in the preceding group, 37-39 weeks, where the percentage for the area reporting LMP is 41.2 percent, while that for the area reporting weeks of gestation is 14.1 percent. In addition, the patterns in the groups under 37 weeks differ. In the area reporting LMP, there is a gradual increase in the percentages between 31 weeks and 36 weeks, while in the area reporting weeks of gestation, there is a suggestion of clusters at 32 and 36 weeks in addition to the large cluster in the group "40 weeks and over" that has already been mentioned. Differences of this kind and size could not be due to real differences in gestational age.

Although one cannot categorically conclude from these data that gestational age computed from the onset of the last menstrual period is perfect, the resulting distribution is far more rational, and in that sense it is considered an improvement over the data based on reported weeks of gestation. The LMP date has also been demonstrated to be an acceptable item of information when compared to currently maintained menstrual histories.[5 9]

By 1967, only a few of the registration areas in the United States could tabulate period of

Table A. Number of recorded live births and percentage distribution by period of gestation: New York City and rest of New York State, 1960

Period of gestation	New York City[1]	Rest of New York State[2]	New York City[1]	Rest of New York State[2]
	Number of live births		Percentage distribution	
Total	166,300	194,915	100.0	100.0
Less than 20 weeks	182	38	0.1	0.0
20-25 weeks	815	746	0.5	0.4
26-27 weeks	544	348	0.3	0.2
28-29 weeks	823	558	0.5	0.3
30 weeks	693	505	0.4	0.3
31 weeks	828	251	0.5	0.1
32 weeks	1,172	955	0.7	0.5
33 weeks	1,714	452	1.0	0.2
34 weeks	2,564	1,083	1.5	0.6
35 weeks	3,880	1,103	2.3	0.6
36 weeks	6,291	4,938	3.8	2.5
37-39 weeks	68,563	27,445	41.2	14.1
40 weeks and over	74,471	156,421	44.8	80.3
Not stated	3,760	72	2.3	0.0

[1] Gestation is computed from LMP date and date of birth as they are recorded on birth certificate.
[2] Gestation is recorded in weeks at point of origin of birth certificate.
Source: State of New York Department of Health: Eighty-first Annual Statistical Report for the year ending December 31, 1960.

gestation derived from the LMP date. In that year, data based on the LMP date were available from the live birth certificates of only five registration areas: Baltimore, California, District of Columbia, Minnesota, and New York City. For the rest of the country, gestational age was based on weeks of gestation as recorded on the live birth certificates.

Because of the heapings at certain weeks of gestation, the categories of period of gestation shown in *Vital Statistics of the United States* are not uniformly divided. The categories for which data are published are as follows:

Under 20 weeks
20-27 weeks
28-31 weeks
32-35 weeks
36 weeks
37-39 weeks
40 weeks
41-42 weeks
43 weeks and over
Not stated

Data which are categorized in this detail call attention to the heapings at 36 and 40 weeks.

Figure 2 shows the gross distortions which are introduced into the national data when gestational age is reported in weeks of gestation on the birth records. The distribution of live births by gestation as derived for areas reporting LMP is used as the tentative standard to which other data are compared. While the gestational ages derived from LMP dates cannot be assumed to be error free, they are the best which are currently available for vital statistics data. The number of live births with gestation periods of less than 37 weeks are understated in the relative sense by about 37 percent. At 37-39 weeks, there is about a 64-percent understatement, at 40 weeks about a 222-percent overstatement, and about a 77-percent understatement in the gestation interval of 41 weeks and over. Apparently, when weeks of gestation are recorded on the birth records, a great number of births are automatically recorded as having periods of gestation of 40 weeks instead of the actual periods of gestation as calculated from the onset of the last menstrual period.

The magnitude of the error becomes even more disturbing when it is recognized that 98 percent of live births occur in hospitals or are

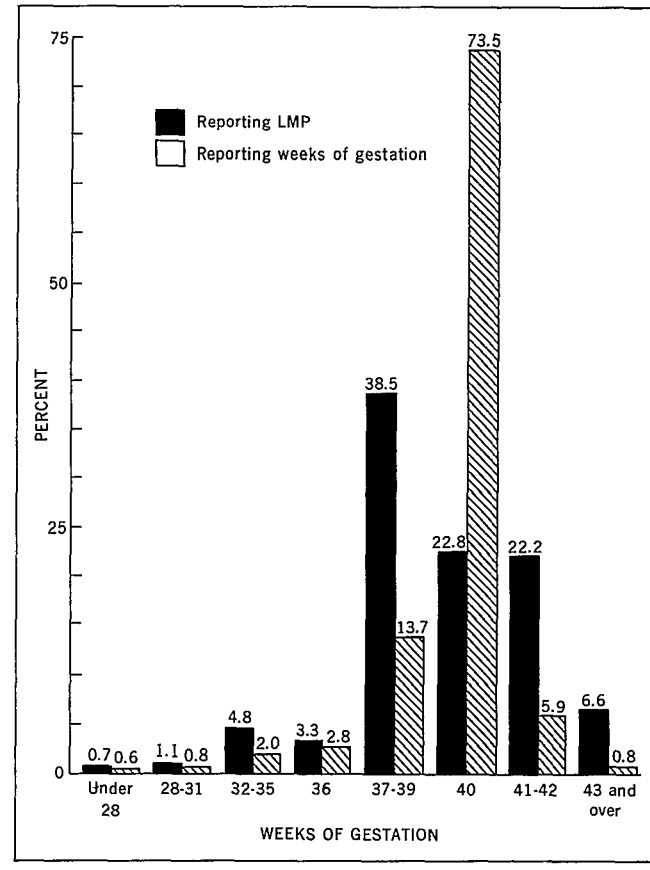

Figure 2. Percentage distribution of live births by period of gestation: Areas reporting LMP and areas reporting weeks of gestation, 1967.

attended by physicians in clinics. Theoretically, the best possible information should be available from these sources. In spite of the almost universal practice of delivery in hospitals in the late 1960's, gestational age in weeks was not considered to be accurately recorded on the live birth records covering the greater part of the United States. The situation may improve considerably beginning with data for 1968 due to the introduction of revised birth certificate forms by many of the States in that year.

The recording of gestational age is also subject to errors of recall. It requires the mother to remember and transmit to her physician the information relating to the onset of the last menstrual period. If she is under prenatal care and provides her physician with this information, it is also necessary that the LMP date (or weeks of gestation) be transmitted from the

physician's office to the hospital where the birth will occur and where the certificate will be prepared. If either of these links in the chain of events is broken, there is a temptation on the part of hospital staff to second-guess the information. If weight at birth is 5½ pounds or more, the infant is often assumed to be full term and is recorded as having a gestational age of 40 weeks. This presumptive procedure has been described in a number of personal discussions with hospital personnel and, unfortunately, is said to be rather widespread. The magnitude of the effect on the statistical data is unknown, but from the degree of the statistical heaping at 40 weeks it is assumed to be serious.

Birth weight, on the other hand, is measured on hospital scales at time of birth for the large majority of infants who are born in hospitals. It is a more objective measure because it avoids the biases of maternal recall, and it does not depend on the transmittal of information from prenatal records in physicians' offices to hospital records. For infants born in hospitals, where scales are usually available and easily accessible, the recording of birth weight is probably more reliable and more complete than the recording of gestation.

For some of the years included in this report, the data for live births are based on samples (Technical Appendix). For the years 1951 to 1954 and 1956 to 1966, inclusive, the data are based on 50-percent systematic samples of live birth certificates. For the year 1967, the data are based on a 20- to 50-percent sample. All other years represent complete counts. Despite the limitations due to sampling, the data are acceptable for identifying major trends, although minor changes cannot be identified with confidence.

FINDINGS

The number of live births in the United States increased from about 3.6 million in 1950 to 4.3 million in 1957 (table 1). After a small decrease in 1958, the number increased again, reaching a peak of 4.3 million in 1961. Since then, there has been a steady decline until, in 1967, the number of live births (3.5 million) was about the same as it was in 1950. Of the 3.5 million live births in 1967, 2.9 million (83 percent) were white, and 600 thousand (17 percent) were infants of other races.

PERIOD OF GESTATION

Trends

The number of live births and percentage distributions of live births by period of gestation for white and for all other infants over the period 1950-67 are shown in tables 1 and 2, respectively. The large frequencies in the "Not stated" category in table 1 are due to the omission of a question regarding gestational age from the official record forms of certain States. When the live births which occurred in these States are omitted, the percent of records with gestation unspecified was relatively small: 3.4 percent in 1950 and 3.6 percent in 1967. The percentages shown in table 2 are based on records with stated gestational ages. The percentages are shown first for live births with gestational age under 37 weeks and those 37 weeks and over, the dividing point recommended by the World Health Organization for classifying infants into preterm and full-term deliveries.

For all births, there appears to be some decline in the proportion of live births which were classified as preterm in the first few years of the 18-year period. In recent years, particularly since 1965, the proportion seems to have stabilized. However, this decline has almost completely paralleled the decline in the 36-week group alone; in fact, the difference between the percentages in 1950 and those in 1967 are very close: 4.4 percent for all births and 4.7 percent for 36 weeks (table B). There is a remarkable consistency in the proportions in the two shortest gestation periods (less than 28 weeks, and 28-31 weeks). The most notable changes in the distributions by gestation which are shown in table 2 are the decreases over time in the gestation periods of 36 weeks and 40 weeks (or 40 weeks and over) and the increases in all other periods. The directions of change are opposite in

Table B. Percentage distribution of live births by gestation and color: United States, 1950 and 1967

Period of gestation	Total			White			All other		
	1950[1]	1967[2]	Difference	1950[1]	1967[2]	Difference	1950[1]	1967[2]	Difference
Total	100.0	100.0	...	100.0	100.0	...	100.0	100.0	...
Under 37 weeks	11.1	6.7	-4.4	10.4	5.9	-4.5	15.9	11.0	-4.9
37 weeks and over	88.9	93.3	+4.4	89.6	94.1	+4.5	84.1	89.0	+4.9
Under 28 weeks	0.6	0.6	-	0.5	0.5	-	0.8	1.1	+0.3
28-31 weeks	0.9	0.8	-0.1	0.8	0.7	-0.1	1.4	1.6	+0.2
32-35 weeks	2.0	2.5	+0.5	2.0	2.2	+0.2	2.1	3.9	+1.8
36 weeks	7.6	2.9	-4.7	7.0	2.6	-4.4	11.5	4.4	-7.1
37-39 weeks	8.5	17.5	+9.0	8.8	17.6	+8.8	6.7	16.9	+10.2
40 weeks	76.9	65.7	-11.3	77.1	65.6	-11.5	75.9	66.1	-9.8
41-42 weeks	3.0	8.4	+5.4	3.3	9.2	+5.9	1.3	4.7	+3.4
43 weeks and over	0.4	1.7	+1.3	0.4	1.7	+1.3	0.3	1.3	+1.0

[1] Excludes all live births recorded in Louisiana and Massachusetts.
[2] Excludes all live births recorded in Massachusetts and Maryland outside Baltimore.

adjacent gestation categories: a small increase in the group 32-35 weeks (2.0 to 2.5 percent), a decrease at 36 weeks (7.6 to 2.9 percent), a doubling at 37-39 weeks (8.5 to 17.5 percent), another decrease at 40 weeks (76.9 to 65.7 percent), and increases at 41-42 weeks (3.0 to 8.4 percent) and 43 weeks and over (0.4 to 1.7 percent).

The alternating increases and decreases lend credence to the hypothesis that the changes may be due to more accurate determination of weeks of gestation rather than a true change in gestation among live births. The increased accuracy may be attributed to two factors: introduction of the LMP item on the records in some parts of the United States and perhaps increased care in computing the weeks of gestation in other areas.

During the period 1950-67, two methods of deriving gestational age were used in the United States. The introduction of the new item requesting "first day, last menstrual period" resulted in a markedly different distribution of live births by period of gestation. The concentrations at single weeks which are multiples of 4 are markedly reduced, and there is a greater dispersion among the intermediate weeks of gestation (table C). The number of areas reporting LMP was never very large during the period covered by this report; live births in these areas accounted for only 17.1 percent of all live births in the United States in 1967.

A second possible factor affecting the distribution of live births by gestation is the scattered and sporadic attempts in a number of States to encourage physicians and hospitals to record weeks of gestation with greater accuracy when the question on the record is phrased in such terms. By comparing the 1950 distribution when none of the data were based on LMP and the distribution of areas reporting weeks of gestation in 1967, it is apparent that there were relatively minor changes in the distribution of gestational ages due to this factor (table D). The single group with the greatest frequency (40 weeks) decreased from 76.9 to 73.5 percent, which is still far from the 22.8 percent which was found when the onset of the LMP was reported (table C). Important relative changes were the decrease at 36 weeks (7.6 to 2.8 percent) and the increase at 37-39 weeks (8.5 to 13.7 percent). A greater part of the decrease at 36 weeks seems to be related to the increase in the longer gestation at 37-39 weeks rather than to the period of 32-35 weeks which appeared unchanged. Rather significantly, there was no major change in the three shorter gestation groups: only in the group representing

Table C. Number of live births and percentage distribution by period of gestation and color for areas reporting LMP and other areas: United States, 1967

Period of gestation and color	Total	Areas reporting LMP[1]	Areas reporting gestation period	Total	Areas reporting LMP[1]	Areas reporting gestation period
	Number			Percentage distribution		
Total	3,520,959	601,337	2,919,622	100.0	100.0	100.0
Under 28 weeks	18,956	3,660	15,296	0.6	0.7	0.6
28-31 weeks	26,478	5,687	20,791	0.8	1.1	0.8
32-35 weeks	80,837	24,321	56,516	2.5	4.8	2.0
36 weeks	93,821	16,680	77,141	2.9	3.3	2.8
37-39 weeks	571,062	193,600	377,462	17.5	38.5	13.7
40 weeks	2,142,988	114,639	2,028,349	65.7	22.8	73.5
41-42 weeks	274,739	111,599	163,140	8.4	22.2	5.9
43 weeks and over	54,217	33,102	21,115	1.7	6.6	0.8
Not stated	257,861	98,049	159,812	...	...	...
White	2,922,502	492,633	2,429,869	100.0	100.0	100.0
Under 28 weeks	12,476	2,153	10,323	0.5	0.5	0.5
28-31 weeks	17,625	3,626	13,999	0.7	0.9	0.6
32-35 weeks	59,102	16,992	42,110	2.2	4.1	1.8
36 weeks	69,021	12,333	56,688	2.6	3.0	2.5
37-39 weeks	475,721	156,564	319,157	17.6	37.8	14.0
40 weeks	1,770,029	97,832	1,672,197	65.6	23.6	73.2
41-42 weeks	248,291	97,030	151,261	9.2	23.4	6.6
43 weeks and over	46,760	27,575	19,185	1.7	6.7	0.8
Not stated	223,477	78,528	144,949	...	...	...
All other	598,457	108,704	489,753	100.0	100.0	100.0
Under 28 weeks	6,480	1,507	4,973	1.1	1.7	1.0
28-31 weeks	8,853	2,061	6,792	1.6	2.3	1.4
32-35 weeks	21,735	7,329	14,406	3.9	8.2	3.0
36 weeks	24,800	4,347	20,453	4.4	4.9	4.3
37-39 weeks	95,341	37 036	58,305	16.9	41.5	12.3
40 weeks	372,959	16,807	356,152	66.1	18.8	75.0
41-42 weeks	26,448	14,569	11,879	4.7	16.3	2.5
43 weeks and over	7,457	5,527	1,930	1.3	6.2	0.4
Not stated	34,384	19,521	14,863	...	...	...

[1] Figures by period of gestation for these areas are based on an item on the birth record—first day of last normal menstrual period (LMP). Areas included are Baltimore, California, District of Columbia, Minnesota and New York City.

Negroes and other minority races, at 32-35 weeks, was there a suggestion of an increase (2.1 to 3.0 percent). The improvement in reporting weeks of gestation between 1950 and 1967 is minor compared to the change which resulted from the introduction of the LMP date on the record forms in some States.

In summary, the changes in the distributions by period of gestation do not suggest that there was an increase in the incidence of preterm live births between 1950 and 1967. The fact that the early gestations (less than 36 weeks) were virtually unaffected lends further support to this view. On the contrary, it would seem that a great part, if not all, of the changes which were noted may well be associated with artifacts in the reporting of the data.

Color

When groups of infants are compared by color, one finds higher proportions of preterm

Table D. Percentage distribution of live births by color and period of gestation: United States, 1950, and areas not reporting LMP, 1967

Period of gestation	Total		White		All other	
	1950[1]	Areas reporting gestation period 1967[2]	1950[1]	Areas reporting gestation period 1967[2]	1950[1]	Areas reporting gestation period 1967[2]
Total	100.0	100.0	100.0	100.0	100.0	100.0
Under 28 weeks	0.6	0.6	0.5	0.5	0.8	1.0
28-31 weeks	0.9	0.8	0.8	0.6	1.4	1.4
32-35 weeks	2.0	2.0	2.0	1.8	2.1	3.0
36 weeks	7.6	2.8	7.0	2.5	11.5	4.3
37-39 weeks	8.5	13.7	8.8	14.0	6.7	12.3
40 weeks	76.9	73.5	77.1	73.2	75.9	75.0
41-42 weeks	3.0	5.9	3.3	6.6	1.3	2.5
43 weeks and over	0.4	0.8	0.4	0.8	0.3	0.4

[1] Excludes Louisiana and Massachusetts.

[2] Excludes Massachusetts and Maryland outside Baltimore. The following are LMP areas and are therefore also excluded: Baltimore, District of Columbia, Minnesota and New York City.

infants (less than 37 weeks) among Negroes and other minority infants than among the white infants. This relationship is evident throughout the period 1950-67 (table 2) and when the areas reporting LMP are shown separately (table C). In the early gestations (less than 36 weeks), there is the suggestion of a small increase in the proportions for Negroes and other minority infants, while proportions for white infants remain relatively unchanged (table 2). The number of live births included in these short gestational ages is a small proportion of the live births for each group.

Future Prospects

The Standard Certificates of Live Birth and Fetal Death were revised and recommended to the States for introduction beginning in 1968. On this revision, the question regarding gestation was changed to ask for the first day of the last menstrual period. Virtually all of the States have adopted the new form of live birth certificate and, as a consequence, it is hoped that within a few years more reasonable distributions of live births by gestation will be available. There will, inevitably, be a few years of accommodation during which physicians and hospital staffs will need to become accustomed to the new question. This may require the closer coordination of this item of information between physicians' offices and hospital record rooms. Recording the new information with greater accuracy and with a reasonable degree of completeness should make the data by period of gestation much more useful in considering perinatal problems. As was noted earlier, the gestation information, when reported in weeks, showed almost no improvement over the 18-year period included in this report. The change to the LMP form of inquiry was, therefore, not undertaken in haste, but only after serious consideration of the persistent distortions of the recorded information over a long period of time.

WEIGHT AT BIRTH

Trends

The number of live births and percentage distribution of live births by birth weight and color are shown for the period 1950-67 in tables 3 and 4, respectively. The large numbers of records with birth weight not stated consist mostly of births in States which did not have a

birth weight item on their live birth records (table 3). If these States are excluded, the percent of records with birth weight unspecified is small and has decreased: 2.7 percent in 1950 and 0.2 percent in 1967. Therefore, the percentages shown in table 4 are based on records with specified weight at birth.

The distribution of birth weight for all births has shown a remarkable degree of regularity during the period 1950-67, reflecting the relatively stable trend for white infants (table 4). For all births, the proportion weighing 2,500 grams or less at birth increased slowly from 7.5 percent in 1950 to 8.3 percent in 1965 and 1966. For 1967 it was only slightly less, 8.2 percent. For the year 1967 alone, this represented about 288,000 live born infants who, by definition, are low birth weight infants.

The proportion of low birth weight among white infants varied only from 6.7 to 7.2 percent in the study period (table 4 and figure 3). In the most recent 5 years which are shown (1963-67), the rates were either 7.1 or 7.2 percent. Although these are higher than the previous 5 years (1958-62), the rates in the first 5 years (1950-54) were almost equally high. For white infants, therefore, there is no evidence of any marked increase or prolonged increasing trend in the proportion of low birth weight infants: it was roughly 7 percent throughout this entire period.

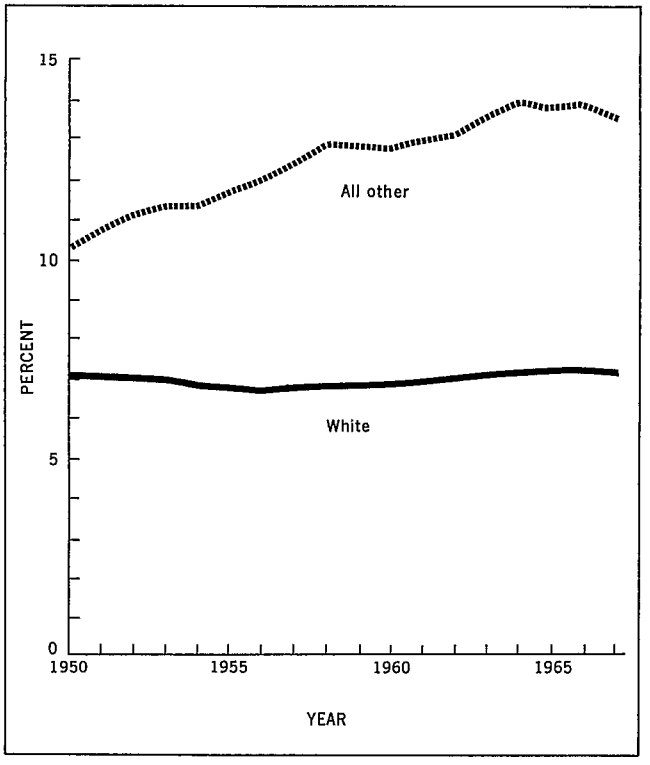

Figure 3. Percent of live births with low birth weight by color: United States, 1950-67.

The data for other infants differ in two respects. First, even in the earliest year shown (1950), the proportion weighing 2,500 grams or less at birth (10.2 percent) was significantly higher than that of white infants (7.1 percent), and it remained consistently higher through the 18-year period. Second, the difference between the two color groups has increased progressively. By 1967, when the proportion of low birth weights among white infants was the same as in 1950 (7.1 percent), the proportion for other infants was 13.6 percent compared with 10.2 percent in 1950. The annual figures showed a generally increasing trend for other than white infants over the period 1950-67 in contrast with the relatively unchanging proportions for white infants (fig. 3).

There are no offsetting or systematic increases and decreases between adjacent groups in the birth weight distributions for total, white, or other infants (table E). For the last group, it appears that there has been a shift of the entire birth weight distribution toward lower birth weights between 1950 and 1967. The shift results from rather regular decreases in each of the birth weight groups over 3,500 grams, with all of the counterbalancing increases in groups up through 3,500 grams. No corresponding shift is found in the distribution for white infants.

There has been a marked decrease in the number of records with birth weight unspecified for each color group. However, the greater part of the decline has resulted from an increase in the number of States including the birth weight item on their records. This development could have had relatively little effect on the national distribution since, for each State, the live births cover the complete range of birth weight. Once the data for these States were omitted, the proportions of certificates with birth weight unspecified were low, and their gradual decline is not of sufficient magnitude to account for the

Table E. Percentage distribution of live births by birth weight and color: United States, 1950 and 1967

Birth weight	Total			White			All other		
	1950[1]	1967	Difference	1950[1]	1967	Difference	1950[1]	1967	Difference
Total	100.0	100.0	...	100.0	100.0	...	100.0	100.0	...
2,500 grams or less	7.5	8.2	+0.7	7.1	7.1	-	10.2	13.6	+3.4
2,501 grams or more	92.5	91.8	−0.7	92.9	92.9	-	89.8	86.4	−3.4
1,000 grams or less	0.4	0.5	+0.1	0.4	0.4	-	0.6	1.1	+0.5
1,001-1,500 grams	0.6	0.7	+0.1	0.6	0.6	-	0.9	1.2	+0.3
1,501-2,000 grams	1.4	1.6	+0.2	1.3	1.3	-	2.0	2.7	+0.7
2,001-2,500 grams	5.1	5.4	+0.3	4.8	4.8	-	6.8	8.6	+1.8
2,501-3,000 grams	18.3	19.7	+1.4	17.8	18.3	+0.5	21.4	26.4	+5.0
3,001-3,500 grams	37.9	38.5	+0.6	38.3	38.7	+0.4	35.4	37.5	+2.1
3,501-4,000 grams	26.9	25.5	−1.4	27.5	27.1	−0.4	22.8	17.8	−5.0
4,001-4,500 grams	7.5	6.7	−0.8	7.6	7.3	−0.3	6.9	3.8	−3.1
4,501 grams or more	1.9	1.3	−0.6	1.7	1.4	−0.3	3.3	0.9	−2.4

[1] Excludes all live births recorded in Connecticut and Massachusetts.

shift in the entire national distribution of weight at birth for other than white infants.

In summary, therefore, one may conclude that the incidence of low birth weight has been higher among other infants than among white infants throughout the period 1950-67. Furthermore, the difference between the two groups has been generally increasing over this period.

Future Prospects

It is generally agreed that weight at birth is a more complete and more accurate item than gestational age. Birth weight, too, presents problems, but of a different nature. Birth weight is recorded on the vast majority of live birth records in pounds and ounces. To facilitate comparisons with medical data and with data for other countries where the metric system is used, birth weight is converted from pounds and ounces to grams and classified in 500-gram groups for publication. The equivalents in pounds and ounces and gram intervals are given in the Technical Appendix. The distribution of live births over these weight classes is not uniform: over 80 percent of live born infants weigh between 5 pounds 9 ounces and 8 pounds 13 ounces (2,501-4,000 grams) as shown in table E. The customary classes of 500 grams would seem to be too broad for a characteristic of small variation, and finer classes of 250 grams (or perhaps even 100 grams for the predominant weight groups) have been suggested.

Relatively little is known about the distributions of the detailed recordings of weight at birth on birth certificates. It is not beyond the realm of possibility that higher frequencies of live births may be recorded at certain rounded weights (whole pounds, half pounds, or quarter pounds) than at the intervening ounces. If such clusters exist, the class 2,001-2,500 grams would represent an overcount of live births because it includes both 4½ and 5½ pounds.

The ideal solution would be for hospitals to have scales from which the metric weight can be read directly, and for the weight of the infant to be recorded on the birth certificate in exact grams. Such data could then be grouped into any desired weight classes at the time of tabulation. However, this goal is not likely to be achieved in the near future. In the interim, a statistical study of recorded birth weights would enable one to gauge the effect of such clusters and to determine whether or not the basic data are amenable to classification into finer birth weight categories.

WEIGHT AT BIRTH AND PERIOD OF GESTATION

The effect of birth weight and period of gestation on neonatal mortality is available from two nationwide studies.[5,20] The low birth weight or preterm infant is subject to much higher risk of neonatal (or infant) death than other infants. In the nationwide study of neonatal mortality from linked birth and death records for the January-March 1950 cohort, neonatal mortality was found to be lower among "other" infants of low birth weight (164.7 per 1,000 live births) than among the comparable group of white infants (175.8 per 1,000).[20] This observation is in contrast with the usual relationship in mortality between infants of the two color groups. It was hypothesized that the reason for this atypical observation rests in the fact that, on the average, other infants weigh less than white infants with equal gestations. As a result, the low birth weight infants were felt to be more heavily weighted with infants having longer periods of gestation for "other" than for white infants. If this hypothesis were true, more favorable gestations could possibly account for the better survival which was noted among low birth weight infants of other than white infants. The question which presents itself is: Among infants of equal weight, do other infants have longer gestations than white infants, on the average?

To examine this hypothesis, the live births for 1967 were tabulated by period of gestation, weight at birth, and color. In view of the inaccuracies in reported weeks of gestation, the data are shown separately for areas reporting LMP and areas reporting weeks of gestation (tables 5 and F). Because of the quality of the gestation data, the first attempt to examine gestation and birth weight together is for 1967, which is presumed to be the best of the available data.

Areas Reporting LMP

Among low birth weight infants in areas reporting LMP, 50.9 percent of the white infants and 58.3 percent of other infants were determined to be preterm in 1967 (table F). The gestational age for infants in these areas was computed from the LMP date to the date of birth. In contrast to the hypothesis that lower neonatal mortality among other than white infants of low birth weight is associated with greater maturity, the data for 1967 suggest that there are higher proportions of preterm infants

Table F. Percentage distribution of live births by period of gestation within major birth weight groups for areas reporting LMP and areas reporting gestation period, by color: United States, 1967

Period of gestation	Areas reporting LMP[1]				Areas reporting gestation period			
	2,500 grams or less		2,501 grams or more		2,500 grams or less		2,501 grams or more	
	White	All other	White	All other	White	All other	White	All other
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Under 37 weeks	50.9	58.3	5.4	10.8	48.6	49.6	2.1	3.6
37 weeks and over	49.1	41.7	94.6	89.2	51.4	50.4	97.9	96.4
Under 28 weeks	6.3	10.2	0.1	0.4	6.1	7.5	0.0	0.0
28-31 weeks	9.3	11.9	0.3	0.7	8.1	10.0	0.0	0.1
32-35 weeks	25.9	26.6	2.5	5.5	20.2	18.0	0.4	0.7
36 weeks	9.4	9.6	2.5	4.2	14.1	14.1	1.6	2.8
37-39 weeks	33.3	26.9	38.1	43.7	22.0	16.2	13.4	11.7
40 weeks	7.4	6.4	24.8	20.7	27.8	33.4	76.7	81.5
41-42 weeks	5.9	5.3	24.7	18.0	1.4	0.7	7.0	2.8
43 weeks and over	2.4	3.2	7.0	6.7	0.2	0.1	0.9	0.5

[1] Refers only to births occurring within these registration areas—Baltimore, California, District of Columbia, Minnesota and New York City.

among the "other" group than among a comparable group of low birth weight white infants. The excess is evident in each of the four subdivisions included in the group, under 37 weeks. From 37 through 42 weeks, there are higher proportions of white than of other infants, and it is only in the longest gestation periods (43 weeks and over) that the proportion of other infants once again exceeds that of white infants.

For the remaining birth weight groups in the areas reporting LMP, there were proportionately more infants other than white in each of the gestation groups under 40 weeks than white infants. In each of the two major weight groups, it would seem that there were more preterm infants among other infants than among white infants in 1967. This would contradict the earlier hypothesis associating lower mortality in this group of low birth weight infants with longer average gestations. However, these data based on LMP relate to the year 1967, which is 17 years later than the January-March 1950 study, and the areas reporting LMP are not representative of the country as a whole.

The opposing tentative conclusions drawn from the study based on January-March 1950 data and on data for the year 1967 may stem from either or both of two artifacts. The conclusions for the earlier data are based on gestational age classes using weeks of gestation as recorded on the birth certificates. The conclusions for 1967 are based on data for selected areas using gestations derived from date of LMP and date of birth. Thus, as one possibility, the different results may be attributable to different measures of gestation. Second, the geographic coverage of the two sets of data are quite different: data for January-March 1950 covered the entire United States, while data for 1967 included only the States of California and Minnesota, and the cities of Baltimore, District of Columbia, and New York City. In addition to the possible effects of these two artifacts, it is also possible that a real change may have occurred in the distributions of gestational ages of "other" infants of low birth weight over the 18-year period.

To explore this matter a step further, table G was prepared to present available data for the entire United States for the years 1951, 1960, and 1967. These years were selected to cover the time span of this report, but 1951 was used in place of 1950 because the necessary data for the latter were not available. The table presents the proportions of live born infants within each birth weight group who are defined as preterm—i.e., less than 37 completed weeks of gestation.

On the whole, the proportion of preterm

Table G. Percent of live births which are preterm, within specified birth weight groups by color: United States, 1951, 1960 and 1967

Birth weight	1951[1]		1960		1967	
	White	All other	White	All other	White	All other
Total	8.9	14.1	6.3	11.4	5.8	10.9
2,500 grams or less	47.6	45.6	50.7	49.6	48.9	50.9
2,501 grams or more	6.0	10.4	3.1	5.8	2.6	4.7
1,000 grams or less	97.1	93.8	98.0	97.2	97.8	97.3
1,001-1,500 grams	91.6	87.1	93.1	90.1	93.1	92.7
1,501-2,000 grams	72.1	69.3	75.2	73.8	74.2	75.5
2,001-2,500 grams	31.9	29.1	34.0	31.4	32.6	31.8
2,501-3,000 grams	8.5	10.1	7.2	8.0	6.5	7.5
3,001-3,500 grams	5.3	9.1	2.5	4.9	2.0	3.6
3,501-4,000 grams	5.3	11.0	1.8	4.7	1.3	3.0
4,001-4,500 grams	5.6	14.0	1.7	5.7	1.2	3.4
4,501-5,000 grams	7.5	16.1	2.0	8.1	1.1	5.0
5,001 grams or more	9.5	14.2	2.5	9.3	1.3	7.4

[1] Excludes all live births recorded in Connecticut and Massachusetts.

infants was higher for other infants than for white in each of the years shown:

	White	All other
1951	8.9	14.1
1960	6.3	11.4
1967	5.8	10.9

Among low birth weight infants, some of the consistency disappears. In 1951 and 1960 for the low birth weight infants, there were proportionately fewer preterm infants among the other infants than among white infants.

	White	All other
1951	47.6	45.6
1960	50.7	49.6
1967	48.9	50.9

The observations for 1951 and 1960 agree with the data for January-March 1950, but the observation for 1967 does not. For all 3 years, however, the differences are small. These data are also affected to varying degrees by the problems associated with recorded weeks of gestation which were described earlier. Although the data include events which occurred throughout the United States and therefore avoid the artifact of geographic selection, the number of areas reporting LMP increased over this period of time. The areas reporting LMP accounted for no births in 1951, 14.3 percent of the total in 1960, and 17.1 percent in 1967. This increase would be expected to have some influence on the distribution of live births by gestational age. While one would tend to place more confidence in the data for 1967 than for 1951, over 80 percent of the data for 1967 are still based on recorded weeks of gestation and as a consequence are felt to be quite unsatisfactory. The decline in the proportion of live births in the group at 36 weeks, with most of it apparently shifting to 37-39 weeks, as shown earlier in this report, has also clouded the issue, particularly in view of the comparatively small differences in the percentages between the earlier and later time period. As a result, it is impossible to draw definite conclusions concerning the increase or lack of increase in preterm deliveries among white and other infants of low birth weight. However, if the data from areas reporting LMP in 1967 can be considered to be the best available data at the present stage of development, it would seem that a new hypothesis presents itself for further testing—i.e., that higher proportions of infants weighing 2,500 grams or less at birth are preterm among other infants than among white infants.

Areas Reporting Weeks of Gestation

The data for the areas reporting weeks of gestation are shown in table 5 for information purposes only, since they are considerably distorted by errors in the reported weeks of gestation. The concentration of so many live births in the "40-week" group has siphoned off enough events from other gestation groups to make it impossible to draw firm conclusions from the data. The heaping at 40 weeks appears more severe for other infants than for white infants, giving an illusion of lower proportions at 37-39 weeks, for example. However, one cannot discount the possibility that such observations may be due to errors in the reported weeks of gestation. Because the records from areas reporting weeks of gestation constitute over three-fourths of all live birth records, conclusions for the country as a whole cannot be inferred from the data.

In summary, the LMP data for 1967 do not suggest that there is a lower proportion of preterm infants among other infants than among white infants. Rather, the suggestion is that for low birth weight infants as well as for infants weighing more than 2,500 grams at birth, the proportion of preterm infants is higher for other infants than for white infants. However, for low birth weight infants, the difference is not very great. Unfortunately, a similar comparison cannot be made of the data for 1950 or 1951 because published data based on the LMP item are not available until after that time.

The marked increase in the proportion of low birth weight infants among "other" infants between 1950 and 1967 does not seem to be associated with an increase in preterm delivery, although the gestation data are not entirely satisfactory. The data are confounded by changes in reporting practices which limit their usefulness in quantifying

the changes in gestation distributions which occurred over the entire period 1950-67.

AGE OF MOTHER

Among the other factors which are known to be related to the proportion of low birth weight infants is the age of the mother at the time of the infant's birth. As is shown in figure 4, the proportion of infants weighing 2,500 grams or less at birth is highest at the lower ages, drops to its lowest level for mothers 25-29 years of age, increases thereafter, and drops once again in the oldest group shown (45 years and over). Because of the marked differences in rates, the distribution of live births by age of mother could have a decided effect on the proportion of low birth weight infants born in any given year. Over the interval covered by this report, the distributions of live births by age of mother have undergone some rather important changes (tables 6 and 7). For example, the proportion of live births born to mothers under 25 years of age was markedly higher in 1967 than in 1950 (table H). This increase is particularly important because of the higher incidence of low birth weight among infants of mothers under 20 years of age. Also, for other than white infants, the markedly higher proportion of live births among mothers under 25 years of age makes it important to consider age of mother as a possible associated factor which may be related to the increasing trend of low birth weight among their infants which was shown in figure 3.

The change in the incidence of low birth weight infants by age of mother is shown in table J and figure 4. Data for the entire year 1950 or 1951 are not available for this combination of variables. Instead, data from a special study for the period January-March 1950 were used.[60] The changes between the period January-March 1950 and 1967 are quite different for infants of the two color groups.

For white infants, there was almost no change in the proportion of low birth weight infants between the two groups: the rates were 7.0 and 7.1 percent (table J). Although there was a decrease in the proportion of low birth weight infants born to mothers under 15 years of age, the number of live births to this age group is but a very small part of the total. The changes in the next higher age groups, where the bulk of the births occur, are either small or negligible. The largest increases in low birth weight infants among the white group occurred in the two oldest age groups.

Among other than white infants, the proportion with low birth weight increased from 9.7 to 13.6 percent during the two time periods. There were no decreases; the incidence of infants of low birth weight increased for mothers in all age groups—the greatest increase occurring for mothers under

Table H. Percentage distribution of live births by color and age of mother: United States, 1950 and 1967

Age of mother	1950			1967		
	Total	White	All other	Total	White	All other
Total	100.0	100.0	100.0	100.0	100.0	100.0
Under 15 years	0.1	0.1	0.7	0.2	0.1	1.0
15-19 years	11.8	10.4	20.6	16.9	14.9	26.9
20-24 years	31.9	31.8	32.6	37.2	38.2	32.4
25-29 years	28.8	29.7	23.2	24.6	25.7	19.6
30-34 years	16.8	17.4	13.2	12.5	12.7	11.6
35-39 years	8.3	8.4	7.5	6.5	6.5	6.3
40-44 years	2.1	2.1	2.0	1.9	1.9	2.0
45 and over	0.1	0.1	0.2	0.1	0.1	0.1

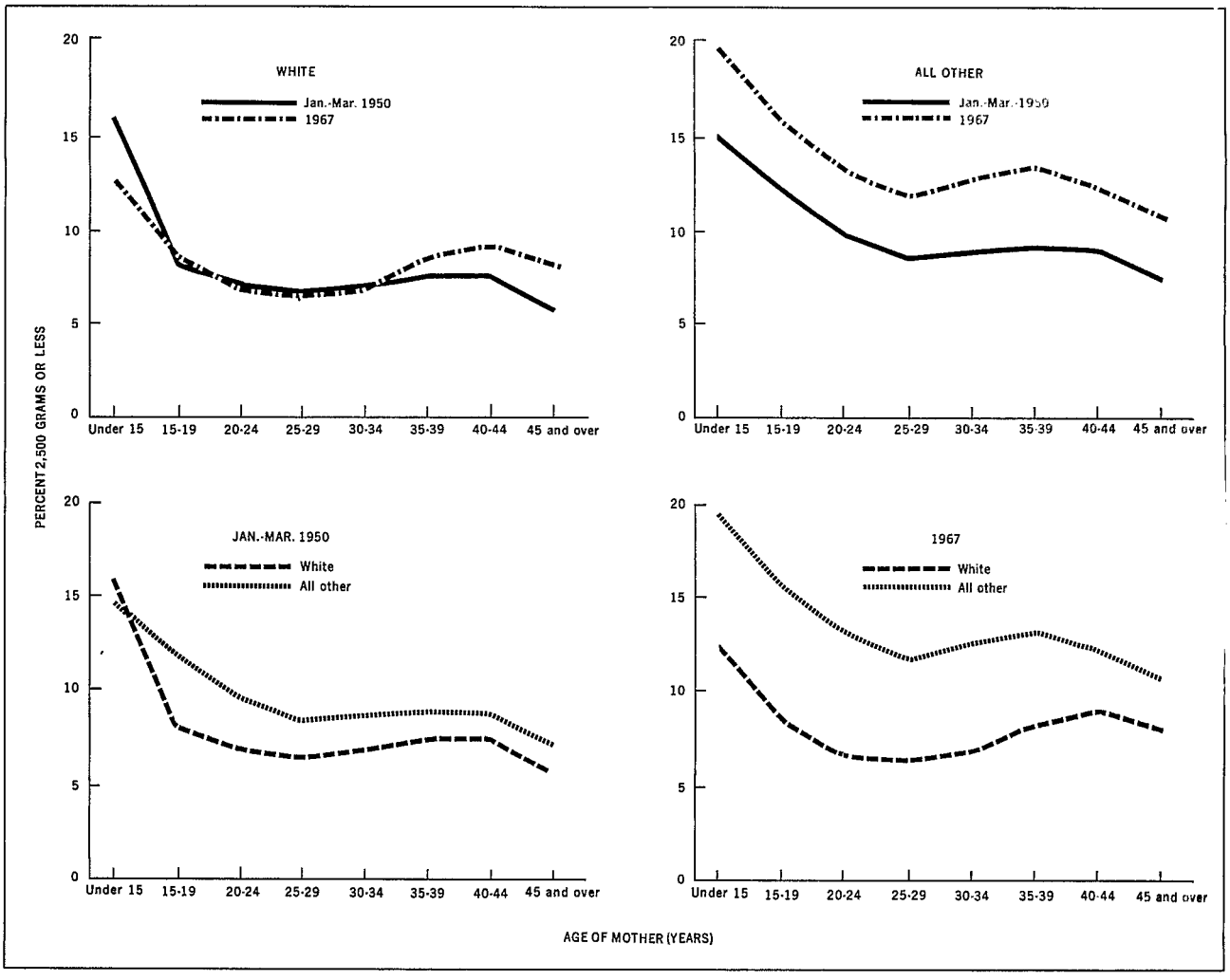

Figure 4. Percent of live births with low birth weight by age of mother: United States, January-March 1950 and 1967.

Table J. Percent of live births with low birth weight by age of mother and color: United States, January-March 1950 and the year 1967

Age of mother	Total			White			All other		
	Jan-Mar 1950[1]	1967	Difference	Jan-Mar 1950[1]	1967	Difference	Jan-Mar 1950[1]	1967	Difference
Total	7.4	8.2	+0.8	7.0	7.1	+0.1	9.7	13.6	+3.9
Under 15 years	15.1	17.2	+2.1	15.9	12.5	–3.4	14.7	19.5	+4.8
15-19 years	9.0	10.5	+1.5	8.0	8.5	+0.5	12.0	15.7	+3.7
20-24 years	7.3	7.7	+0.4	6.9	6.7	–0.2	9.6	13.2	+3.6
25-29 years	6.7	7.2	+0.5	6.5	6.5	-	8.4	11.8	+3.4
30-34 years	7.2	7.9	+0.7	7.0	7.0	-	8.8	12.6	+3.8
35-39 years	7.7	9.1	+1.4	7.5	8.3	+0.8	9.0	13.3	+4.3
40-44 years	7.7	9.6	+1.9	7.5	9.1	+1.6	8.9	12.2	+3.3
45 years and over	6.1	8.6	+2.5	5.7	8.1	+2.4	7.4	10.8	+3.4

[1] Excludes all live births recorded in Massachusetts.

15 years of age (+4.8 percent). The second highest increase was for ages 35-39 years (+4.3 percent), and the increases for all of the other age groups ranged between +3.3 and +3.8 percent.

The two upper charts of figure 4 illustrate the changes in the proportion of low birth weight by age of mother between January-March 1950 and the year 1967. They depict, graphically, the relatively small change for white infants and the relatively constant substantial increase for other infants. The smallest arithmetic increase in the latter group exceeds the largest increase in the white group.

The two lower charts compare the same data for the two color groups, first for the January-March cohort and then for the year 1967. The differential between the two color groups increased over the period covered in this report. For 1967, the difference between the color groups is greatest among mothers under 20 years of age, and least among the oldest group.

Both the distribution by age of mother and the age-specific rates of low birth weight affect the proportion of low birth weight infants for any group. For planning purposes, it is important to decide which of the two factors has the greatest effect on the levels for infants in the two color groups. A further examination of the data reveals that the difference in the distributions of age of mother has little effect on the color-specific rates; almost all of the difference is associated with differences in the age-specific rates of low birth weight. Thus, one may conclude that the stability of the proportion of infants of low birth weight among white infants and the increasing trend among other infants between January-March 1950 and the year 1967 is not attributable to the changing distributions of live births by age of mother.

BIRTH ORDER

Another factor associated with the proportion of low birth weight infants is order of birth. The study for January-March 1950 showed that for all births the rates are lowest for second births and are elevated for first births and higher birth orders:[60]

Total-birth order	Total	White	All other
	Percent 2,500 grams or less		
All birth orders	7.4	7.0	9.7
First	7.7	7.2	11.8
Second	6.9	6.5	10.1
Third	7.2	6.9	8.9
Fourth	7.5	7.4	8.3
Fifth and over	7.7	7.4	8.5

Distributions by birth weight and total-birth order are not routinely published for the United States and therefore the trends in proportions of low birth weight infants for other years could not be examined directly by birth order. However, the range in the proportions is smaller by order of birth than was the range by age of mother. Therefore, the effect of a changing distribution of total-birth orders is probably less than the effect of mother's age, and it would probably have less influence on the proportion of low birth weight infants for white and other infants. This inference is based on the relative magnitude of the proportions of low birth weight infants by age of mother and by birth weight, and cannot be demonstrated conclusively because of the lack of the basic data.

PLURALITY

Infants of plural births weigh, on the average, considerably less than those of single births. Thus plurality is also a factor which could affect the proportion of low birth weight infants in any given population. If the proportions of plural births were increasing for other infants but not for the white infants, a relative increase in the proportion of low birth weight infants could occur. Table K shows the rate of plural births per 1,000 live births. Although the rate is higher among other than white infants, it is not increasing. It must be concluded, therefore, that the increasing trend in low birth weight among other than white infants is not the result of increases in the rate of plural births.

Table K. Proportion of plural births by color: United States, 1950-67

Year	Total	White	All other
	Rate per 1,000 live births		
1950	20.9	20.2	25.3
1951	20.7	20.0	25.4
1952	20.7	19.9	25.6
1953	21.0	20.1	26.9
1954	20.9	19.9	26.4
1955	21.1	20.2	26.5
1956	21.3	20.4	26.6
1957	20.5	19.4	26.7
1958	20.6	19.5	27.0
1959	20.6	19.5	27.0
1960	20.4	19.3	26.3
1961	20.2	19.0	26.6
1962[1]	19.5	18.5	24.8
1963[1]	19.8	18.6	26.1
1964	19.9	18.7	26.1
1965	20.1	19.0	25.8
1966	19.8	18.8	24.6
1967	19.7	18.8	24.1

[1] Figures by color excluded for New Jersey.

SEX

Similarly, it can be shown that the increasing trend in low birth weight among other than white infants is not related to a change in the sex ratio at birth. It is known that male infants are, on the average, heavier than female infants. Thus if the sex ratio (males per 1,000 females) were decreasing, there would be fewer heavier babies among the live births, and the proportion of low birth weight infants would be expected to increase. However, from table L, it is apparent that there has not been a gradually decreasing sex ratio. Moreover, the changes in sex ratio from year to year are relatively minor compared to the increasing trend of low birth weight among other than white infants. As with age of mother and plurality, a changing trend in the sex ratio at birth cannot account for the observed trends in the proportion of low birth weight infants.

PLACE OF BIRTH AND ATTENDANT

The comparability of the data on length of gestation over the years 1950-67 has been

Table L. Sex ratio of live births by color: United States, 1950-67

Year	Total	White	All other
	Males per 1,000 females		
1950	1,054	1,058	1,025
1951	1,052	1,058	1,018
1952	1,051	1,059	1,011
1953	1,053	1,058	1,025
1954	1,051	1,056	1,020
1955	1,051	1,056	1,020
1956	1,052	1,056	1,028
1957	1,050	1,055	1,025
1958	1,050	1,054	1,022
1959	1,049	1,054	1,023
1960	1,049	1,055	1,018
1961	1,050	1,055	1,023
1962[1]	1,048	1,052	1,024
1963[1]	1,053	1,057	1,030
1964	1,047	1,052	1,022
1965	1,051	1,056	1,028
1966	1,049	1,053	1,025
1967	1,050	1,056	1,020

[1] Figures by color excluded for New Jersey.

challenged in this report on the basis of improper recording of weeks of gestation on a large proportion of live birth certificates. With birth weight, as well, one might question the comparability of the data over the 18-year period. Between 1950 and 1967, the proportions of live births which occurred in hospitals increased, and the increase was much greater for other infants than for white infants (table M). For infants who were born in hospitals, where scales are available and easily accessible, the recording of birth weight is presumably more accurate than for infants born at home. Thus one might well consider whether the shift in the distribution by birth weight among "other" infants is real or whether it reflects the greater use of hospitals in 1967 than in 1950.

Over the period of time covered by this study, increasing proportions of live births have occurred in hospitals for both color groups:

Place of delivery and attendant	White		All other	
	1950	1967	1950	1967
	Percentage distribution			
Total	100.0	100.0	100.0	100.0
Born in hospitals	92.8	99.4	57.9	92.9
Born outside hospitals:				
Physician	5.9	0.3	14.3	1.1
Midwife, other, not specified	1.3	0.4	27.8	6.0

The increase in hospital delivery was especially great among "other" infants (from 57.9 to 92.9 percent), while the decreases in births outside hospitals was marked whether physicians or other attendants were present. The changes for white infants were in the same directions as for other infants (an increase for hospital deliveries, and decreases for the other two groups), but were much smaller in magnitude. Since the changes were smaller for white than for other infants, the effect on the birth weight distributions, if any, would also be expected to be smaller for white infants. This possibility gives rise to the question: Could such a statistical artifact be responsible for the shift in the distributions of "other" infants toward lower birth weights?

Most of the increase in the hospital delivery occurred between 1950 and 1960. The arithmetic increase from 57.9 to 85.0 percent between these 2 years (27.1 percent) was over three times the increase between 1960 and 1967 (7.9 percent). If the changing pattern of recorded birth weights is associated with the increase in hospital deliveries, one would expect a greater effect on birth weight among other than white infants during the period 1950-60 than 1960-67, and this pattern is reflected in the data. The increase in low birth weight among these infants was about three times as great between 1950 and 1960 (2.6 percent) as between 1960 and 1967 (0.8 percent). This observation would be consistent with a hypothesis associating the increase in low birth weight with the increase in hospital deliveries.

Another approach is to consider whether the magnitude of the difference in percentage of low birth weight for other than white infants

Table M. Percent of live births which occurred in hospitals and percent with low birth weight by color: United States, 1950-67

Year	White		All other	
	Born in hospital	Low birth weight	Born in hospital	Low birth weight
1950	92.8	[1]7.1	57.9	[1]10.2
1951	94.4	[1]7.0	62.4	[1]10.7
1952	95.7	[1]7.0	66.4	[1]11.1
1953	96.5	[1]7.0	70.3	[1]11.3
1954	97.0	[1]6.8	73.1	[1]11.3
1955	97.5	[1]6.8	76.0	[1]11.7
1956	98.0	[2]6.7	78.7	[2]12.0
1957	98.2	[3]6.8	81.1	[3]12.4
1958	98.4	[3]6.8	82.5	[3]12.9
1959	98.7	6.8	83.7	12.9
1960	98.8	6.8	85.0	12.8
1961	98.9	6.9	86.0	13.0
1962[4]	99.0	7.0	86.9	13.1
1963[4]	99.1	7.1	87.9	13.6
1964	99.1	7.1	89.0	13.9
1965	98.9	7.2	89.8	13.8
1966	99.3	7.2	91.6	13.9
1967	99.4	7.1	92.9	13.6

[1] Excludes all live births recorded in Connecticut and Massachusetts.

[2] Excludes all live births recorded in Massachusetts for entire year and Connecticut for part of year.

[3] Excludes all live births recorded in Massachusetts.

[4] Figures by color excluded for New Jersey.

between 1950 and 1967 could be attributed to misreporting of weight at birth in 1950, and thus be due to artifacts. For the sake of discussion, one could hypothesize that, in reality, the birth weight distribution did not change between 1950 and 1967, but that the data may reflect better reporting of weight at birth in 1967 because of the marked increase in the proportion of births which occurred in hospitals. Under this hypothesis, how would the distribution of live births have appeared in 1950, based on the 1967 experience? This line of questioning is pursued in table N. The first column contains the number of "other" live births in 1950 according to recorded weight at birth. All infants whose birth was recorded in Connecticut (1,428) and Massachusetts (2,243) have been excluded because the official records of these States did not request weight at birth. The second column contains the expected number of live births which would have been recorded in the various weight groups in 1950 under the hypothesis that live births in that year were actually distributed in the same proportions as in 1967, and that the differences between the two distributions are due to erroneous recording of birth weight for infants delivered outside hospitals in 1950. The third column reflects the differences between the frequencies in each of the birth weight groups.

One notable difference between the observed and expected number of births is the marked decrease from 27,766 to 1,694 in the number of infants with weight unspecified. This difference of 26,072 includes infants whose birth records failed to include a specified birth weight in 1950, and about half of them were born in hospitals. In addition to the 26,072 infants with weight unspecified in 1950 which are represented in actual weight categories in the expected distribution, another 83,886 seem to have been allocated to an improper weight category in the observed distribution. In all, for the 1950 group of other than white infants to have really had a distribution like that of 1967, there would have had to be a change in the weight group allocation of 109,958 of the 486,851 births (23 percent).

Looking at the cells in more detail, if the birth weight distributions of the live births in 1950 were really the same as in 1967, only 109,286 live births weighing 3,501 grams or

Table N. Birth weight distribution of infants of Negro and other races observed in 1950, and as expected based on the 1967 experience: United States

Birth weight	Observed	Expected[1]	Difference	
	Number of live births			
Total	[2]486,851	486,851	—	
1,000 grams or less	2,632	5,258	+2,626	
1,001-1,500 grams	4,073	6,060	+1,987	+18,846
1,501-2,000 grams	8,963	12,869	+3,906	
2,001-2,500 grams	31,376	41,703	+10,327	
2,501-3,000 grams	98,334	128,235	+29,901	+49,169
3,001-3,500 grams	162,478	181,746	+19,268	
3,501-4,000 grams	104,540	86,433	-18,107	
4,001-4,500 grams	31,613	18,554	-13,059	-41,943
4,501 grams or more	15,076	4,299	-10,777	
Not stated	27,766	1,694	-26,072	-26,072

[1] Based on distribution of live-born infants in 1967.
[2] Excludes data for Connecticut and Massachusetts.

more would have been expected in the year 1950, whereas 151,229 were actually so designated. This difference of 41,943 far exceeded the expected decrease in the number with birth weight unspecified (26,072). Furthermore, the two differences do not offset each other since both have decreased.

At the other end of the birth weight scale, under the present hypothesis, the expected number of low birth weight infants should have been 65,890 instead of the 47,044 which was observed, an understatement of 18,846 infants in these weight groups. Numerically, it is possible that all of the increase could have come from the category with weight not stated (26,072). However, one may question that such a large proportion (72 percent) of the group with weight unspecified should have been low birth weight infants, when only about 13 percent of all infants were in that weight class.

In all of the weight groups of 3,501 grams or more, it would also be numerically possible that the decrease of 41,943 infants would have had their birth weight misreported in 1950 so as to fall almost completely within the categories between 2,501 and 3,500 grams. However, the arithmetic coincidences which are required to explain away all of the changes on the basis of statistical artifacts challenge the imagination.

It seems much more reasonable to accept the fact that most of the 58 percent of other than white infants who were delivered in hospitals in 1950 were probably actually weighed and satisfactorily recorded. An additional 14 percent of infants were born outside hospitals, but their deliveries were attended by physicians, and their weights were also probably fairly well reported. If one accepts these assumptions, then the remaining 28 percent of live births delivered outside hospitals which were attended by nonphysicians would then have to account for the entire distortion of the birth weight data. To maintain that the phenomenon is due entirely to misreporting of birth weight for nonhospital births delivered by nonphysicians in 1950 would imply that as many as half of the birth weights of this 28 percent would have been overstated.

The average weight of infants in the observed distribution is 3,245 grams, and in the expected distribution 3,079 grams, a difference of 166 grams, on the average. If this effect on the distribution of all infants were attributable to overstatement among half of the infants who were born outside hospitals and whose birth was attended by nonphysicians, the overstatement for the latter group would have averaged 1,230 grams (about 2 lbs. 9 oz.) for each infant. The magnitude of this overstatement in relationship to the median weight of 3,120 grams (6 lbs. 14 oz.), is quite large and may be magnified to some extent by the assumption that the birth weights recorded for the 14 percent delivered by physicians outside hospitals were adequately recorded. In any event, this degree of misreporting is felt to be too great to be an acceptable explanation of the *total* difference between the observed and expected distributions. The truth probably lies somewhere between the two extremes. If the difference between the observed and expected distributions of birth weights of other infants is too great to be attributed to misreporting alone, neither can the *entire* difference reasonably be attributed to an actual shift in the birth weight distribution.

An alternate approach to estimate the possible effect of incorrect reporting of birth weight for nonhospital births is to assume that the entire difference in the birth weight distributions between infants born in hospitals and infants born outside hospitals in any given year is due to erroneous recording of birth weight information for infants born outside hospitals. This assumption implies that, in reality, the true proportionate birth weight distributions are identical for (a) infants born in hospitals, (b) infants delivered by physicians outside hospitals, and (c) infants delivered by nonphysicians outside hospitals. Any differences in the observed proportions are assumed to be artifacts due to incorrectly recorded birth weight. The color-specific distributions are not identical to each other.

Between 1950 and 1967, there were marked changes in the proportions of infants by place of delivery and attendant, as has already been demonstrated. If these proportions for 1967 are used to weight the birth-weight-specific proportions in each place of delivery and attendant group in 1950, the expected distributions for 1950 reflect the combined effect of the hypothetical error in recorded birth weights in 1950 and also the changing proportions in place of

delivery and attendant groups between 1950 and 1967 (table O).

Under these assumptions, the expected changes in the distribution of white infants closely resembled the actual observed distribution in 1967. However, for "other" infants, the changes in the birth weight distributions would have accounted for only half of the actual increase in low birth weight infants between 1950 and 1967. The remainder, unexplained by the assumed error in recorded birth weights, or to the changing patterns of place of delivery and attendants, may possibly be attributable to a genuine increase in the proportion of low birth weight infants in this group.

This line of reasoning requires an assumption about birth weight that is presently not subject to verification. There is no way of reweighing the infants to validate their birth weights. In addition, this method assumes that the proportion of infants in the three attendant groups is constant for each birth weight group within each of the color groups of infants. To the extent that these assumptions are valid, the method yields a crude estimate of the possible effect of errors of recorded weight. Ideally, one would like to determine conclusively whether increases in the proportion of low birth weight among other than white infants are real or are due to other factors, such as more complete registration of live births, more complete reporting of weight at birth, or more accurate reporting of birth weight. In contrast to laboratory situations where an experiment can be repeated any number of times, it is impossible to replicate the same birth weight information under each of a number of alternative situations after the fact. For example, one cannot document the birth weight of infants who were not registered in 1950 but whose counterparts were registered in 1967. Also, one cannot determine, even within a given year, to what extent the recorded birth weight of the same infant would have differed if it had been born in a hospital instead of elsewhere. Instead, one must rely on distributions of events occurring at different points in time, coupling the observations with what is known about registration, and drawing inferences rather than deductions.

Tabulations of live births by color, weight at birth, and place of delivery (hospital or nonhospital) are not published annually. Such data have been found only for 2 of the 18 years included in this report, 1950 and 1951. The

Table O. Estimate of the effect of changing proportions of births by place of delivery and attendant on weight-specific distribution of live births by color: United States, 1950 and 1967

Weight at birth	White			All other		
	1950		1967	1950		1967
	Observed	Theoretical[1]	Observed	Observed	Theoretical[1]	Observed
Total	100,000	100,000	100,000	100,000	100,000	100,000
2,500 grams or less	7,059	7,113	7,112	10,246	11,936	13,582
2,501 grams or more	92,941	92,887	92,889	89,753	88,064	86,418
1,000 grams or less	401	402	437	573	729	1,084
1,001-1,500 grams	554	552	552	887	1,019	1,249
1,501-2,000 grams	1,310	1,321	1,338	1,952	2,290	2,653
2,001-2,500 grams	4,794	4,838	4,785	6,834	7,898	8,596
2,501-3,000 grams	17,805	18,096	18,342	21,420	25,157	26,432
3,001-3,500 grams	38,324	38,730	38,716	35,392	37,825	37,461
3,501-4,000 grams	27,519	27,350	27,101	22,771	19,205	17,815
4,001-4,500 grams	7,595	7,299	7,321	6,886	4,495	3,824
4,501 grams or more	1,698	1,412	1,409	3,284	1,382	886

[1] Derived by applying the 1967 proportions of live births delivered in hospitals, delivered by physicians outside hospitals, and delivered by midwives and others outside hospitals to the weight-specific distributions of each of these categories in 1950. Births with birth weight unspecified are excluded.

experience of these 2 early years may not be representative of the entire period, but the data are indicative of events at midcentury. For the specified years, the proportions of low birth weight infants in each of the groups are as follows:

Place of delivery and attendant	White		All other	
	1950	1951	1950	1951
	Percent[1]			
Total	7.1	7.0	10.2	10.7
Born in hospitals	7.1	7.1	12.3	12.5
Born outside hospitals:				
Physician	6.2	6.4	8.8	8.8
Midwife, other, not specified	6.7	7.0	6.3	6.8

[1] Based only on stated birth weights.

For white infants, the proportion of infants born in hospitals who were of low birth weight remained unchanged while there were increases among those born outside hospitals. In contrast, for "other" infants, there was an increase in the proportion of low birth weight infants among those delivered in hospitals. For those born outside hospitals, the proportion of infants who were of low birth weight remained unchanged for those delivered by physicians, but increased for those delivered by nonphysicians. Since the data are for successive years 1950 and 1951, they do not permit one to draw conclusions about trends in terms of the entire period covered by this study.

Another factor which may have affected the distribution of birth weight of live born infants is the degree of completeness of live birth registration. Tests of completeness were carried out for the period January-March 1950 and again in 1970 for infants born during the 5-year period 1964-68.[6,1] The percentage completeness of registration of live births of white infants was estimated as 98.6 for January-March 1950 and 99.4 for 1964-68. Corresponding percentages for other live born infants are 93.6 and 98.0. Since 1950, the proportion of low birth weight infants has remained almost stationary at 7 percent for white infants, and it has increased from 10.2 to 13.6 percent for other infants (table 4). Perhaps part of the increase for the latter group may be associated with more complete registration of live births, but this factor is probably of less importance than some of the other factors which have been mentioned.

One characteristic of the change in the distribution of birth weight for other than white infants which is worthy of mention is the pervasiveness of the phenomenon. Each category of birth weight was affected to some degree, resulting in a shift of the entire distribution toward lower birth weight (table P). There were actually *decreases* in the numbers of live births in weight groups over 4,000 grams (8 lb. 14 oz.) between 1950 and 1967, at the same time that there were increases in the lower weight groups. For example, the number of live born infants in the weight group over 4,000 grams declined from 46,689 in 1950 to 28,093 in 1967 despite a 22 percent increase in the number of live births in the same period (table 3). Such changes may reflect, to some extent, determined efforts to control the weight of fetuses in order to avoid complications associated with the delivery of large fetuses. For example, one such condition, overweight in a fetus which is related to diabetes in the mother, is amenable to control in the prenatal period if the mother is under the care of a physician. The decreases in the frequencies in the upper weight groups may reflect, in part, increased prenatal care and the control of adverse maternal conditions. Such changes would constitute some of the real factors which

Table P. Percent change in number of live births by birth weight and color: United States, 1950 to 1967

Birth weight	Total	White	All other
Total	−0.9	−4.6	+22.0
2,500 grams or less	+8.5	−3.9	+61.7
2,501 grams or more	−1.7	−4.7	+17.5
1,000 grams or less	+27.5	+3.8	+130.7
1,000-1,500 grams	+10.6	−5.0	+71.8
1,501-2,000 grams	+10.6	−2.6	+65.8
2,001-2,500 grams	+6.0	−4.8	+53.4
2,501-3,000 grams	+6.7	−1.7	+50.6
3,001-3,500 grams	+0.6	−3.6	+29.1
3,501-4,000 grams	−5.9	−6.1	−4.5
4,001-4,500 grams	−11.1	−8.0	−32.2
4,501 grams or more	−31.8	−20.9	−67.1

could affect the birth weight distributions in contrast to the statistical artifacts which have been emphasized earlier in this report.

Although the exact effect of the various possible factors explaining low birth weight cannot be quantified, there is no question about the regularity of the changes in birth weight for other than white infants. This is in contrast to the erratic picture encountered in the review of data by gestational age, where faulty data were a major contributing factor. Although it cannot be stated categorically that the entire shift is due to real factors, neither can the change be dismissed summarily as a statistical artifact.

Even though the full explanation is not known, there is no question about the fact that for 1967, the proportion of low birth weight infants for other than white infants (13.6 percent) is almost double the proportion for the white group (7.1 percent) (table 4). Having identified these two sharply contrasting groups with regard to low birth weight, epidemiological studies of the two groups are the next logical step. Such studies could supplement the information already included on vital records with a host of other factors, some of a biological, some of an environmental, and some of a socioeconomic nature. In past decades, studies of this kind have contributed to the solution of problems associated with a number of communicable diseases. The potential of such studies in solving the problems of prematurity is relatively unexplored.

INTERNATIONAL COMPARISON

In the United States, the proportion of live born infants weighing 2,500 grams or less at birth increased for all births from 7.5 percent in 1950 to 8.2 percent in 1967 (table 4). That the level of mortality in the first year of life (infant mortality) is related to the proportion of low birth weight infants is generally accepted. However, the magnitude of the effect is not always recognized: the risk of death during the first 4 weeks of life (neonatal death) among low birth weight infants is 30 times the risk for heavier infants.[5] Because of the relationship of low birth weight to infant mortality, an attempt was made to gauge the possible effect of the change in proportions of this magnitude on infant mortality rates.

Infant mortality in some of the other medically and economically advanced countries is considerably lower than in the United States. For example, for 1966 the rates were:[3]

Sweden	12.6
Netherlands	14.7
Australia	18.2
United States	23.7
White	20.6
All other	38.8

Even when the data for the United States are limited to white births, a considerable differential remains between the rate for this country (20.6) and those for Sweden (12.6) and the Netherlands (14.7). In these two European countries, the proportion of low birth weight infants is reported to be about 5 percent.[3, 62] A Swedish investigator has suggested that the difference between the infant mortality rates of Sweden and the United States may be due to a considerable extent to differences in the birth weight distributions in the two countries.[62]

The Committee on Maternal Nutrition of the National Research Council, National Academy of Sciences, considered the relation of nutrition to fetal growth and development. Its report states, in part:

> Among healthy women who have well-balanced diets and eat "to appetite," the range in weight gains is very wide. The target of 20 to 25 pounds has been found to be a reasonable average. The Working Group agreed that gains in this range are consistent with the most favorable outcome of pregnancy and that a weight-reduction program that distorts normal gain should not be imposed during pregnancy.
>
> Current obstetric practice in the United States tends to restrict weight gain during pregnancy. In view of the evidence available, one may raise the question of whether this practice is in effect contributing to the large number of low-birth-weight infants and to the high perinatal- and infant-mortality-rates.[63]

From an infant mortality study based on linked birth and death records for the cohort of infants born alive in the United States in 1960, it was determined that the risk of neonatal and infant death in relation to weight at birth was as follows:[5]

Weight at birth	Risk of infant death	Risk of neonatal death
	Per 1,000 live births	
All weights	25.1	18.4
2,500 grams or less	190.3	171.6
2,501 grams or more	11.2	5.5

Using these rates, one can construct a set of hypothetical cohort death rates for a series of birth cohorts having varying percentages of births weighing 2,500 grams or less at birth:

Percent low birth weight	Expected risk of death	
	Infant	Neonatal
	Per 1,000 live births	
5.0	20.2	13.8
6.0	21.9	15.5
7.0	23.7	17.1
8.0	25.5	18.8
9.0	27.3	20.4
10.0	29.1	22.1
11.0	30.9	23.8
12.0	32.7	25.4
13.0	34.5	27.1
14.0	36.3	28.8
15.0	38.1	30.4

If one group of live births has 5 percent of its births weighing 2,500 grams or less and experiences the weight-specific risks of death shown, the overall risk of infant death would be expected to be 20.2 per 1,000 live births. If another group has 7 percent of its births weighing 2,500 grams or less at birth, the expected rate would be 23.7. If 14 percent of live births are of low birth weight, the expected rate would be 36.3. The differences in these three expected rates are due entirely to the different proportions of low birth weight infants because the risks of death which were used for the birth weight distributions are identical throughout. Obviously, even small increases in the proportion of low birth weight infants can produce significant increases in the overall risk of infant or neonatal death.

If in Western European countries such as Sweden or the Netherlands only 5 percent of live born infants weigh 2,500 grams or less at birth and the proportion in the United States is 8 percent, the arithmetic weighting could account for perhaps half of the total difference between the infant mortality rates for the United States and the other two countries. The remaining half is assumed to be attributable to other factors. Although the cohort mortality rates and the traditional infant mortality rates are not arithmetically identical, they are sufficiently close to permit this kind of comparison. The hypothetical data are presented to indicate the marked effect which can be produced on neonatal and infant mortality rates by what may at first glance appear to be small differences in the proportions of low birth weight infants. Because of the high mortality among low birth weight infants, even small increases in proportions of low birth weight infants assume significance. They may be useful to clinical and public health planners in better understanding the nation's position with regard to low birth weight and infant mortality.

SUMMARY AND CONCLUSION

SUMMARY

The purpose of the present report is to summarize the changes in "prematurity" in the United States between 1950 and 1967. Because of incomplete registration of fetal deaths and deficiencies in the information recorded on fetal death records, the study is limited to live births.

The report considers the distributions of live births in the United States according to two indexes of prematurity—i.e., birth weight and period of gestation. The effort was stimulated by reports which implicated low birth weight as an important factor associated with trends in infant and neonatal mortality. An increase in the proportion of low birth weight infants is not evident in the national data for the total group of live births or for the white infants, who constitute 83 percent of the total. However, for "other" infants an increase in the proportion of low birth weight infants is noted. The proportions of low birth weight infants for individual hospitals or cities can be affected by the changing nature of urban populations which, in recent years, have witnessed sizable in-migrations of Negroes and other minority groups and out-migrations of the white group. In some instances, population shifts have markedly

changed the composition of a city's population or of a hospital's patient load. This demographic drift may account for increases in the proportion of low birth weight infants in individual urban hospitals.

From the national data, one reaches a tentative conclusion that there appears to be relatively little change in the distribution of live births by period of gestation between 1950 and 1967. The conclusion is qualified as "tentative" because of the apparent inaccuracies in the majority of recorded gestational ages for which the data are recorded in weeks. Conclusive data will probably never be available with regard to gestational age over this period of time, and conclusions for the period must remain somewhat conjectural.

Observations with regard to birth weight are quite different. As a variable, birth weight is a more reliable item than gestation. Thus, one can say with more confidence that changes have occurred. The proportion of low birth weight infants increased from 7.5 to 8.2 percent over the period 1950-67 (table 4), which at first glance does not appear to be a large increase for the population of births as a whole. However, while there appeared to be little change for white infants, the proportion of infants of low birth weight among other infants increased from 10.2 percent to 13.6 percent. The increase is not attributable to changing distributions of live births by age of mother, plurality, or sex, and it is probably not due in its entirety to higher proportions of other than white infants who were delivered in hospitals with a resulting improvement in accuracy of reported birth weights.

The trend in proportions of low birth weight infants for white and for other infants diverged over the period of the study. While the rates for white live births remained relatively stable, the rates for other infants increased. The divergent trends could not be explained on the basis of the factors which were available for comparison. The reporting of gestational age is subject to considerable inaccuracies, but the available evidence did not suggest that the increasing proportions of low birth weight for other than white infants were associated with concurrent increases of similar magnitudes in preterm deliveries.

The present study has demonstrated a health problem in a significant and identifiable portion of the Nation's population: an apparent increasing proportion of low birth weight among other than white infants. About 90 percent of these births are Negroes, and the remaining 10 percent is composed of American Indians, Oriental, and other groups. The findings for this diverse group reflect the experience of its Negro majority, but they may not reflect similar patterns for the smaller minority groups such as American Indians or Orientals.

One may ask whether the difference in trends between the white and the other groups are due to changes in their respective socioeconomic conditions between 1950 and 1967. Unfortunately, the national data for the period 1950-67 do not provide infant mortality or prematurity data classified according to a socioeconomic indicator, and the data could not be examined in relation to this factor. The separation into white and other infants, of itself, provides a type of socioeconomic stratification, but it cannot provide any information according to socioeconomic stratification within each group. Thus, one cannot explore the possible relationship between trends in prematurity and the socioeconomic changes which may have occurred during the period covered by the study.

QUALITY OF DATA

One of the important side benefits of the study has been the redemonstration of some of the limitations of the Nation's vital statistics system. The deficiencies in fetal death registration have been reported elsewhere.[44] In that report, it was estimated that a significant amount of underregistration of fetal deaths exists: perhaps 20-25 percent of fetal deaths of 20 weeks or more of gestation are not registered. Reporting of fetal deaths for all of the States is required for at least those of 20 completed weeks or more of gestation or an equivalent, but fetal deaths at these gestational ages represent only about 20 percent of all fetal deaths. The failure to record birth weight on many fetal death records when the fetus is preterm introduces a bias in the birth weight data. These deficiencies, among others in fetal death registration, have precluded the production of fetal death and perinatal data of genuine utility to

researchers, program administrators, and planners.

For live births, fortunately, the registration is very nearly complete. However, the same deficiencies which are found in the reported period of gestation for fetal deaths are found for live births as well. When gestation was recorded in weeks of gestation on the live birth records, 73.5 percent of the gestational ages were reported to be 40 weeks (table C). When the gestational age was computed from the first day of the last menstrual period, only 22.8 percent were allocated to 40 weeks. It is difficult to reconcile the inadequacies of the gestational age data with the high proportion of live births that are born in hospitals in the United States (98 percent in 1967). In the absence of factual information, one might assume that gestational age data derived under such a system should be highly reliable, but the heapings at 40 weeks and at 36 weeks, with indications of other less prominent clusters at other multiples of four, tend to negate this assumption.

The Standard Certificates of Live Birth and Fetal Death, after which most of the States pattern their certificate forms, have recently been revised. The Surgeon General of the Public Health Service recommended to the States that these standard forms be introduced for regular use beginning in 1968. Most of the States have introduced new certificate forms as recommended, and the new items on these forms will increase the information available for future study. Among the changes on the forms are the date on which the last normal menses began, which should improve the gestational age data, and the education of father and mother, which should provide a socioeconomic indicator. These changes will, of course, not overcome the inadequacies of past data, but new data should form a base for better information in the future.

CONCLUSION

The early impetus for this report stemmed from an international comparison of perinatal and infant mortality which suggested that a higher proportion of low birth weight infants were born in the United States than in countries such as the Netherlands or Sweden, which have significantly lower infant mortality rates. While the present report concerns itself with the trends in "prematurity," its importance extends to infant mortality and morbidity as well.

Premature delivery and/or low birth weight are prime determinants of risk of infant death or impaired health. Their importance, long recognized by perinatal investigators, are not to be underestimated. The number of low birth weight infants who are born alive in the United States is over a quarter of a million infants annually—288,000 in 1967 alone. Because of the number of affected individuals, prematurity is regarded as a public health as well as a clinical problem. The clinical concern is reflected in the establishment of intensive care units for premature infants in hospitals, and the public health concern is reflected in the classification of prematurity in some States with other rehabilitative conditions under the federally assisted, crippled children's programs. The medical care requirements for a low birth weight infant are great, sometimes requiring weeks or months of hospital care before the infant has attained the desired weight and can be released to join his family at home. Furthermore, mortality among low birth weight infants is higher than among other infants at least up to 5 years of age.

The need for teamwork is no less now, for this particular health problem, than it was decades ago when communicable diseases played an important role in infant mortality. The search for solutions to the problem of low birth weight extends back beyond the point of delivery of the infant, to the care of the mother during pregnancy, and indeed to her formative years as well. At the time of an infant's birth, it is too late to change its weight and, therefore, the concept of prevention assumes significance. Furthermore, because of the wide range of associated morbid conditions, and the long range effects of many of them, prevention assumes increased importance: prevention of lethal assaults by infections or drugs on the fetus, prevention of preterm delivery, and prevention of low birth weight among the newborn. These objectives call on the combined resources of clinical and preventive medicine.

Statistical findings can assist in problem identification and in localizing associated factors, and thereby can further the efforts of other

investigators, However, the identification of a problem should not be confused with its solution. The definitive answers are not to be found in vital statistics alone, but must be sought in special surveys, epidemiological investigations, and clinical research. The present findings represent only the starting point for the development of new hypotheses to be tested in pursuing the solutions to the problems of preterm delivery and/or low birth weight among newborn infants.

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LIST OF DETAILED TABLES

Table 1. Number of live births by period of gestation and color: United States, 1950-67

[Data for the years 1951-54 and 1956-66 are based on a 50-percent sample of births; data for 1967 are based on a 20- to 50-percent sample]

Year and color	Total	Period of gestation (weeks)										
		Under 20	20-27	28-31	32-35	36	37-39	40 and over	40	41-42	43 and over	Not stated
Total												
1950	[1]3,554,149	646	18,339	30,034	64,612	248,169	277,606	2,618,609	2,507,847	97,321	13,441	[2]294,579
1951	3,750,850	684	19,050	30,636	65,694	226,320	303,842	2,867,018	2,735,864	115,718	15,436	[3]237,606
1952	3,846,986	732	19,868	31,368	68,526	189,274	353,832	2,925,638	2,764,940	160,698		[4]257,748
1953	3,902,120	858	20,644	31,062	68,310	172,128	353,438	3,021,636	2,844,956	176,680		[5]234,044
1954	4,017,362	---	---	---	---	---	---	---	---	---	---	---
1955	4,047,295	---	---	---	---	---	---	---	---	---	---	---
1956	4,163,090	1,208	23,092	32,762	76,924	158,234	455,616	3,153,534	---	---	---	[6]261,720
1957	4,254,784	---	---	---	---	---	---	---	---	---	---	---
1958	4,203,812	1,474	23,872	34,732	88,260	140,404	583,126	3,084,920	---	---	---	[7]247,024
1959	4,244,796	---	---	---	---	---	---	---	---	---	---	---
1960	4,257,850	1,656	24,154	34,210	93,726	132,370	640,114	3,087,898	---	---	---	[7]243,722
1961	4,268,326	---	---	---	---	---	---	---	---	---	---	---
1962	4,167,362	1,728	23,608	33,008	92,378	120,388	638,298	3,016,834	---	---	---	[7]241,120
1963	4,098,020	1,306	22,544	31,516	89,798	113,252	622,154	2,935,222	---	---	---	[7]282,228
1964	4,027,490	942	22,328	31,498	92,306	112,936	650,852	2,865,422	2,539,606	275,486	50,330	[7]251,206
1965	3,760,358	810	20,514	29,150	85,952	102,654	602,324	2,664,518	2,341,376	272,916	50,226	[7]254,436
1966	3,606,274	752	19,728	27,758	82,590	98,080	579,408	2,548,096	2,227,168	270,410	50,518	[7]249,862
1967	3,520,959	652	18,304	26,478	80,837	93,821	571,062	2,471,944	2,142,988	274,739	54,217	[7]257,861
White												
1950	[1]3,063,627	505	14,896	23,853	55,321	197,907	248,387	2,279,922	2,175,874	91,750	12,298	[2]241,726
1951	3,237,072	540	15,260	23,986	55,286	177,494	269,868	2,484,282	2,360,974	109,184	14,124	[3]210,356
1952	3,322,658	554	15,758	24,242	57,360	147,906	313,440	2,527,200	2,375,624	151,576		[4]236,198
1953	3,356,772	620	16,308	23,460	56,530	135,490	308,716	2,598,288	2,433,032	165,256		[5]217,360
1954	3,443,630	---	---	---	---	---	---	---	---	---	---	---
1955	3,458,448	---	---	---	---	---	---	---	---	---	---	---
1956	3,545,350	876	17,266	23,946	60,800	118,556	394,712	2,691,598	---	---	---	[6]237,596
1957	3,621,456	---	---	---	---	---	---	---	---	---	---	---
1958	3,572,306	968	17,656	25,064	67,954	105,764	501,118	2,634,000	---	---	---	[7]219,782
1959	3,597,430	---	---	---	---	---	---	---	---	---	---	---
1960	3,600,744	1,056	17,432	24,102	71,342	99,508	549,198	2,619,812	---	---	---	[7]218,294
1961	3,600,864	---	---	---	---	---	---	---	---	---	---	---
1962[8]	3,394,068	1,164	16,284	22,338	67,454	87,110	525,684	2,458,900	---	---	---	[7]215,134
1963[8]	3,326,344	754	15,306	21,382	65,738	81,772	512,024	2,384,584	---	---	---	[7]244,784
1964	3,369,160	622	15,070	21,456	68,162	83,096	550,836	2,407,682	2,114,836	249,368	43,478	[7]222,236
1965	3,123,860	508	14,002	19,594	63,314	75,130	504,360	2,225,426	1,935,774	246,222	43,430	[7]221,526
1966	2,993,230	478	13,154	18,616	60,464	71,756	484,116	2,128,072	1,840,822	243,808	43,442	[7]216,574
1967	2,922,502	420	12,056	17,625	59,102	69,021	475,721	2,065,080	1,770,029	248,291	46,760	[7]223,477
All other												
1950	[1]490,522	141	3,443	6,181	9,291	50,262	29,219	338,687	331,973	5,571	1,143	[2]52,853
1951	513,778	144	3,790	6,650	10,408	48,826	33,974	382,736	374,890	6,534	1,312	[3]27,250
1952	524,328	178	4,110	7,126	11,166	41,368	40,392	398,438	389,316	9,122		[4]21,550
1953	545,348	238	4,336	7,602	11,780	36,638	44,722	423,348	411,924	11,424		[5]16,684
1954	573,732	---	---	---	---	---	---	---	---	---	---	---
1955	588,847	---	---	---	---	---	---	---	---	---	---	---
1956	617,740	332	5,826	8,816	16,124	39,678	60,904	461,936	---	---	---	[6]24,124
1957	633,328	---	---	---	---	---	---	---	---	---	---	---
1958	631,506	506	6,216	9,668	20,306	34,640	82,008	450,920	---	---	---	[7]27,242
1959	647,366	---	---	---	---	---	---	---	---	---	---	---

See footnotes at end of table.

Table 1. Number of live births by period of gestation and color: United States, 1950-67—Con.

Year and color	Total	Period of gestation (weeks)										
		Under 20	20-27	28-31	32-35	36	37-39	40 and over	40	41-42	43 and over	Not stated
All other—Con.												
1960	657,106	600	6,722	10,108	22,384	32,862	90,916	468,086	---	---	---	[7]25,428
1961	667,462	---	---	---	---	---	---	---	---	---	---	---
1962[8]	641,580	508	6,616	9,662	22,186	30,544	94,306	452,676	---	---	---	[7]25,082
1963[8]	638,928	490	6,500	9,172	21,332	28,702	91,374	444,668	---	---	---	[7]36,690
1964	658,330	320	7,258	10,042	24,144	29,840	100,016	457,740	424,770	26,118	6,852	[7]28,970
1965	636,498	302	6,512	9,556	22,638	27,524	97,964	439,092	405,602	26,694	6,796	[7]32,910
1966	613,044	274	6,574	9,142	22,126	26,324	95,292	420,024	386,346	26,602	7,076	[7]33,288
1967	598,457	232	6,248	8,853	21,735	24,800	95,341	406,864	372,959	26,448	7,457	[7]34,384

[1] Includes a number of live births classified as premature with gestation not specified: total—1,555, white—1,110, and other—445.
[2] Includes all live births recorded in Louisiana and Massachusetts.
[3] Includes all live births recorded in Massachusetts.
[4] Includes all live births recorded in Massachusetts and practically all of those recorded in Washington.
[5] Includes all live births recorded in Massachusetts and Washington.
[6] Includes all live births recorded in Maryland outside Baltimore, Massachusetts and Washington.
[7] Includes all live births recorded in Maryland outside Baltimore, and Massachusetts.
[8] Figures by color excluded for New Jersey.

Table 2. Percentage distribution of live births by period of gestation and color: United States, 1950-67

[Data for the years 1951-54 and 1956-66 are based on a 50-percent sample of births; data for 1967 are based on a 20- to 50-percent sample]

Year and color	Total	Period of gestation (weeks)										
		Under 37	37 and over	Under 28	28-31	32-35	36	37-39	40 and over	40	41-42	43 and over
Total												
1950[1]	100.0	11.1	88.9	0.6	0.9	2.0	7.6	8.5	80.4	76.9	3.0	0.4
1951[2]	100.0	9.7	90.3	0.6	0.9	1.9	6.4	8.6	81.6	77.9	3.3	0.4
1952[3]	100.0	8.6	91.4	0.6	0.9	1.9	5.3	9.9	81.5	77.0	4.5	
1953[4]	100.0	8.0	92.0	0.6	0.8	1.9	4.7	9.6	82.4	77.6	4.8	
1954	100.0	---	---	---	---	---	---	---	---	---	---	---
1955	100.0	---	---	---	---	---	---	---	---	---	---	---
1956[5]	100.0	7.5	92.5	0.6	0.8	2.0	4.1	11.7	80.8	---	---	---
1957	100.0	---	---	---	---	---	---	---	---	---	---	---
1958[6]	100.0	7.3	92.7	0.6	0.9	2.2	3.5	14.7	78.0	---	---	---
1959	100.0	---	---	---	---	---	---	---	---	---	---	---
1960[6]	100.0	7.1	92.9	0.6	0.9	2.3	3.3	15.9	76.9	---	---	---
1961	100.0	---	---	---	---	---	---	---	---	---	---	---
1962[6]	100.0	6.9	93.1	0.6	0.8	2.4	3.1	16.3	76.8	---	---	---
1963[6]	100.0	6.8	93.2	0.6	0.8	2.4	3.0	16.3	76.9	---	---	---
1964[6]	100.0	6.9	93.1	0.6	0.8	2.4	3.0	17.2	75.9	67.3	7.3	1.3
1965[6]	100.0	6.8	93.2	0.6	0.8	2.5	2.9	17.2	76.0	66.8	7.8	1.4
1966[6]	100.0	6.8	93.2	0.6	0.8	2.5	2.9	17.3	75.9	66.4	8.1	1.5
1967[6]	100.0	6.7	93.3	0.6	0.8	2.5	2.9	17.5	75.8	65.7	8.4	1.7
White												
1950[1]	100.0	10.4	89.6	0.5	0.8	2.0	7.0	8.8	80.8	77.1	3.3	0.4
1951[2]	100.0	9.0	91.0	0.5	0.8	1.8	5.9	8.9	82.1	78.0	3.6	0.5
1952[3]	100.0	8.0	92.0	0.5	0.8	1.9	4.8	10.2	81.9	77.0	4.9	
1953[4]	100.0	7.4	92.6	0.5	0.7	1.8	4.3	9.8	82.8	77.5	5.3	
1954	100.0	---	---	---	---	---	---	---	---	---	---	---
1955	100.0	---	---	---	---	---	---	---	---	---	---	---
1956[5]	100.0	6.7	93.3	0.5	0.7	1.8	3.6	11.9	81.4	---	---	---
1957	100.0	---	---	---	---	---	---	---	---	---	---	---
1958[6]	100.0	6.5	93.5	0.6	0.7	2.0	3.2	14.9	78.6	---	---	---
1959	100.0	---	---	---	---	---	---	---	---	---	---	---
1960[6]	100.0	6.3	93.7	0.5	0.7	2.1	2.9	16.2	77.5	---	---	---
1961	100.0	---	---	---	---	---	---	---	---	---	---	---
1962[6,7]	100.0	6.1	93.9	0.5	0.7	2.1	2.7	16.5	77.3	---	---	---
1963[6,7]	100.0	6.0	94.0	0.5	0.7	2.1	2.7	16.6	77.4	---	---	---
1964[6]	100.0	6.0	94.0	0.5	0.7	2.2	2.6	17.5	76.5	67.2	7.9	1.4
1965[6]	100.0	5.9	94.1	0.5	0.7	2.2	2.6	17.4	76.7	66.7	8.5	1.5
1966[6]	100.0	5.9	94.1	0.5	0.7	2.2	2.6	17.4	76.6	66.3	8.8	1.6
1967[6]	100.0	5.9	94.1	0.5	0.7	2.2	2.6	17.6	76.5	65.6	9.2	1.7

See footnotes at end of table.

Table 2. Percentage distribution of live births by period of gestation and color: United States, 1950-67—Con.

Year and color	Total	Period of gestation (weeks)										
		Under 37	37 and over	Under 28	28-31	32-35	36	37-39	40 and over	40	41-42	43 and over
All other												
1950[1]	100.0	15.9	84.1	0.8	1.4	2.1	11.5	6.7	77.5	75.9	1.3	0.3
1951[2]	100.0	14.4	85.6	0.8	1.4	2.1	10.0	7.0	78.7	77.1	1.3	0.3
1952[3]	100.0	12.7	87.3	0.9	1.4	2.2	8.2	8.0	79.2	77.4	1.8	
1953[4]	100.0	11.5	88.5	0.9	1.4	2.2	6.9	8.5	80.1	77.9	2.2	
1954	100.0	---	---	---	---	---	---	---	---	---	---	---
1955	100.0	---	---	---	---	---	---	---	---	---	---	---
1956[5]	100.0	11.9	88.1	1.0	1.5	2.7	6.7	10.3	77.8	---	---	---
1957	100.0	---	---	---	---	---	---	---	---	---	---	---
1958[6]	100.0	11.8	88.2	1.1	1.6	3.4	5.7	13.6	74.6	---	---	---
1959	100.0	---	---	---	---	---	---	---	---	---	---	---
1960[6]	100.0	11.5	88.5	1.2	1.6	3.5	5.2	14.4	74.1	---	---	---
1961	100.0	---	---	---	---	---	---	---	---	---	---	---
1962[6,7]	100.0	11.3	88.7	1.2	1.6	3.6	5.0	15.3	73.4	---	---	---
1963[6,7]	100.0	11.0	89.0	1.2	1.5	3.5	4.8	15.2	73.8	---	---	---
1964[6]	100.0	11.4	88.6	1.2	1.6	3.8	4.7	15.9	72.7	67.5	4.1	1.1
1965[6]	100.0	11.0	89.0	1.1	1.6	3.8	4.6	16.2	72.7	67.2	4.4	1.1
1966[6]	100.0	11.1	88.9	1.2	1.6	3.8	4.5	16.4	72.4	66.6	4.6	1.2
1967[6]	100.0	11.0	89.0	1.1	1.6	3.9	4.4	16.9	72.1	66.1	4.7	1.3

[1] Excludes all live births recorded in Louisiana and Massachusetts.
[2] Excludes all live births recorded in Massachusetts.
[3] Excludes all live births recorded in Massachusetts and practically all those recorded in Washington.
[4] Excludes all live births recorded in Massachusetts and Washington.
[5] Excludes all live births recorded in Maryland outside Baltimore, Massachusetts and Washington.
[6] Excludes all live births recorded in Maryland outside Baltimore and Massachusetts.
[7] Figures by color excluded for New Jersey.

Table 3. Number of live births by birth weight and color: United States, 1950-67

[Data for the years 1951-54 and 1956-66 are based on a 50-percent sample of births; data for 1967 are based on a 20- to 50-percent sample]

Year and color	Total	Birth weight (grams)										
		1,000 or less	1,001-1,500	1,501-2,000	2,001-2,500	2,501-3,000	3,001-3,500	3,501-4,000	4,001-4,500	4,501-5,000	5,001 or more	Not stated
Total												
1950	3,554,149	14,114	19,928	46,441	168,571	607,855	1,259,213	892,047	248,949	63,682		[1]233,349
1951	3,750,850	15,344	20,984	49,360	180,840	647,280	1,348,438	948,646	261,624	54,856	7,348	[1]216,130
1952	3,846,986	16,616	22,062	51,428	184,878	669,786	1,390,776	976,272	266,934	61,706		[1]206,528
1953	3,902,120	17,640	22,870	52,664	188,046	685,542	1,415,034	995,644	272,668	61,332		[1]190,680
1954	4,017,362	18,670	23,278	53,056	188,990	698,954	1,460,746	1,034,626	284,360	55,908	7,466	[1]191,308
1955	4,047,295	19,808	24,151	54,252	193,769	711,174	1,472,159	1,036,673	285,258	54,750	7,248	[1]188,053
1956	4,163,090	20,328	24,566	55,884	200,078	733,562	1,524,102	1,073,064	297,880	55,416	7,148	[2]171,062
1957	4,254,784	21,126	25,892	58,378	208,982	763,008	1,573,570	1,102,352	301,822	55,330	7,028	[3]137,296
1958	4,203,812	21,810	25,620	58,612	207,496	756,742	1,553,222	1,085,574	299,024	54,858	6,790	[3]134,064
1959	4,244,796	23,164	27,058	61,394	215,178	784,394	1,608,404	1,128,554	312,406	57,196	7,196	19,852
1960	4,257,850	23,008	26,928	61,266	216,282	784,200	1,611,358	1,135,522	316,808	58,342	7,440	16,696
1961	4,268,326	22,946	27,128	62,196	220,696	800,762	1,621,374	1,125,184	309,810	56,602	7,176	14,452
1962	4,167,362	23,404	26,844	62,412	219,398	796,350	1,585,576	1,084,486	294,588	53,668	7,106	13,530
1963	4,098,020	22,714	26,882	62,526	220,968	791,078	1,559,694	1,054,014	284,104	50,834	6,242	18,964
1964	4,027,490	22,356	26,760	61,986	218,430	775,682	1,536,768	1,037,702	280,630	50,896	6,500	9,780
1965	3,760,358	21,238	24,938	58,458	206,380	735,894	1,437,358	958,834	256,630	46,182	5,968	8,478
1966	3,606,274	19,980	24,688	56,650	199,036	713,464	1,382,170	913,296	240,970	42,384	5,562	8,074
1967	3,520,959	19,205	23,536	54,836	190,825	692,558	1,352,533	896,627	236,323	40,933	5,451	8,132
White												
1950	3,063,627	11,482	15,855	37,478	137,195	509,521	1,096,735	787,507	217,336	48,606		[1]201,912
1951	3,237,072	12,288	16,352	39,526	146,084	540,920	1,173,378	838,364	229,256	43,296	5,120	[1]192,488
1952	3,322,658	13,160	17,300	40,952	147,686	556,634	1,209,020	866,814	235,584	48,860		[1]186,648
1953	3,356,772	13,918	17,588	41,354	148,680	564,988	1,222,502	882,642	240,792	49,356		[1]174,952
1954	3,443,630	14,260	17,582	41,048	148,008	569,878	1,256,314	916,536	252,482	45,906	5,684	[1]175,932
1955	3,458,448	14,936	18,183	41,397	150,352	574,803	1,261,345	918,329	253,812	45,729	5,687	[1]173,875
1956	3,545,350	15,094	18,244	42,354	152,868	589,354	1,300,494	950,856	266,092	46,916	5,642	[2]157,436
1957	3,621,456	15,440	19,070	43,718	158,626	610,588	1,342,020	980,368	271,664	47,412	5,812	[3]126,738
1958	3,572,306	16,050	18,490	43,204	155,828	601,372	1,322,590	966,684	270,008	47,772	5,708	[3]124,600
1959	3,597,430	16,762	19,738	45,294	161,850	622,122	1,370,004	1,007,176	283,672	49,974	6,150	14,688
1960	3,600,744	16,630	19,494	45,234	162,402	619,200	1,369,022	1,012,080	286,878	51,366	6,380	12,058
1961	3,600,864	16,426	19,588	45,582	165,090	632,046	1,374,184	1,001,222	280,440	49,760	6,178	10,348
1962[4]	3,394,068	16,216	18,600	44,200	158,930	606,846	1,297,174	932,896	257,936	45,886	5,894	9,490
1963[4]	3,326,344	15,392	18,458	43,596	158,516	600,448	1,273,322	905,258	249,056	43,662	5,218	13,418
1964	3,369,160	15,320	18,632	44,386	160,336	604,494	1,293,684	920,384	254,286	45,024	5,606	7,008
1965	3,123,860	14,382	17,284	41,522	150,492	569,890	1,200,838	845,758	231,802	40,734	5,094	6,064
1966	2,993,230	13,326	16,870	40,302	145,222	551,166	1,154,786	805,504	217,726	37,752	4,752	5,824
1967	2,922,502	12,741	16,087	39,017	139,562	534,927	1,129,124	790,380	213,515	36,466	4,633	6,050
All other												
1950	490,522	2,632	4,073	8,963	31,376	98,334	162,478	104,540	31,613	15,076		[1]31,437
1951	513,778	3,056	4,632	9,834	34,756	106,360	175,060	110,282	32,368	11,560	2,228	[1]23,642
1952	524,328	3,456	4,762	10,476	37,192	113,152	181,756	109,458	31,350	12,846		[1]19,880
1953	545,348	3,722	5,282	11,310	39,366	120,554	192,532	113,002	31,876	11,976		[1]15,728
1954	573,732	4,410	5,696	12,008	40,982	129,076	204,432	118,090	31,878	10,002	1,782	[1]15,376
1955	588,847	4,872	5,968	12,855	43,417	136,371	210,814	118,344	31,446	9,021	1,561	[1]14,178
1956	617,740	5,234	6,322	13,530	47,210	144,208	223,608	122,208	31,788	8,500	1,506	[2]13,626
1957	633,328	5,686	6,822	14,660	50,356	152,420	231,550	121,984	30,158	7,918	1,216	[3]10,558
1958	631,506	5,760	7,130	15,408	51,668	155,370	230,632	118,890	29,016	7,086	1,082	[3]9,464
1959	647,366	6,402	7,320	16,100	53,328	162,272	238,400	121,378	28,734	7,222	1,046	5,164

See footnotes at end of table.

Table 3. Number of live births by birth weight and color: United States, 1950-67—Con.

Year and color	Total	Birth weight (grams)										
		1,000 or less	1,001-1,500	1,501-2,000	2,001-2,500	2,501-3,000	3,001-3,500	3,501-4,000	4,001-4,500	4,501-5,000	5,001 or more	Not stated
All other—Con.												
1960	657,106	6,378	7,434	16,032	53,880	165,000	242,336	123,442	29,930	6,976	1,060	4,638
1961	667,462	6,520	7,540	16,614	55,606	168,716	247,190	123,962	29,370	6,842	998	4,104
1962[4]	641,580	6,370	7,456	16,248	53,540	163,680	237,458	118,142	27,922	6,210	1,024	3,530
1963[4]	638,928	6,480	7,672	16,934	55,226	164,196	235,238	115,226	26,302	5,678	848	5,128
1964	658,330	7,036	8,128	17,600	58,094	171,188	243,084	117,318	26,344	5,872	894	2,772
1965	636,498	6,856	7,654	16,936	55,888	166,004	236,520	113,076	24,828	5,448	874	2,414
1966	613,044	6,654	7,818	16,348	53,814	162,298	227,384	107,792	23,244	4,632	810	2,250
1967	598,457	6,464	7,449	15,819	51,263	157,631	223,409	106,247	22,808	4,467	818	2,082

[1] Includes all live births recorded in Massachusetts and Connecticut.

[2] Includes all live births recorded in Massachusetts for entire year and Connecticut for part of year.

[3] Includes all live births recorded in Massachusetts.

[4] Figures by color excluded for New Jersey.

Table 4. Percentage distribution of live births by birth weight and color: United States, 1950-67

[Data for the years 1951-54 and 1956-66 are based on a 50-percent sample of births; data for 1967 are based on a 20- to 50-percent sample]

Year and color	Total	Birth weight (grams)											
		2,500 or less	2,501 or more	1,000 or less	1,001-1,500	1,501-2,000	2,001-2,500	2,501-3,000	3,001-3,500	3,501-4,000	4,001-4,500	4,501-5,000	5,001 or more
Total													
1950[1]	100.0	7.5	92.5	0.4	0.6	1.4	5.1	18.3	37.9	26.9	7.5	1.9	
1951[1]	100.0	7.5	92.5	0.4	0.6	1.4	5.1	18.3	38.1	26.8	7.4	1.6	0.2
1952[1]	100.0	7.6	92.4	0.5	0.6	1.4	5.1	18.4	38.2	26.8	7.3	1.7	
1953[1]	100.0	7.6	92.4	0.5	0.6	1.4	5.1	18.5	38.1	26.8	7.3	1.7	
1954[1]	100.0	7.4	92.6	0.5	0.6	1.4	4.9	18.3	38.2	27.0	7.4	1.5	0.2
1955[1]	100.0	7.6	92.4	0.5	0.6	1.4	5.0	18.4	38.1	26.9	7.4	1.4	0.2
1956[2]	100.0	7.5	92.4	0.5	0.6	1.4	5.0	18.4	38.2	26.9	7.5	1.4	0.2
1957[3]	100.0	7.6	92.4	0.5	0.6	1.4	5.1	18.5	38.2	26.8	7.3	1.3	0.2
1958[3]	100.0	7.7	92.3	0.5	0.6	1.4	5.1	18.6	38.2	26.7	7.3	1.3	0.2
1959	100.0	7.7	92.3	0.5	0.6	1.5	5.1	18.6	38.1	26.7	7.4	1.4	0.2
1960	100.0	7.7	92.3	0.5	0.6	1.4	5.1	18.5	38.0	26.8	7.5	1.4	0.2
1961	100.0	7.8	92.2	0.5	0.6	1.5	5.2	18.8	38.1	26.5	7.3	1.3	0.2
1962	100.0	8.0	92.0	0.6	0.6	1.5	5.3	19.2	38.2	26.1	7.1	1.3	0.2
1963	100.0	8.2	91.8	0.6	0.7	1.5	5.4	19.4	38.2	25.8	7.0	1.2	0.2
1964	100.0	8.2	91.8	0.6	0.7	1.5	5.4	19.3	38.2	25.8	7.0	1.3	0.2
1965	100.0	8.3	91.7	0.6	0.7	1.6	5.5	19.6	38.3	25.6	6.8	1.2	0.2
1966	100.0	8.3	91.7	0.6	0.7	1.6	5.5	19.8	38.4	25.4	6.7	1.2	0.2
1967	100.0	8.2	91.8	0.5	0.7	1.6	5.4	19.7	38.5	25.5	6.7	1.2	0.2
White													
1950[1]	100.0	7.1	92.9	0.4	0.6	1.3	4.8	17.8	38.3	27.5	7.6	1.7	
1951[1]	100.0	7.0	93.0	0.4	0.5	1.3	4.8	17.8	38.5	27.5	7.5	1.4	0.2
1952[1]	100.0	7.0	93.0	0.4	0.6	1.3	4.7	17.7	38.6	27.6	7.5	1.6	
1953[1]	100.0	7.0	93.0	0.4	0.6	1.3	4.7	17.8	38.4	27.7	7.6	1.6	
1954[1]	100.0	6.8	93.2	0.4	0.5	1.3	4.5	17.4	38.4	28.0	7.7	1.4	0.2
1955[1]	100.0	6.8	93.2	0.5	0.6	1.3	4.6	17.5	38.4	28.0	7.7	1.4	0.2
1956[2]	100.0	6.7	93.3	0.4	0.5	1.3	4.5	17.4	38.4	28.1	7.9	1.4	0.2
1957[3]	100.0	6.8	93.2	0.4	0.5	1.3	4.5	17.5	38.4	28.1	7.8	1.4	0.2
1958[3]	100.0	6.8	93.2	0.5	0.5	1.3	4.5	17.4	38.4	28.0	7.8	1.4	0.2
1959	100.0	6.8	93.2	0.5	0.6	1.3	4.5	17.4	38.2	28.1	7.9	1.4	0.2
1960	100.0	6.8	93.2	0.5	0.5	1.3	4.5	17.3	38.1	28.2	8.0	1.4	0.2
1961	100.0	6.9	93.1	0.5	0.5	1.3	4.6	17.6	38.3	27.9	7.8	1.4	0.2
1962[4]	100.0	7.0	93.0	0.5	0.5	1.3	4.7	17.9	38.3	27.6	7.6	1.4	0.2
1963[4]	100.0	7.1	92.9	0.5	0.6	1.3	4.8	18.1	38.4	27.3	7.5	1.3	0.2
1964	100.0	7.1	92.9	0.5	0.6	1.3	4.8	18.0	38.5	27.4	7.6	1.3	0.2
1965	100.0	7.2	92.8	0.5	0.6	1.3	4.8	18.3	38.5	27.1	7.4	1.3	0.2
1966	100.0	7.2	92.8	0.4	0.6	1.3	4.9	18.4	38.7	27.0	7.3	1.3	0.2
1967	100.0	7.1	92.9	0.4	0.6	1.3	4.8	18.3	38.7	27.1	7.3	1.3	0.2

See footnotes at end of table.

Table 4. Percentage distribution of live births by birth weight and color: United States, 1950-67—Con.

Year and color	Total	Birth weight (grams)											
		2,500 or less	2,501 or more	1,000 or less	1,001-1,500	1,501-2,000	2,001-2,500	2,501-3,000	3,001-3,500	3,501-4,000	4,001-4,500	4,501-5,000	5,001 or more
All other													
1950[1]	100.0	10.2	89.8	0.6	0.9	2.0	6.8	21.4	35.4	22.8	6.9	3.3	
1951[1]	100.0	10.7	89.3	0.6	0.9	2.0	7.1	21.7	35.7	22.5	6.6	2.4	0.5
1952[1]	100.0	11.1	88.9	0.7	0.9	2.1	7.4	22.4	36.0	21.7	6.2	2.5	
1953[1]	100.0	11.3	88.7	0.7	1.0	2.1	7.4	22.8	36.4	21.3	6.0	2.3	
1954[1]	100.0	11.3	88.7	0.8	1.0	2.2	7.3	23.1	36.6	21.1	5.7	1.8	0.3
1955[1]	100.0	11.7	88.3	0.8	1.0	2.2	7.6	23.7	36.7	20.6	5.5	1.6	0.3
1956[2]	100.0	12.0	88.0	0.9	1.0	2.2	7.8	23.9	37.0	20.2	5.3	1.4	0.2
1957[3]	100.0	12.4	87.6	0.9	1.1	2.4	8.1	24.5	37.2	19.6	4.8	1.3	0.2
1958[3]	100.0	12.9	87.1	0.9	1.1	2.5	8.3	25.0	37.1	19.1	4.7	1.1	0.2
1959	100.0	12.9	87.1	1.0	1.1	2.5	8.3	25.3	37.1	18.9	4.5	1.1	0.2
1960	100.0	12.8	87.2	1.0	1.1	2.5	8.3	25.3	37.1	18.9	4.6	1.1	0.2
1961	100.0	13.0	87.0	1.0	1.1	2.5	8.4	25.4	37.3	18.7	4.4	1.0	0.2
1962[4]	100.0	13.1	86.9	1.0	1.2	2.5	8.4	25.7	37.2	18.5	4.4	1.0	0.2
1963[4]	100.0	13.6	86.4	1.0	1.2	2.7	8.7	25.9	37.1	18.2	4.1	0.9	0.1
1964	100.0	13.9	86.1	1.1	1.2	2.7	8.9	26.1	37.1	17.9	4.0	0.9	0.1
1965	100.0	13.8	86.2	1.1	1.2	2.7	8.8	26.2	37.3	17.8	3.9	0.9	0.1
1966	100.0	13.9	86.1	1.1	1.3	2.7	8.8	26.6	37.2	17.6	3.9	0.8	0.1
1967	100.0	13.6	86.4	1.1	1.2	2.7	8.6	26.4	37.5	17.8	3.8	0.7	0.1

[1] Excludes all live births recorded in Connecticut and Massachusetts.
[2] Excludes all live births recorded in Massachusetts for entire year and Connecticut for part of year.
[3] Excludes all live births recorded in Massachusetts.
[4] Figures by color excluded for New Jersey.

Table 5. Number of live births and percentage distribution by color, birth weight, and period of gestation for areas reporting LMP and for areas reporting period of gestation: United States, 1967

[Data are based on a 20- to 50-percent sample]

Area and period of gestation	Total		2,500 grams or less		2,501 grams or more		Total		2,500 grams or less		2,501 grams or more	
	White	All other	White	All other	White	All other	White	All other	White	All other	White	All other
	Number of live births						Percentage distribution					
All areas												
Total	2,694,921	562,634	189,067	75,527	2,505,854	487,107	100.0	100.0	100.0	100.0	100.0	100.0
Under 37 weeks	157,204	61,412	92,501	38,449	64,703	22,963	5.8	10.9	48.9	50.9	2.6	4.7
37 weeks and over	2,537,717	501,222	96,566	37,078	2,441,151	464,144	94.2	89.1	51.1	49.1	97.4	95.3
Under 28 weeks	12,119	6,282	11,621	5,959	498	323	0.4	1.1	6.1	7.9	0.0	0.1
28-31 weeks	17,408	8,759	15,658	7,785	1,750	974	0.6	1.6	8.3	10.3	0.1	0.2
32-35 weeks	58,799	21,663	39,813	14,600	18,986	7,063	2.2	3.9	21.1	19.3	0.8	1.4
36 weeks	68,878	24,708	25,409	10,105	43,469	14,603	2.6	4.4	13.4	13.4	1.7	3.0
37-39 weeks	475,113	95,171	44,756	13,446	430,357	81,725	17.6	16.9	23.7	17.8	17.2	16.8
40 weeks	1,767,885	372,186	46,889	22,116	1,720,996	350,070	65.6	66.2	24.8	29.3	68.7	71.9
41-42 weeks	248,035	26,410	3,889	1,060	244,146	25,350	9.2	4.7	2.1	1.4	9.7	5.2
43 weeks and over	46,684	7,455	1,032	456	45,652	6,999	1.7	1.3	0.5	0.6	1.8	1.4
Areas reporting LMP[1]												
Total	413,466	88,986	27,801	11,585	385,665	77,401	100.0	100.0	100.0	100.0	100.0	100.0
Under 37 weeks	34,929	15,143	14,159	6,750	20,770	8,393	8.4	17.0	50.9	58.3	5.4	10.8
37 weeks and over	378,537	73,843	13,642	4,835	364,895	69,008	91.6	83.0	49.1	41.7	94.6	89.2
Under 28 weeks	2,078	1,466	1,761	1,182	317	284	0.5	1.6	6.3	10.2	0.1	0.4
28-31 weeks	3,579	2,042	2,586	1,375	993	667	0.9	2.3	9.3	11.9	0.3	0.9
32-35 weeks	16,946	7,302	7,212	3,079	9,734	4,223	4.1	8.2	25.9	26.6	2.5	5.5
36 weeks	12,326	4,333	2,600	1,114	9,726	3,219	3.0	4.9	9.4	9.6	2.5	4.2
37-39 weeks	156,344	36,973	9,260	3,113	147,084	33,860	37.8	41.5	33.3	26.9	38.1	43.7
40 weeks	97,723	16,792	2,062	739	95,661	16,053	23.6	18.9	7.4	6.4	24.8	20.7
41-42 weeks	96,945	14,553	1,644	611	95,301	13,942	23.4	16.4	5.9	5.3	24.7	18.0
43 weeks and over	27,525	5,525	676	372	26,849	5,153	6.7	6.2	2.4	3.2	7.0	6.7
Areas reporting gestation period												
Total	2,281,455	473,648	161,266	63,942	2,120,189	409,706	100.0	100.0	100.0	100.0	100.0	100.0
Under 37 weeks	122,275	46,269	78,342	31,699	43,933	14,570	5.4	9.8	48.6	49.6	2.1	3.6
37 weeks and over	2,159,180	427,379	82,924	32,243	2,076,256	395,136	94.6	90.2	51.4	50.4	97.9	96.4
Under 28 weeks	10,041	4,816	9,860	4,777	181	39	0.4	1.0	6.1	7.5	0.0	0.0
28-31 weeks	13,829	6,717	13,072	6,410	757	307	0.6	1.4	8.1	10.0	0.0	0.1
32-35 weeks	41,853	14,361	32,601	11,521	9,252	2,840	1.8	3.0	20.2	18.0	0.4	0.7
36 weeks	56,552	20,375	22,809	8,991	33,743	11,384	2.5	4.3	14.1	14.1	1.6	2.8
37-39 weeks	318,769	58,198	35,496	10,333	283,273	47,865	14.0	12.3	22.0	16.2	13.4	11.7
40 weeks	1,670,162	355,394	44,827	21,377	1,625,335	334,017	73.2	75.0	27.8	33.4	76.7	81.5
41-42 weeks	151,090	11,857	2,245	449	148,845	11,408	6.6	2.5	1.4	0.7	7.0	2.8
43 weeks and over	19,159	1,930	356	84	18,803	1,846	0.8	0.4	0.2	0.1	0.9	0.5

[1] Figures by period of gestation for these areas are based on an item on the birth record, first day of last normal menstrual period (LMP). Areas included are Baltimore, California, District of Columbia, Minnesota, and New York City.

Table 6. Number of live births by age of mother and color: United States, 1950-67

[Data for the years 1951-54 and 1956-66 are based on a 50-percent sample of births; data for 1967 are based on a 20- to 50-percent sample]

Year and color	Total	Age of mother (years)								
		Under 15	15-19	20-24	25-29	30-34	35-39	40-44	45 and over	Not stated
Total										
1950	3,554,149	5,021	419,535	1,131,234	1,021,902	597,821	293,440	74,804	4,830	5,562
1951	3,750,850	5,086	443,872	1,198,966	1,072,374	637,238	304,898	78,224	4,932	5,260
1952	3,846,986	5,032	438,046	1,212,010	1,104,012	679,220	318,338	80,494	5,170	4,664
1953	3,902,120	5,316	455,878	1,220,532	1,110,768	691,090	326,102	83,290	5,004	4,140
1954	4,017,362	6,058	477,880	1,257,104	1,122,050	720,820	337,098	86,766	5,106	4,480
1955	4,047,295	5,883	484,097	1,273,908	1,119,279	722,277	345,305	87,587	5,111	3,848
1956	4,163,090	6,356	520,422	1,325,444	1,131,346	725,990	355,158	89,734	5,140	3,500
1957	4,254,784	6,960	550,212	1,361,396	1,140,806	730,818	365,298	90,808	5,272	3,214
1958	4,203,812	6,648	554,184	1,367,826	1,108,766	711,550	358,388	88,702	5,116	2,632
1959	4,244,796	6,776	571,048	1,406,200	1,099,684	700,826	363,120	89,626	5,246	2,270
1960	4,257,850	6,780	586,966	1,426,912	1,092,816	687,722	359,908	91,564	5,182	...
1961	4,268,326	7,462	601,720	1,445,054	1,081,706	677,264	355,750	94,114	5,256	...
1962	4,167,362	7,340	600,298	1,444,978	1,045,086	638,382	334,708	91,490	5,080	...
1963	4,098,020	7,594	586,454	1,453,740	1,023,942	610,196	322,182	88,982	4,930	...
1964	4,027,490	7,816	585,710	1,439,486	1,007,362	585,006	309,814	87,626	4,670	...
1965	3,760,358	7,768	590,894	1,337,350	925,732	529,376	282,908	81,716	4,614	...
1966	3,606,274	8,128	621,426	1,297,990	872,786	474,542	252,526	74,440	4,436	...
1967	3,520,959	8,593	596,445	1,310,588	867,426	439,373	227,323	67,053	4,158	...
White										
1950	3,063,627	1,669	318,822	972,132	908,536	533,340	256,899	64,981	3,894	3,354
1951	3,237,072	1,718	340,670	1,035,310	951,422	567,102	266,342	67,370	4,036	3,102
1952	3,322,658	1,734	336,428	1,047,162	977,224	603,866	279,554	69,708	4,274	2,708
1953	3,356,772	1,854	350,984	1,051,910	977,240	611,074	285,626	71,626	4,092	2,366
1954	3,443,630	2,172	367,812	1,079,944	982,894	634,776	294,010	74,968	4,252	2,802
1955	3,458,448	2,136	372,678	1,090,736	977,618	633,019	300,057	75,590	4,217	2,397
1956	3,545,350	2,348	402,822	1,132,460	985,014	631,974	307,178	77,156	4,278	2,120
1957	3,621,456	2,648	428,974	1,162,938	992,874	633,690	315,926	78,162	4,286	1,958
1958	3,572,306	2,648	432,696	1,169,056	961,896	615,300	308,808	76,268	4,178	1,456
1959	3,597,430	2,572	445,370	1,202,996	949,730	602,620	311,606	76,926	4,280	1,330
1960	3,600,744	2,524	458,130	1,219,962	942,112	588,402	307,426	77,976	4,212	...
1961	3,600,864	2,808	471,706	1,234,432	927,684	577,994	301,866	79,976	4,398	...
1962[1]	3,394,068	2,690	459,832	1,197,864	863,124	520,260	271,476	74,752	4,070	...
1963[1]	3,326,344	2,584	443,308	1,202,804	844,250	496,358	260,998	72,124	3,918	...
1964	3,369,160	2,676	444,358	1,224,876	864,784	494,714	260,634	73,356	3,762	...
1965	3,123,860	2,444	443,754	1,131,624	791,250	446,180	236,552	68,332	3,724	...
1966	2,993,230	2,666	465,112	1,101,120	749,226	399,368	210,706	61,452	3,580	...
1967	2,922,502	2,761	435,239	1,116,686	749,997	370,069	189,322	55,045	3,383	...

See footnote at end of table.

Table 6. Number of live births by age of mother and color: United States, 1950-67—Con.

Year and color	Total	Age of mother (years)								
		Under 15	15-19	20-24	25-29	30-34	35-39	40-44	45 and over	Not stated
All other										
1950	490,522	3,352	100,713	159,102	113,366	64,481	36,541	9,823	936	2,208
1951	513,778	3,368	103,202	163,656	120,952	70,136	38,556	10,854	896	2,158
1952	524,328	3,298	101,618	164,848	126,788	75,354	38,784	10,786	896	1,956
1953	545,348	3,462	104,894	168,622	133,528	80,016	40,476	11,664	912	1,774
1954	573,732	3,886	110,068	177,160	139,156	86,044	43,088	11,798	854	1,678
1955	588,847	3,747	111,419	183,172	141,661	89,258	45,248	11,997	894	1,451
1956	617,740	4,008	117,600	192,984	146,332	94,016	47,980	12,578	862	1,380
1957	633,328	4,312	121,238	198,458	147,932	97,128	49,372	12,646	986	1,256
1958	631,506	4,000	121,488	198,770	146,870	96,250	49,580	12,434	938	1,176
1959	647,366	4,204	125,678	203,204	149,954	98,206	51,514	12,700	966	940
1960	657,106	4,256	128,836	206,950	150,704	99,320	52,482	13,588	970	...
1961	667,462	4,654	130,014	210,622	154,022	99,270	53,884	14,138	858	...
1962[1]	641,580	4,520	127,788	205,424	145,458	93,094	50,682	13,750	864	...
1963[1]	638,928	4,814	130,510	207,712	142,762	89,836	48,744	13,676	874	...
1964	658,330	5,140	141,352	214,610	142,578	90,292	49,180	14,270	908	...
1965	636,498	5,324	147,140	205,726	134,482	83,196	46,356	13,384	890	...
1966	613,044	5,462	156,314	196,870	123,560	75,174	41,820	12,988	856	...
1967	598,457	5,832	161,206	193,902	117,429	69,304	38,001	12,008	775	...

[1] Figures by color excluded for New Jersey.

Table 7. Percentage distribution of live births by age of mother and color: United States, 1950-67

[Data for the years 1951-54 and 1956-66 are based on a 50-percent sample of births; data for 1967 are based on a 20- to 50-percent sample]

Year and color	Total	Age of mother (years)							
		Under 15	15-19	20-24	25-29	30-34	35-39	40-44	45 and over
Total									
1950	100.0	0.1	11.8	31.9	28.8	16.8	8.3	2.1	0.1
1951	100.0	0.1	11.9	32.0	28.6	17.0	8.1	2.1	0.1
1952	100.0	0.1	11.4	31.5	28.7	17.7	8.3	2.1	0.1
1953	100.0	0.1	11.7	31.3	28.5	17.7	8.4	2.1	0.1
1954	100.0	0.2	11.9	31.3	28.0	18.0	8.4	2.2	0.1
1955	100.0	0.1	12.0	31.5	27.7	17.9	8.5	2.2	0.1
1956	100.0	0.2	12.5	31.9	27.2	17.5	8.5	2.2	0.1
1957	100.0	0.2	12.9	32.0	26.8	17.2	8.6	2.1	0.1
1958	100.0	0.2	13.2	32.6	26.4	16.9	8.5	2.1	0.1
1959	100.0	0.2	13.5	33.1	25.9	16.5	8.6	2.1	0.1
1960	100.0	0.2	13.8	33.5	25.7	16.2	8.5	2.2	0.1
1961	100.0	0.2	14.1	33.9	25.3	15.9	8.3	2.2	0.1
1962	100.0	0.2	14.4	34.7	25.1	15.3	8.0	2.2	0.1
1963	100.0	0.2	14.3	35.5	25.0	14.9	7.9	2.2	0.1
1964	100.0	0.2	14.5	35.7	25.0	14.5	7.7	2.2	0.1
1965	100.0	0.2	15.7	35.6	24.6	14.1	7.5	2.2	0.1
1966	100.0	0.2	17.2	36.0	24.2	13.2	7.0	2.1	0.1
1967	100.0	0.2	16.9	37.2	24.6	12.5	6.5	1.9	0.1
White									
1950	100.0	0.1	10.4	31.8	29.7	17.4	8.4	2.1	0.1
1951	100.0	0.1	10.5	32.0	29.4	17.5	8.2	2.1	0.1
1952	100.0	0.1	10.1	31.5	29.4	18.2	8.4	2.1	0.1
1953	100.0	0.1	10.5	31.4	29.1	18.2	8.5	2.1	0.1
1954	100.0	0.1	10.7	31.4	28.6	18.4	8.5	2.2	0.1
1955	100.0	0.1	10.8	31.6	28.3	18.3	8.7	2.2	0.1
1956	100.0	0.1	11.4	32.0	27.8	17.8	8.7	2.2	0.1
1957	100.0	0.1	11.9	32.1	27.4	17.5	8.7	2.2	0.1
1958	100.0	0.1	12.1	32.7	26.9	17.2	8.6	2.1	0.1
1959	100.0	0.1	12.4	33.5	26.4	16.8	8.7	2.1	0.1
1960	100.0	0.1	12.7	33.9	26.2	16.3	8.5	2.2	0.1
1961	100.0	0.1	13.1	34.3	25.8	16.1	8.4	2.2	0.1
1962[1]	100.0	0.1	13.5	35.3	25.4	15.3	8.0	2.2	0.1
1963[1]	100.0	0.1	13.3	36.2	25.4	14.9	7.8	2.2	0.1
1964	100.0	0.1	13.2	36.4	25.7	14.7	7.7	2.2	0.1
1965	100.0	0.1	14.2	36.2	25.3	14.3	7.6	2.2	0.1
1966	100.0	0.1	15.5	36.8	25.0	13.3	7.0	2.1	0.1
1967	100.0	0.1	14.9	38.2	25.7	12.7	6.5	1.9	0.1

See footnote at end of table.

Table 7. Percentage distribution of live births by age of mother and color: United States, 1950-67—Con.

Year and color	Total	Age of mother (years)							
		Under 15	15-19	20-24	25-29	30-34	35-39	40-44	45 and over
All other									
1950	100.0	0.7	20.6	32.6	23.2	13.2	7.5	2.0	0.2
1951	100.0	0.7	20.2	32.0	23.6	13.7	7.5	2.1	0.2
1952	100.0	0.6	19.5	31.6	24.3	14.4	7.4	2.1	0.2
1953	100.0	0.6	19.3	31.0	24.6	14.7	7.4	2.1	0.2
1954	100.0	0.7	19.2	31.0	24.3	15.0	7.5	2.1	0.1
1955	100.0	0.6	19.0	31.2	24.1	15.2	7.7	2.0	0.2
1956	100.0	0.7	19.1	31.3	23.7	15.3	7.8	2.0	0.1
1957	100.0	0.7	19.2	31.4	23.4	15.3	7.8	2.0	0.2
1958	100.0	0.6	19.3	31.5	23.3	15.3	7.9	2.0	0.1
1959	100.0	0.6	19.4	31.4	23.2	15.2	8.0	2.0	0.1
1960	100.0	0.6	19.6	31.5	22.9	15.1	8.0	2.1	0.1
1961	100.0	0.7	19.5	31.6	23.1	14.9	8.1	2.1	0.1
1962[1]	100.0	0.7	19.9	32.0	22.7	14.5	7.9	2.1	0.1
1963[1]	100.0	0.8	20.4	32.5	22.3	14.1	7.6	2.1	0.1
1964	100.0	0.8	21.5	32.6	21.7	13.7	7.5	2.2	0.1
1965	100.0	0.8	23.1	32.3	21.1	13.1	7.3	2.1	0.1
1966	100.0	0.9	25.5	32.1	20.2	12.3	6.8	2.1	0.1
1967	100.0	1.0	26.9	32.4	19.6	11.6	6.3	2.0	0.1

[1] Figures by color excluded for New Jersey.

TECHNICAL APPENDIX

DEFINITION OF LIVE BIRTH

Every product of conception that gives signs of life after birth, regardless of the length of the pregnancy, is considered a live birth. This concept is embraced by the definition set forth by the World Health Organization as follows:

> Live birth is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live-born.[64]

SOURCES OF DATA

Natality Statistics

Natality statistics are based on information obtained from microfilm copies of the original birth certificates. These copies are received from the registration offices of all States, certain cities, and the District of Columbia. The statistical information on these records was edited, classified, placed on punchcards, and tabulated at the National Center for Health Statistics. In the statistical tabulations, United States refers to the aggregate of the 50 States and the District of Columbia. Alaska has been included in the United States tabulations since 1959 and Hawaii since 1960.

Natality data for the United States are limited to births occuring within the United States, including those occurring to nonresident aliens. Births occurring to U.S. citizens outside the United States are not included.

Standard Certificate of Live Birth

The Standard Certificate of Live Birth, issued by the Public Health Service, has served for many years as the principal means of attaining uniformity in the content of the documents used to collect information on births in the United States. It has been modified in each State to the extent required by the particular needs of the State or by special provisions of the State vital statistics law. However, the certificates of most States conform closely in content and arrangement to the standard certificate.

Form approved
Budget Bureau No. 68-R374.3.

CERTIFICATE OF LIVE BIRTH

STATE OF _____ BIRTH NO. _____

1956 REVISION OF STANDARD CERTIFICATE

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—PUBLIC HEALTH SERVICE

PHS-706 REV. 11-56

GPO: 1911 O - 315111

CHILD

1. PLACE OF BIRTH
   a. COUNTY
   b. CITY, TOWN, OR LOCATION
   c. NAME OF HOSPITAL OR INSTITUTION (*If not in hospital, give street address*)
   d. IS PLACE OF BIRTH INSIDE CITY LIMITS? YES ☐ NO ☐

2. USUAL RESIDENCE OF MOTHER (*Where does mother live?*)
   a. STATE b. COUNTY
   c. CITY, TOWN, OR LOCATION
   d. STREET ADDRESS
   e. IS RESIDENCE INSIDE CITY LIMITS? YES ☐ NO ☐
   f. IS RESIDENCE ON A FARM? YES ☐ NO ☐

3. NAME (*Type or print*) *First* *Middle* *Last*

4. SEX

5a. THIS BIRTH SINGLE ☐ TWIN ☐ TRIPLET ☐

5b. IF TWIN OR TRIPLET, WAS CHILD BORN 1ST ☐ 2D ☐ 3D ☐

6. DATE OF BIRTH *Month* *Day* *Year*

FATHER

7. NAME *First* *Middle* *Last*

8. COLOR OR RACE

9. AGE (*At time of this birth*) YEARS

10. BIRTHPLACE (*State or foreign country*)

11a. USUAL OCCUPATION

11b. KIND OF BUSINESS OR INDUSTRY

MOTHER

12. MAIDEN NAME *First* *Middle* *Last*

13. COLOR OR RACE

14. AGE (*At time of this birth*) YEARS

15. BIRTHPLACE (*State or foreign country*)

16. PREVIOUS DELIVERIES TO MOTHER (*Do NOT include this birth*)
   a. *How many OTHER children are now living?*
   b. *How many OTHER children were born alive but are now dead?*
   c. *How many fetal deaths (fetuses born dead at ANY time after conception)?*

17. INFORMANT

18. MOTHER'S MAILING ADDRESS

I hereby certify that this child was born alive on the date stated above.

18a. SIGNATURE

18b. ATTENDANT AT BIRTH M. D. ☐ D. O. ☐ MIDWIFE ☐ OTHER (*Specify*)

18c. ADDRESS

18d. DATE SIGNED

19. DATE RECD. BY LOCAL REG.

20. REGISTRAR'S SIGNATURE

21. DATE ON WHICH GIVEN NAME ADDED BY (*Registrar*)

FOR MEDICAL AND HEALTH USE ONLY

(*This section MUST be filled out*)

22a. LENGTH OF PREGNANCY COMPLETED WEEKS

22b. WEIGHT AT BIRTH LB. OZ.

23. LEGITIMATE YES ☐ NO ☐

(SPACE FOR ADDITION OF MEDICAL AND HEALTH ITEMS BY INDIVIDUAL STATES)

CLASSIFICATION OF DATA

Age of Mother

The birth certificate asks for "age (at time of this birth)."

Total-Birth Order

Birth order shown in this report refers to the total number of births the mother has had, including fetal deaths.

Race and Color

Births in the United States are classified for statistical purposes according to the race of the parents. In this report only the classes "white" and "other" are used. The category "white" comprises births reported as white, Mexican, Puerto Rican, and Cuban. The category "other" comprises Negro, American Indian, Chinese, Japanese, Hawaiian and part-Hawaiian, Aleuts and Eskimos and persons of any other race not included in "white."

Data by color for the years 1962 and 1963 do not include births in New Jersey because the item was omitted from the record form in those years.

Place of Birth

Births occurring in hospitals and institutions, regardless of the person in attendance, and those occurring in clinics, centers, or homes that were attended by physicians are included in the category "in hospital." In this context the word "home" does not refer to the mother's residence but to an institution such as a home for unwed mothers.

Birth Weight

In practically all areas birth weight is reported in terms of pounds and ounces rather than in grams. However, the metric system has been used in tabulating and presenting the statistics to facilitate comparison with data published by other groups in the United States. The equivalents in pounds and ounces of the gram intervals are as follows:

500 grams or less = 1 lb. 1 oz. or less
501-1,000 grams = 1 lb. 2 oz.-2lb. 3 oz.
1,001-1,500 grams = 2 lb. 4 oz.-3 lb. 4 oz.
1,501-2,000 grams = 3 lb. 5 oz.-4 lb. 6 oz.
2,001-2,500 grams = 4 lb. 7 oz.-5 lb. 8 oz.
2,501-3,000 grams = 5 lb. 9 oz.-6 lb. 9 oz.
3,001-3,500 grams = 6 lb. 10 oz.-7 lb. 11 oz.
3,501-4,000 grams = 7 lb. 12 oz.-8 lb. 13 oz.
4,001-4,500 grams = 8 lb. 14 oz.-9 lb. 14 oz.
4,501-5,000 grams = 9 lb. 15 oz.-11 lb. 0 oz.
5,001 grams or more = 11 lb. 1 oz. or more

For purposes of classification the term "low birth weight" refers to infants weighing 2,500 grams or less at birth.

For the years 1950-55, the records for Connecticut and Massachusetts are included in the category "Not specified" because birth weight was not included on the birth record forms in those states. In 1956, the information became available for Connecticut for part of the year, and for the years 1957-58 only Massachusetts failed to include this item on its live birth record forms. Beginning with 1959, birth weight was included on the record forms of all States.

Period of Gestation

The period of gestation is defined as beginning with the first day of the last normal menstrual period (LMP) and ending with the day of birth. The LMP is used as the initial date since it can be more accurately determined than the date of conception, which usually occurs 2 weeks after LMP.

The reporting of period of gestation is often in terms of weeks or of months of pregnancy. When months are reported, they are converted to gestation intervals in weeks as follows:

4 months to under 20 weeks
5 and 6 months to 20-27 weeks
7 months to 28-31 weeks
8 months to 32-35 weeks
9 months to 40 weeks
10 months to 43 weeks and over

Births occurring prior to 37 weeks of gestation are considered to be premature for purposes of classification.

An examination of the reported information on period of gestation suggests a substantial heaping at the intervals of 36 weeks and 40 weeks and over. These biases result from the fact that the gestation period is frequently not carefully observed and that the newborn infant of normal size is generally assumed to have had a gestation period of 40 weeks or 9 months, depending on conventional usage. Such errors in reporting are minimized in areas where the gestation period item on the birth certificate requests the "first day of the last normal menstrual period."

During the period of this study, relatively few areas in the United States required the entry of first day of the last menstrual period on their records. In 1958, only Baltimore, California, and New York City are shown as requiring this information in the annual volume *Vital Statistics of the United States.* By 1967, the following areas were added: District of Columbia beginning in 1960, Rhode Island in 1965, Minnesota in 1967. Inadvertently, in 1967 weeks of gestation were punched for Rhode Island instead of date of last normal menses as shown on the record form. The year which is reported here is not necessarily the year that the item first appeared on the record form, but the first year that data for this method of reporting are so identified in *Vital Statistics of the United States.*

Data by gestational age are not published for all years. Published volumes for the years 1954-55, 1957, 1959, and 1961 do not contain data by gestation. For the remaining years, the data do not include all of the States. For the following years, the exclusions are:

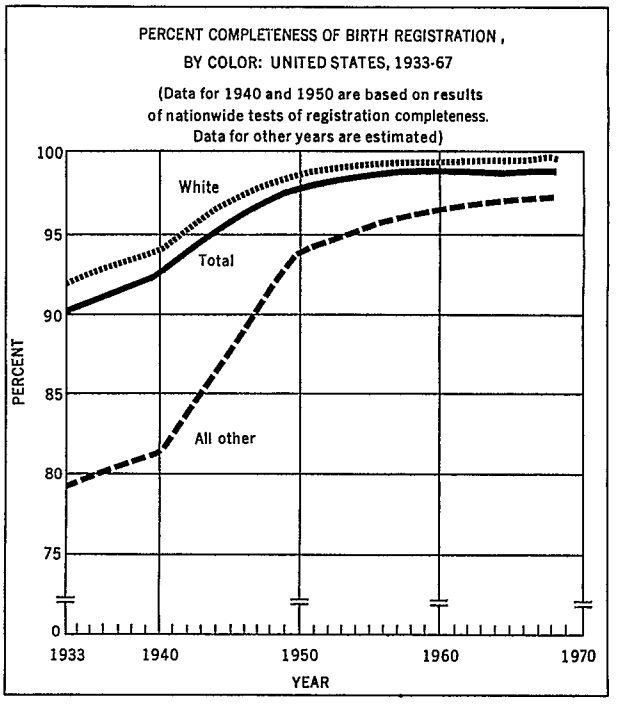
1950 – – – – Louisiana, Massachusetts
1951 – – – – Massachusetts
1952-53 – – – Massachusetts, Washington
1956, 1958, 1960, 1962-67 – Maryland outside Baltimore, and Massachusetts

QUALITY OF DATA

While vital statistics data are useful for a variety of administrative and scientific purposes, they cannot be correctly interpreted unless various qualifying factors and methods of classification are taken into account. It is not feasible to discuss all the pertinent factors in the use of vital statistics tabulations, but some of the more important ones should be mentioned.

Completeness of Registration

It is estimated that 99.0 percent of all births occurring in the United States in 1967 were registered. This estimate is based on results of the 1950 test of birth registration completeness, which indicates that 98.6 percent of white births and 93.6 percent of nonwhite births were registered in that year. Estimates of birth registration completeness by color since 1933 are shown in the figure.



Quality Control Procedures

The coding and punching of birth data are performed simultaneously directly from microfilm images or transcripts of the original certificates. Approximately 75 percent of all cards punched are verified on a 10-percent systematic

sample. The expected result from this system of verification is that on the average 2.25 percent of the cards contain one or more errors. The rest of the cards are verified completely, and the errors remaining are presumably very few.

Sampling of Birth Records

Birth statistics presented in this report for years prior to 1951 and for 1955 are based on the total file of birth records. Statistics for 1951-54 and 1956-66 are based on 50-percent samples which consist of even-numbered birth records. During the processing of the 1967 records, the sampling rate was reduced from 50 percent to 20 percent.

The sample design is essentially a stratified random sample. The sampling frame consists of births that occur in the United States during a calendar year and are recorded by State registrars of vital statistics. Tables of standard errors are included in the annual volumes *Vital Statistics of the United States* for the appropriate years.

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