NATIONAL CENTER For HEALTH STATISTICS | Series 22 Number 8

VITAL and HEALTH STATISTICS

DATA FROM THE NATIONAL VITAL STATISTICS SYSTEM

Variations in Birth Weight

Legitimate Live Births

United States - 1963

Statistics on the variation in birth weight according to whether or not the mother was employed during pregnancy, 1962 family income, the time of the first visit for medical care and the number of visits during the 12 months preceding childbirth. Based on data collected by a questionnaire mailed to mothers and medical care services for a sample selected from records of births in 1963 which were filed with the National Center for Health Statistics.

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Health Services and Mental Health Administration

Washington, D.C. November 1968

Public Health Service Publication No. 1000-Series 22-No. 8

For sale by the Superintendent of Documents, U.S. Government Printing Office
Office, Washington, D.C., 20402 - Price 45 cents

NATIONAL CENTER FOR HEALTH STATISTICS

DIVISION OF VITAL STATISTICS

Public Health Service Publication No. 1000-Series 22-No. 8

Library of Congress Catalog Card Number 68-62240

CONTENTS

Introduction ---------- 1

Selected Findings ---------- 2
- Classification ---------- 2
- Comparison of Survey and Registration Data ---------- 3
- Employment During Pregnancy ---------- 4
- Family Income ---------- 5
- Visits for Medical Care During Year Before Childbirth ---------- 7

References ---------- 11

Detailed Tables ---------- 12

Appendix I. Technical Notes on Methods ---------- 25
- Background of This Report ---------- 25
- Sources of Data ---------- 25
- Sample Design ---------- 25
- The Birth Certificate and Questionnaires ---------- 26
- Collection of Data ---------- 26
- Processing of Data ---------- 27
- Nonresponse and Imputation of Missing Data ---------- 27
- Birth Records ---------- 28
- Physicians and Medical Facilities ---------- 28
- Estimation ---------- 28
- Reliability of Estimates ---------- 29
- Rounding of Numbers ---------- 30

Appendix II. Definitions of Certain Terms Used in This Report ---------- 31
- Information From the Certificate of Live Birth ---------- 31
- Information From the Questionnaire ---------- 31

Appendix III. Source Forms ---------- 32
- Certificate of Live Birth ---------- 32
- Mother Questionnaire ---------- 33
- Physician Questionnaire ---------- 34
- Hospital Questionnaire ---------- 35

IN THIS REPORT statistics are presented on the variation in birth weight among legitimate births in the United States in 1963. Estimates of the average birth weight and the percent distribution of births by birth-weight intervals are given when the mothers are classified by whether or not they were employed during pregnancy, by the family income in 1962, and by the timing and amount of medical care during the 12 months preceding childbirth.

These statistics are based on data collected in a mail survey with questionnaires sent to the mother, the attending physician, the hospital where the birth took place, and to any other physician, hospital, or other medical facility named by one of the first three sources. In cases where there was no response to three mailed questionnaires, followups by telephone or personal interview were attempted.

The average birth weight of all legitimate live births in 1963 was 3,280 grams. Approximately 7.2 percent of the babies weighed 2,500 grams or less and 8.0 percent weighed 4,001 grams or more. Babies born to married women who were employed during pregnancy had a lower average birth weight than babies born to women who were not employed. However, employed women had fewer babies of low birth weight (2,500 grams or less) than women who were not employed. Married women in families with low incomes in 1962 had a higher percentage of babies weighing 2,500 grams or less than women in families with high incomes. Married women who made 10 visits or more to physicians or medical facilities during the year had fewer low-birth-weight babies than women who made fewer than 10 visits.

SYMBOLS

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

VARIATIONS IN BIRTH WEIGHT

1963 LEGITIMATE LIVE BIRTHS

Mary Grace Kovar, *Division of Vital Statistics*

INTRODUCTION

It has long been recognized that birth weight is a factor in the survival of the newborn. Earlier studies published in the *Vital and Health Statistics* series (Series 21, Nos. 3-6) have examined the relationship between birth weight and survival. These studies, which were based on matched birth and death records for infants who were born during the first quarter of 1950 and who died within 28 days after birth, amply demonstrate the increased risk of early death for the low-birth-weight baby. There were, for example, 173.7 deaths per 1,000 live births weighing 2,500 grams or less as contrasted with 7.8 deaths per 1,000 live births weighing 2,501 grams or more.

The present report contains no information about death rates. It is instead an attempt to examine some of the factors operating on the family or the mother before the birth which might affect the weight of the child. The three items which were selected for study are employment of the mother during pregnancy, family income, and timing and number of visits for medical care during the year before childbirth.

These data became available from the 1963 National Natality Survey which was designed to obtain estimates of the amount of exposure to radiation during pregnancy. The number of visits to a physician or medical facility, the mother's employment during pregnancy, and the income of the family in the previous calendar year (1962) were obtained in the course of the study of X-ray exposure. Color, the birth weight of the child, the age of the mother, and the number of previous live births were available from the birth certificate. By combining the information received from the mother with that recorded on the certificate, it became possible to examine additional conditions which might affect the birth weight.

Through a process of ratio adjustment, the data obtained from the survey were converted into national estimates so that persons familiar with the statistics from the vital registration system can use these data in conjunction with the vital statistics. However, because these data are from a sample survey, the estimates will not always agree with those which would be obtained from the complete file of registered births. In addition, the data contained in this report are subject to sampling error and the reader should consult the tables of sampling error in appendix I before deciding that there are real differences in birth weights among the various groups of women.

The necessity of allowing for sampling variability in making comparisons between birth weights is one reason for showing the average or arithmetic mean rather than the median weight as is usual in vital statistics reports. Although it is possible to compute the sampling errors of the median, it is much easier to do so for a mean—particularly in this case where the computer

program was already available. Those readers who prefer the median can make an approximation from the frequency distribution. However, as shown later in the report, in the relatively symmetrical distribution of live-birth weights, there is little difference between the average and the median.

Appendix I describes the design and procedures of the survey and the methods of obtaining the estimates.

Appendix II gives definitions of terms used in this report and appendix III consists of facsimiles of the Standard Certificate of Live Birth and of the questionnaires which were mailed to the mothers, physicians, and medical facilities.

SELECTED FINDINGS

During 1963 an estimated 3.8 million legitimate babies were born in the United States. Their average birth weight was 3,280 grams. Approximately 7.2 percent of the babies weighed 2,500 grams or less and 8.0 percent weighed 4,001 grams or more. The average birth weight of babies born to married white women was 3,300 grams and 6.5 percent of the babies weighed 2,500 grams or less. The average birth weight of babies born to married nonwhite women was 3,130 grams and 11.8 percent weighed 2,500 grams or less.

On the average, babies born to married women who were not employed during pregnancy weighed 3,290 grams and babies born to married women who were employed during pregnancy weighed 3,250 grams. However, approximately 7.6 percent of the babies born to women who were not employed weighed 2,500 grams or less but only 6.5 percent of the babies born to women who were employed during pregnancy weighed 2,500 grams or less. Among women who were employed, those who stopped working during the second trimester of pregnancy appeared to have babies with a lower average weight and to have more babies of low birth weight than women who stopped working in the first trimester or women who continued working into the third trimester of pregnancy.

Babies born to married women in the lower income classes weighed less on the average than babies born to women in the higher income classes. The percentage of babies weighing 2,500 grams or less was almost twice as high in families with an income of under $3,000 in 1962 as in families with an income of $7,000 or over. Within each income class, babies born to nonwhite mothers had a lower average birth weight and were more likely to weigh 2,500 grams or less than babies born to white mothers. For example, in families with a 1962 income of under $3,000, 8.8 percent of the babies born to white mothers and 14.0 percent of the babies born to nonwhite mothers weighed 2,500 grams or less. In families with a 1962 income of $7,000 or more, 5.4 percent of the babies born to white mothers and 9.6 percent of the babies born to nonwhite mothers weighed 2,500 grams or less.

Babies born to married white women who received medical care before the end of the first trimester of pregnancy were less likely to weigh 2,500 grams or less than babies born to women who either did not receive care until later in pregnancy or who received no prenatal care. Babies born to nonwhite married women who received medical care before the end of the first trimester of pregnancy were more likely to weigh 2,500 grams or less than babies born to women who did not receive care until later in pregnancy or who received no prenatal care. Although no data are available from this survey to explain the difference, some suggestions as to possible explanations based on data from other sources are made in the text.

Over 10 percent of the married women who had fewer than 10 visits to physicians or medical facilities during the 12 months before childbirth had babies which weighed 2,500 grams or less. Approximately 5 percent of the women who made 10 visits or more had babies which weighed 2,500 grams or less.

Classification

In almost all areas birth weight was reported in pounds and ounces. Gram groupings have been used here in order to facilitate comparison with other studies and to make the arithmetic computations and comparisons more efficient. The

equivalents of these groups in terms of pounds and ounces are as follows:

1,000 grams or less = 2 lb. 3 oz. or less
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 discussion, infants weighing 2,500 grams or less have been referred to as low-birth-weight babies. This term is used on the recommendation of the World Health Organization and medical groups in the United States and refers only to the weight of the child at birth with no implications as to length of gestation or any other measure of maturity.

Comparison of Survey and Registration Data

Color, age of mother, and live-birth order are all recorded on the birth certificate. Therefore, the statistics presented in tables 1 and 2 for legitimate births from the survey can be compared with vital statistics data for all United States births in 1963.

Table A shows the percent distribution of births by birth-weight intervals for all births from the vital registration system and for legitimate births from the National Natality Survey. The two distributions are very similar. In addition, the median for all registered births was 3,290 grams and the average for the legitimate births in the survey was 3,280 grams.

Another comparison of the two sets of data is shown in table B. In this table the median weights (the only measure available from published data) from the registration system are shown with the average weights of the babies selected in the survey for age of mother and color classes. There is a tendency for the average to be lower than the median for births to women under age 25 and aged 35 or older, but higher for births to women aged 25-34. The average is also lower than the median for each color class. The differences are slight except for births to women aged 35 or over. For some reason, the average birth weight is low for women 35 years or over in the survey—lower than would be expected from previous experience with registration statistics. In an effort to discover the reason for this, the average birth weight was computed for all sample births to women in this age group instead of just for legitimate births. The average birth weight of all of the births to women aged 35 or over selected in the sample was 3,280 grams. Thus, the difference between survey and registration data was not due to restricting the survey to legitimate births.

Table 2 is the last of the introductory tables based on information recorded on the birth cer-

Table A. Percent distribution of births, by birth-weight intervals according to estimates from vital registration data and National Natality Survey: United States, 1963

Birth weight	All births[1] (median 3,290)	Legitimate births (mean 3,280)
	Percent distribution	
Total	100.0	100.0
1,000 grams or less	0.6	0.5
1,001-1,500 grams	0.7	0.7
1,501-2,000 grams	1.5	1.5
2,001-2,500 grams	5.4	4.5
2,501-3,000 grams	19.4	19.4
3,001-3,500 grams	38.2	39.2
3,501-4,000 grams	25.8	26.1
4,001-4,500 grams	7.0	6.6
4,501-5,000 grams	1.2	1.3
5,001 grams or more	0.2	0.1

[1]National Center for Health Statistics: Vital Statistics of the United States, 1963, Vol. I, Natality. Public Health Service. Washington. U.S. Government Printing Office, 1965.

tificate. The average weight and the percent distribution by birth weight intervals are shown for each of the first three and for the fourth and higher birth orders for each color. The average birth weight was higher for each succeeding birth order. Within each birth order the average weight of white births was higher than the average weight of nonwhite births. For first and second births the difference was almost 300 grams. For third births it was 170 grams; for fourth and high order births it was 100 grams. However, as has been shown in earlier reports in this series, the proportional distribution of nonwhite births within the category "fourth or higher" is not the same as that of white births. Therefore, the effects of order and color are confounded in the final category.

Two things are apparent from this exposition of tables 1 and 2 and their comparison with registration data. First, the average birth weight is not strikingly different from the median commonly used in publications based on the registration system. The reader accustomed to the one can use the other. Second, the percent distributions by birth-weight intervals are very close; this gives confidence that the survey, which is based on a sample, accurately represents births from the full file of registered births.

Table B. Median and average birth weights, by age of mother and color; estimates from vital registration data and National Natality Survey: United States, 1963

Age of mother and color	Weight at birth in grams	
	All births[1]	Legitimate births
	Median	Average
All ages	3,290	3,280
Under 15 years	3,040	3,180
15-19 years	3,220	
20-24 years	3,280	3,250
25-29 years	3,310	3,320
30-34 years	3,330	3,340
35-39 years	3,340	3,290
40-44 years	3,360	
45 years and over	3,380	
White	3,320	3,300
Nonwhite	3,140	3,130

[1] National Center for Health Statistics: Vital Statistics of the United States, 1963, Vol. I, Natality. Public Health Service. Washington. U.S. Government Printing Office, 1965.

Employment During Pregnancy

In a previous report in this series[1] it was noted that a relationship between employment during pregnancy and birth weight, thus possibly between employment of the mother and survival of the child, has been suspected. Tables 3 and 4 present the birth weight distributions for each age and color category for certain classes of employment during pregnancy.

When the average birth weight of babies of employed wives is compared with that of babies of wives who were not employed, it is obvious that, within each age-of-mother interval, the average birth weight of children of employed wives was less than that of children of wives who were not employed. The differences in each interval are not significant but they are consistent. The lower average weight does not mean, however, a greater incidence of babies weighing 2,500 grams or less born to the employed wives. Only 6.5 percent of the babies of employed women weighed 2,500 grams or less while 7.6 percent of the children of wives who were not employed were classified as low-birth-weight babies. The lower average birth weight of babies born to employed wives was due to fewer babies of high birth weight rather than to more babies of low birth weight. Employed wives had fewer babies of both low and high birth weights and more in the 3,001-3,500 gram class (fig. 1). The high concentration of birth weights of babies of employed wives in the modal interval was apparent for each age category except that of under 20 years. Among these young wives the distributions were essentially the same both for those who were employed during pregnancy and those who were not.

The lower average birth weight of children of married women who were employed during pregnancy was found only among white wives.

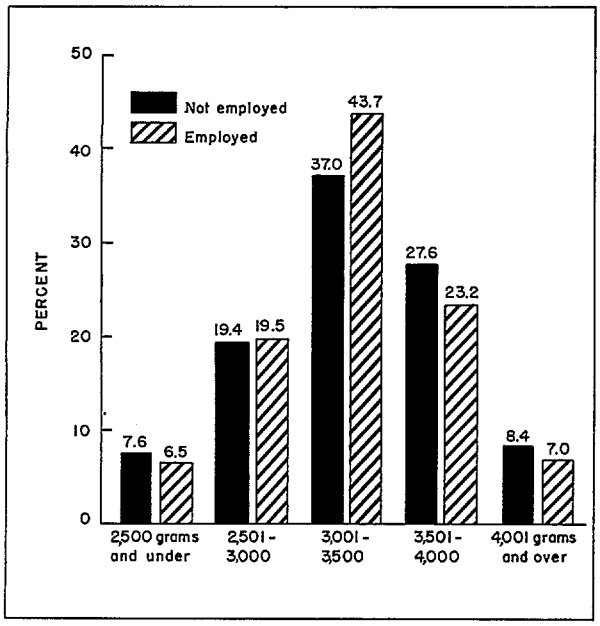


Figure 1. Percent distribution of babies by birth-weight intervals according to mother's employment status during pregnancy.

Among babies born to white mothers there was a difference of 50 grams in the average birth weight; 3,310 grams for babies of mothers who were not employed, 3,260 grams for babies of employed mothers (table C). However, for babies of nonwhite mothers the reverse situation was found. The babies of nonwhite mothers who were not employed during pregnancy weighed, on the average, 3,110 grams, and the babies of nonwhite mothers who were employed weighed, on the average, 3,190 grams. Thus, children of working nonwhite mothers averaged 80 grams heavier than the children of nonwhite mothers who were not employed. Further, 13.0 percent of the nonwhite mothers who were not employed during pregnancy had babies who weighed 2,500 grams or less, while only 9.7 percent of those who were employed had babies so classified (table 4).

The birth weights by the trimester of pregnancy when the mother was last employed show an interesting pattern. The average birth weight was lower and the percentage weighing 2,500 grams or less was higher for babies of mothers who stopped working during the second trimester than of those who stopped in the first trimester or who were still working during the third trimester. This is quite possibly the result of selection on the part of the attending physician. If the mother was having medical problems he might advise her to stop working; if all was going well medically, she might continue.

In conclusion, there is no evidence here that working during pregnancy increased the risk of having a low-birth-weight baby. On the contrary, except possibly for pregnant women under 20, the reverse seems to be true, particularly for the nonwhite woman who was employed.

Family Income

A second factor which might be expected to influence the weight of the newborn is the income of the family into which it is born. The influence of income would not be directly on the weight, but on diet and medical care both of which might influence weight and are dependent upon adequate financial resources.

The income referred to in this report is the total money income during the previous calendar year of all members of the family who were usual residents of the household at the time of the child's birth. In the case of couples whose marriage took place in 1963 and who were not a family in 1962, their individual incomes, if any, were added and used as a family income.

Table C. Average birth weight and percent of babies weighing 2,500 grams or less, by color of mother and employment status during pregnancy: United States, 1963 legitimate live births

Color of mother and employment status during pregnancy	Average birth weight in grams	Percent of babies 2,500 grams or less
White----------	3,300	6.5
Not employed----------	3,310	6.8
Employed----------	3,260	6.0
Nonwhite--------	3,130	11.8
Not employed----------	3,110	13.0
Employed----------	3,190	9.7

Table D. Average birth weight, by color and percent of births to white wives according to 1962 family income: United States, 1963 legitimate live births

1962 family income	Average birth weight in grams			Percent of births to white wives
	All wives	White	Nonwhite	
All incomes	3,280	3,300	3,130	87.3
Under $3,000	3,180	3,200	3,080	69.6
$3,000-$4,999	3,280	3,300	3,160	85.3
$5,000-$6,999	3,310	3,310	3,300	95.2
$7,000 and over	3,330	3,330	3,190	96.5

The average birth weight was higher in each succeeding income class as shown in table D. Children born into families with a 1962 income of less than $3,000 weighed, on the average, 3,180 grams; children born into families with a 1962 income of $7,000 or over weighed 3,330 grams. Simultaneously, the percentage of low-birth-weight babies declined from 10.4 percent for those with a family income of less than $3,000 to 5.5 percent where the family income was $7,000 or more in 1962 (table 5).

Within each of the income classes, the average birth weight of babies born to white wives was higher than that of babies born to nonwhite wives. The decreased proportion of nonwhite births in each succeeding income class accounts for part of the increased birth weight when births to all married women are considered. However, the average birth weight was higher in the higher income classes for both white and nonwhite so the increase in birth weight with increased income is independent of color.

Table 5 shows more detail for income classes for each color than table D. However, there are so few nonwhite mothers in the higher income classes that the sampling error is too high to show them separately. It is therefore possible to show only all married women and white married women, bearing in mind that in the upper income classes almost all the women were white.

Among white wives then, the average birth weight of their children was higher for each income class until the $10,000 level. The average weight in the class $10,000 and over was somewhat lower than in the $7,000-$9,999 class, but the difference was too small to have any statistical significance. The percentage of babies weighing 2,500 grams or less was somewhat higher and the percentage weighing 3,501 grams or over was somewhat lower in the highest income group than in the $7,000-$9,999 class. It is possible that the shift toward lower birth weights in the top income group is related to an increased proportion of women aged 35 and over in that group. As previously noted, data from this survey show a lower average birth weight for babies born to these women.

This possibility is supported by data shown in table 6. For each of the three lower income classes the modal age class is 20-24 years. For the income class $7,000 and over the modal age class is 25-29 and there were about twice as many women aged 35 or older as in any of the three lower income classes. In addition, approximately 40 percent of the women aged 35 or older were members of families with a 1962 income of $7,000 or more.

Within each age class, except 35 and over, the pattern consisted of higher average birth weights in families with higher incomes. The

pattern shows slight variations and the differences between incomes classes are often not statistically significant, but the pattern seems to be consistent enough to say that the family income does exert an effect on birth weight which is independent of the wife's age.

Since a low family income appears to exert a depressing effect on the weight at birth, resulting in a lower average birth weight and a higher percentage of babies weighing 2,500 grams or less in the low income classes, and a mother's employment during her pregnancy seems mainly to result in a concentrated range of birth weights, it seems advisable to look at employment within each income class. These data are shown in table 7.

In families with an income of less than $3,000 in 1962 there was no difference in the average birth weight between babies of mothers who were employed during pregnancy and those who were not. In each income class above $3,000 there was a difference of 40-80 grams in the average weight, with the babies of employed wives weighing somewhat less than those born to wives who were not employed. However, except for the class $3,000-$4,999, the employed wives had fewer babies weighing 2,500 grams or less than the wives who were not employed. Within each income class there was a higher concentration of birth weights in the modal class of 3,001-3,500 grams for babies born to employed wives than for babies born to wives who were not employed.

Finally, both among wives who were employed during pregnancy and for those who were not, the average birth weight was higher as the family's income was higher. The percentage of babies who weighed 2,500 grams or less decreased as the family's income increased from under $3,000 to $10,000.

Visits for Medical Care During Year Before Childbirth

Due to the structure of the questionnaire used in the 1963 National Natality Survey, it is impossible to separate the visits for prenatal care from visits for other kinds of medical care. It is necessary to include all visits to physicians or to medical facilities during the entire 12-month period before the baby was born. The advantages and disadvantages of the 12-month period, the methods used to collect the information about the date of the first visit and the number of visits, and an analysis of the data have all been presented in a previous report in this series.[2] The reader who is interested in the details should consult that report in addition to the technical appendixes at the end of this report.

However, a few points should be stated here. First, the collection of information on visits for medical care was relatively independent of the mother. The mothers' responses served only to double check so that no source of care was missed. Second, the information on the date of first visit and the number of visits came directly from the physician or the medical facility providing the care. Response rates were excellent. Ninety-three percent of the physicians and 98 percent of the medical facilities responded to the questionnaires. Furthermore, almost all of the returned questionnaires were complete in all details.

Finally, since it was impossible to ascertain when the first visit for prenatal care took place, the mothers who first saw a physician or were seen at a medical facility during the three months before conception are shown together with the mothers who first received care during the first three months of pregnancy and the assumption was made that those who were receiving medical care before conception continued to do so afterwards. This assumption is justified by the fact that women whose first medical care during the year was before conception made more visits on the average than women whose first medical care during the year was after conception.

Table E shows the average birth weight and the percent of births weighing 2,500 grams or less according to the trimester of the first visit. Table 8 shows the complete percent distribution by birth-weight intervals.

For all legitimate births, babies born to married women who were receiving medical care before the end of the first trimester of pregnancy were heavier than babies whose mothers did not receive care until later in pregnancy. Moreover, the later in pregnancy that care began, the higher the percentage of babies weighing 2,500 grams or less.

Table E. Average birth weight and percent of babies weighing 2,500 grams or less, by color: United States, 1963 legitimate live births

Trimester of first visit for medical care	All wives		White		Nonwhite	
	Average birth weight in grams	Percent of births 2,500 grams or less	Average birth weight in grams	Percent of births 2,500 grams or less	Average birth weight in grams	Percent of births 2,500 grams or less
All trimesters--------	3,280	7.2	3,300	6.5	3,130	11.8
First----------	3,300	6.7	3,310	6.1	3,090	13.9
Second----------	3,230	7.5	3,250	6.8	3,110	11.1
Third----------	3,250	8.6	3,280	7.8	3,140	11.2
No care----------	3,250	11.5	3,160	13.0	3,370	9.5

According to the data presented in column 2 of table E there appears to be an increase in the proportion of low birth weight babies of approximately one percent with each trimester that medical care was delayed. Among women whose first visit for medical care was before the end of the first trimester, approximately 6.7 percent of the births weighed 2,500 grams or less. Among those whose first medical care was in the third trimester, approximately 8.6 percent of the births weighed 2,500 grams or less.

However, the differences in birth weight according to the trimester of first medical care are not the same for the white and nonwhite wives. The percentage of babies weighing 2,500 grams or less who were born to white mothers was 6.1 for those receiving care before the end of the first trimester of pregnancy; 6.8 for those who first received care in the second trimester; 7.8 for those who first received care in the third trimester; and 13.0 for those who received no medical care before the birth. No medical care was reported for only an estimated 46 thousand married white women, 1.4 percent, but these mothers had 2.8 percent of the low-birth-weight babies. Despite the small number of mothers receiving no care, the difference between their rate of having babies weighing 2,500 grams or less and that for mothers receiving any care is statistically significant.

Among nonwhite married women, the base numbers are too small for differences to have any statistical significance, but the trend is in the opposite direction. Babies born to nonwhite mothers who received medical care before the end of the first trimester had a lower average birth weight and a higher incidence of low birth weight than babies born to any group of wives which started care later. Those wives who had no prenatal care, as defined for this survey, had on the average the heaviest babies and the fewest babies of low birth weight.

Although there are no data from this survey to test any hypothesis about the inverse relationship between timing of medical care and birth weight among the nonwhite wives, indirect information offers some possible explanations. First, there was a relationship between level of income and medical care[2] and the nonwhite mothers were almost all in the lower income groups. It is possible that only those nonwhite women who were in obvious need of medical care sought it early in pregnancy or even before pregnancy began and that conditions which led them to seek care were also conditions which predisposed them to have either premature or low-birth-weight babies. Support for this possibility is found later in this report in the section on income and trimester of care. Second, the women who were reported as receiving no care may have received care from

midwives who were not defined in this survey as sources of medical care. It is known from registration data that although only 1.6 percent of all live births in the United States were attended by midwives in 1964, 8.0 percent of nonwhite births in the United States and 17.9 percent of nonwhite births in the South had midwives recorded as the attendant at birth.[1]

A second measure of medical care was the number of visits made during the year. With the exception of the nonwhite mothers who received no care, the average birth weight increased as the amount of care increased from no visits to 15-19 visits (table 9). The percentage of babies who were of low birth weight showed a general decline through this same range.

There was a slight but not significant decrease in the weight of babies born to mothers who had made 20 visits or more for medical care. It is possible that the women who made 20 visits or more were women who had medical problems in their pregnancies which would lead to lower birth weights. The same nonsignificant decline has already been noted in the top income and age groups.

There is a distinct difference in both the average weight and the percentage weighing 2,500 grams or less between babies born to mothers who made fewer than 10 visits and those born to mothers who made 10 visits or more. When the mother made fewer than 10 visits, the average weight was less than 3,200 grams and 10.5 percent of the babies were of low birth weight. When the mother made 10 visits or more, the average weight was over 3,300 grams and only 5.2 percent of the babies weighed 2,500 grams or less. Approximately twice as many low-birth-weight babies were born to women making fewer than 10 visits as were born to women making 10 visits or more. In addition the average birth weight was 150 grams less for the women making fewer than 10 visits (table F).

Table 11 shows the birth weight distribution according to the trimester in which the mother first received care and whether she made fewer or more than 10 visits. Regardless of when the first visit was made, the mothers who made 10 visits or more had fewer low-birth-weight babies than those who made fewer than 10 visits. For example, among women whose first visit for medical care was during the second trimester of pregnancy, 11 percent of those who made fewer than 10 visits had low-birth-weight babies while only 4 percent of those who made 10 visits or

Table F. Average birth weight according to 1962 family income, by number of visits for medical care during 12 months before childbirth: United States, 1963 legitimate live births

Number of visits	1962 family income				
	All incomes	Under $3,000	$3,000-$4,999	$5,000-$6,999	$7,000 and over
	Average birth weight in grams				
All visits	3,280	3,180	3,280	3,310	3,330
0 visits	3,250	3,420	3,150	*	*
1-4 visits	3,170	3,130	3,150	3,160	3,280
5-9 visits	3,200	3,120	3,220	3,220	3,260
10-14 visits	3,310	3,230	3,330	3,360	3,300
15-19 visits	3,360	3,230	3,320	3,390	3,430
20 visits or more	3,350	3,200	3,440	3,330	3,340
0-9 visits	3,190	3,140	3,190	3,180	3,270
10 visits or more	3,340	3,220	3,350	3,360	3,350

more had low-birth-weight babies. The difference in the average birth weight was 160 grams.

Since birth weights were higher in the upper income classes and among mothers receiving earlier or more medical care, and since the amount of medical care is related to the family's income, the last two tables (11 and 12) are devoted to an examination of the variability in birth weight according to the amount of medical care within each of the income classes.

In families with a 1962 income of less than $3,000, an inverse relationship was found between average birth weight and trimester of first medical care. Those mothers who received care late in pregnancy or who received no care had heavier babies on the average and had fewer low-birth-weight babies than those who received care early in pregnancy. No relationship is evident between birth weight and the number of visits. It should be remembered that in this low income class approximately 30 percent of the women were nonwhite and among these women the highest average birth weights were found when there was the least medical care.

In each of the three higher income classes the highest birth weights were found when medical care was begun before the end of the first trimester of pregnancy. However, the women in each income class who began their care earliest did not always have the lowest incidence of low-birth-weight babies in their income class.

If trimester of first medical care is treated as the major variable rather than income, that is, income classes within each trimester are compared, there is no clear pattern evident and certainly no statistical justification for stating that there are real differences. There may be an increase in birth weight with increased family income within each trimester of care classification, but the data have not been tabulated in a fashion which would permit the use of the refined statistical techniques necessary to support such a hypothesis.

Table F shows the average birth weight for each income class when the mothers are also classified by the number of visits made during the year. Within each income class, there is a significant difference in weight between babies whose mothers made 5-9 visits and those whose mothers made 10-14 visits. In general, it can be said that mothers who made fewer than 10 visits (with the exception of those in families with a 1962 income under $3,000 who received no care) had lighter babies than those who made 10 visits or more, regardless of the family's income. Conversely, for mothers who made fewer than 10 visits, the average birth weight was higher when the family's income was greater; the same was also true for mothers who made 10 visits or more. Finally, within each income class there were more low-birth-weight babies born to mothers who made fewer than 10 visits than to mothers who made 10 visits or more (table 12).

There is no explanation for the difference in birth weight between babies whose mothers made fewer than 10 visits and those with 10 or more available from the data in this survey. The information was collected after the birth had taken place and physicians and medical facilities were not asked to furnish any diagnostic information. It is possible that conditions outside the scope of the survey account for many of the differences observed between levels of medical care. Given the uniform availability of care it seems logical to assume that women with medical problems not directly related to pregnancy and women who were experiencing difficulty with the current pregnancy would both receive more medical attention than women without such problems. The women in each level of care category are almost certainly selected and are not randomly distributed. Without knowledge of the basis of selection, the data presented in this report have definite limitations and should be interpreted with caution.

Ideally, statistics on women without complications of pregnancy should be shown separately from those on women with complications. However, unless such information is recorded accurately on the birth certificate, a special study has to be made in order to obtain the necessary data. This study was not designed for that purpose and so the statistics presented here only indicate possible differences and areas where more research is needed.

REFERENCES

[1]National Center for Health Statistics: Employment during pregnancy: United States, 1963 legitimate live births. *Vital and Health Statistics*. PHS Pub. No. 1000-Series 22-No. 7. Public Health Service. Washington. U.S. Government Printing Office, Sept. 1968.

[2]National Center for Health Statistics: Visits for medical and dental care during the year preceding childbirth: United States, 1963 births. *Vital and Health Statistics*. PHS Pub. No. 1000-Series 22-No. 4. Public Health Service. Washington. U.S. Government Printing Office, May 1968.

[3]National Center for Health Statistics: Methods and response characteristics of the National Natality Survey, United States, 1963. *Vital and Health Statistics*. PHS Pub. No. 1000-Series 22-No. 3. Washington. U.S. Government Printing Office, Sept. 1966.

[4]Kish, L.: *Survey Sampling*. New York. John Wiley & Sons, Inc., 1965. p. 559.

[5]National Center for Health Statistics: *Vital Statistics of the United States, 1963,* Vol. I. Public Health Service. Washington. U.S. Government Printing Office, 1964.

[6]McCarthy, P. J., Simmons, W. R., and Losee, G. J.: Replication Techniques for Estimating Variances From Complex Surveys. Paper presented at a joint session of the Epidemiology and Statistics Sections at the Ninety-Third Meeting of the American Public Health Association. Chicago, Ill. Oct. 18, 1965; and National Center for Health Statistics: Replication, an approach to the analysis of data from complex surveys. *Vital and Health Statistics*. PHS Pub. No. 1000-Series 2-No. 14. Public Health Service. Washington. U.S. Government Printing Office, Apr. 1966.

———o o o———

DETAILED TABLES

Page

Table 1. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to age and color of mother: United States, 1963 legitimate live births---------- 13

2. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to live-birth order and color of mother: United States, 1963 legitimate live births---------- 14

3. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to age of mother and whether mother was employed during pregnancy: United States, 1963 legitimate live births---------- 15

4. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to color of mother and trimester of last employment during pregnancy: United States, 1963 legitimate live births---------- 16

5. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to family income in 1962 and color of mother: United States, 1963 legitimate live births---------- 17

6. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to family income in 1962 and age of mother: United States, 1963 legitimate live births---------- 18

7. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to family income in 1962 and whether mother was employed during pregnancy: United States, 1963 legitimate live births---------- 19

8. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to trimester of first visit for medical care and color of mother: United States, 1963 legitimate live births---------- 20

9. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to number of visits for medical care and color of mother: United States, 1963 legitimate live births---------- 21

10. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to trimester of first visit for medical care and number of visits: United States, 1963 legitimate live births---------- 22

11. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to family income in 1962 and trimester of first visit for medical care: United States, 1963 legitimate live births---------- 23

12. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to family income in 1962 and number of visits: United States, 1963 legitimate live births---------- 24

Table 1. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to age and color of mother: United States, 1963 legitimate live births

Age and color	Average birth weight	Births	Birth weight					
			Total	2,500 grams or less	2,501-3,000 grams	3,001-3,500 grams	3,501-4,000 grams	4,001 grams or more
	Grams	Number in thousands	Percent distribution					
All ages								
Total	3,280	3,797	100.0	7.2	19.4	39.2	26.1	8.0
White	3,300	3,315	100.0	6.5	18.8	39.1	27.1	8.5
Nonwhite	3,130	482	100.0	11.8	23.7	40.0	19.8	4.7
Under 20 years								
Total	3,180	468	100.0	8.2	22.7	42.6	20.7	5.8
White	3,210	407	100.0	6.9	21.3	43.6	22.0	6.3
Nonwhite	2,990	60	100.0	17.5	32.1	36.0	11.8	2.6
20-24 years								
Total	3,250	1,354	100.0	7.6	19.7	41.5	24.4	6.7
White	3,270	1,197	100.0	6.7	19.3	41.1	25.6	7.2
Nonwhite	3,050	156	100.0	14.3	22.9	44.7	15.2	2.9
25-29 years								
Total	3,320	992	100.0	5.9	18.5	37.8	28.7	9.2
White	3,330	861	100.0	5.6	18.0	37.4	29.2	9.9
Nonwhite	3,210	131	100.0	8.0	21.8	40.8	24.9	4.6
30-34 years								
Total	3,340	583	100.0	6.5	18.2	36.8	29.2	9.4
White	3,350	505	100.0	6.2	17.3	36.9	29.6	10.1
Nonwhite	3,230	78	100.0	8.4	24.1	36.1	26.5	4.9
35 years and over								
Total	3,290	402	100.0	9.1	18.7	34.7	27.6	9.9
White	3,300	345	100.0	8.6	18.4	34.7	28.8	9.5
Nonwhite	3,210	57	100.0	12.2	20.4	34.7	20.4	12.2

Table 2. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to live-birth order and color of mother: United States, 1963 legitimate live births

Live-birth order and color	Average birth weight	Births	Birth weight					
			Total	2,500 grams or less	2,501-3,000 grams	3,001-3,500 grams	3,501-4,000 grams	4,001 grams or more
All live births	Grams	Number in thousands	Percent distribution					
Total	3,280	3,797	100.0	7.2	19.4	39.2	26.1	8.0
White	3,300	3,315	100.0	6.5	18.8	39.1	27.1	8.5
Nonwhite	3,130	482	100.0	11.8	23.7	40.0	19.8	4.7
First birth								
Total	3,220	989	100.0	6.9	20.4	43.8	23.2	5.7
White	3,250	910	100.0	6.3	19.8	43.5	24.5	6.0
Nonwhite	2,960	79	100.0	14.1	26.6	47.6	8.4	3.3
Second birth								
Total	3,250	912	100.0	7.9	22.0	38.5	23.9	7.8
White	3,280	823	100.0	6.6	21.5	38.7	24.8	8.4
Nonwhite	2,990	89	100.0	19.9	25.8	36.5	16.2	1.7
Third birth								
Total	3,310	714	100.0	6.9	17.7	39.1	27.0	9.3
White	3,320	639	100.0	6.3	17.6	38.1	28.1	9.9
Nonwhite	3,150	74	100.0	11.3	18.6	48.4	16.8	4.9
Fourth birth or higher								
Total	3,320	1,182	100.0	7.2	17.7	36.1	29.8	9.2
White	3,340	943	100.0	6.9	16.3	36.0	30.8	10.0
Nonwhite	3,240	240	100.0	8.1	23.5	36.2	25.9	6.3

Table 3. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to age of mother and whether mother was employed during pregnancy: United States, 1963 legitimate live births

Age and employment status	Average birth weight	Births	Birth weight					
			Total	2,500 grams or less	2,501-3,000 grams	3,001-3,500 grams	3,501-4,000 grams	4,001 grams or more
All ages	Grams	Number in thousands	Percent distribution					
All mothers	3,280	3,797	100.0	7.2	19.4	39.2	26.1	8.0
Not employed	3,290	2,564	100.0	7.6	19.4	37.0	27.6	8.4
Employed	3,250	1,179	100.0	6.5	19.5	43.7	23.2	7.0
Under 20 years								
All mothers	3,180	468	100.0	8.2	22.7	42.6	20.7	5.8
Not employed	3,180	287	100.0	8.2	22.7	43.1	20.6	5.4
Employed	3,170	171	100.0	8.8	22.2	43.1	20.3	5.6
20-24 years								
All mothers	3,250	1,354	100.0	7.6	19.7	41.5	24.4	6.7
Not employed	3,250	833	100.0	7.8	19.8	40.5	24.8	7.1
Employed	3,230	496	100.0	7.5	19.7	42.9	23.9	6.0
25-29 years								
All mothers	3,320	992	100.0	5.9	18.5	37.8	28.7	9.2
Not employed	3,330	688	100.0	6.1	19.4	33.4	31.5	9.5
Employed	3,290	294	100.0	5.2	16.6	46.9	22.9	8.4
30-34 years								
All mothers	3,340	583	100.0	6.5	18.2	36.8	29.2	9.4
Not employed	3,350	447	100.0	7.6	17.3	35.2	29.7	10.3
Employed	3,320	133	100.0	2.2	21.1	42.2	28.2	6.4
35 years and over								
All mothers	3,290	402	100.0	9.1	18.7	34.7	27.6	9.9
Not employed	3,300	309	100.0	9.7	17.8	32.9	30.2	9.3
Employed	3,230	85	100.0	7.7	21.4	40.8	18.5	11.6
Unknown								
Total	3,300	55	100.0	3.5	20.9	45.8	18.4	11.3

Table 4. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to color of mother and trimester of last employment during pregnancy: United States, 1963 legitimate live births

Color and employment status	Average birth weight	Births	Birth weight					
			Total	2,500 grams or less	2,501-3,000 grams	3,001-3,500 grams	3,501-4,000 grams	4,001 grams or more
Total	Grams	Number in thousands	Percent distribution					
All mothers	3,280	3,797	100.0	7.2	19.4	39.2	26.1	8.0
Not employed	3,290	2,564	100.0	7.6	19.4	37.0	27.6	8.4
Employed	3,250	1,179	100.0	6.5	19.5	43.7	23.2	7.0
First trimester	3,270	165	100.0	5.8	20.2	44.4	19.9	9.6
Second trimester	3,210	374	100.0	8.0	19.7	43.0	23.1	6.3
Third trimester	3,280	555	100.0	5.6	18.9	43.5	25.1	6.8
Unknown trimester	3,180	85	100.0	7.2	22.1	47.1	17.6	6.0
Employment unknown	3,300	55	100.0	3.5	20.9	45.8	18.4	11.3
White								
All mothers	3,300	3,315	100.0	6.5	18.8	39.1	27.1	8.5
Not employed	3,310	2,248	100.0	6.8	18.5	37.0	28.7	9.0
Employed	3,260	1,016	100.0	6.0	19.5	43.6	23.8	7.1
First trimester	3,260	147	100.0	5.9	20.8	45.6	17.6	10.1
Second trimester	3,220	332	100.0	7.2	19.2	43.2	24.3	6.0
Third trimester	3,300	469	100.0	5.2	18.5	42.9	26.1	7.2
Unknown trimester	3,160	68	100.0	5.7	24.6	45.9	19.3	4.5
Employment unknown	3,320	51	100.0	3.8	20.3	43.9	19.8	12.2
Nonwhite								
All mothers	3,130	482	100.0	11.8	23.7	40.0	19.8	4.7
Not employed	3,110	316	100.0	13.0	25.5	37.4	20.3	3.8
Employed	3,190	163	100.0	9.7	20.0	44.3	19.3	6.6
First trimester	*	*	*	*	*	*	*	*
Second trimester	3,140	42	100.0	14.0	23.0	40.8	13.9	8.3
Third trimester	3,180	86	100.0	7.9	21.0	46.7	19.6	4.8
Unknown trimester	*	*	*	*	*	*	*	*
Employment unknown	*	*	*	*	*	*	*	*

Table 5. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to family income in 1962 and color of mother: United States, 1963 legitimate live births

1962 family income and color	Average birth weight	Births	Birth weight					
			Total	2,500 grams or less	2,501-3,000 grams	3,001-3,500 grams	3,501-4,000 grams	4,001 grams or more
	Grams	Number in thousands	Percent distribution					
All incomes								
Total	3,280	3,797	100.0	7.2	19.4	39.2	26.1	8.0
White	3,300	3,315	100.0	6.5	18.8	39.1	27.1	8.5
Nonwhite	3,130	482	100.0	11.8	23.7	40.0	19.8	4.7
Under $3,000								
Total	3,180	819	100.0	10.4	21.6	39.2	23.2	5.6
White	3,200	570	100.0	8.8	20.1	38.9	26.3	5.9
Nonwhite	3,080	249	100.0	14.0	25.0	39.8	16.2	5.0
$3,000-$4,999								
Total	3,280	1,030	100.0	7.7	18.7	39.8	25.0	8.8
White	3,300	879	100.0	6.9	18.2	40.2	25.0	9.7
Nonwhite	3,160	151	100.0	12.4	21.7	37.1	24.8	3.9
$5,000-$6,999								
Total	3,310	920	100.0	5.7	18.1	39.6	28.2	8.4
White	3,310	876	100.0	6.0	17.8	39.1	28.4	8.6
Nonwhite	3,300	44	100.0	-	22.4	50.4	23.5	3.7
$7,000 and over								
Total	3,330	973	100.0	5.5	19.6	38.0	28.4	8.6
White	3,330	930	100.0	5.4	19.5	38.0	28.6	8.6
Nonwhite	3,190	34	100.0	9.6	23.3	37.6	21.6	7.9
$7,000-$9,999								
Total	3,330	667	100.0	5.0	20.5	36.8	29.1	8.6
White	3,340	645	100.0	4.8	20.3	36.9	29.1	8.8
Nonwhite	3,190	22	100.0	9.7	25.5	32.0	29.4	3.5
$10,000 and over								
Total	3,310	306	100.0	6.8	17.6	40.6	26.6	8.5
White	3,320	294	100.0	6.7	17.5	40.3	27.4	8.2
Nonwhite	*	*	*	*	*	*	*	*
Unknown								
Total	3,300	55	100.0	3.5	20.9	45.8	18.4	11.3
White	3,320	51	100.0	3.8	20.3	43.9	19.8	12.2
Nonwhite	*	*	*	*	*	*	*	*

Table 6. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to family income in 1962 and age of mother: United States, 1963 legitimate live births

1962 family income and age	Average birth weight	Births	Birth weight					
			Total	2,500 grams or less	2,501-3,000 grams	3,001-3,500 grams	3,501-4,000 grams	4,001 grams or more
All incomes	Grams	Number in thousands	Percent distribution					
All ages	3,280	3,797	100.0	7.2	19.4	39.2	26.1	8.0
Under 20 years	3,180	468	100.0	8.2	22.7	42.6	20.7	5.8
20-24 years	3,250	1,354	100.0	7.6	19.7	41.5	24.4	6.7
25-29 years	3,320	992	100.0	5.9	18.5	37.8	28.7	9.2
30-34 years	3,340	583	100.0	6.5	18.2	36.8	29.2	9.4
35 years and over	3,290	402	100.0	9.1	18.7	34.7	27.6	9.9
Under $3,000								
All ages	3,180	819	100.0	10.4	21.6	39.2	23.2	5.6
Under 20 years	3,110	221	100.0	10.9	24.4	42.4	18.5	3.8
20-24 years	3,170	309	100.0	10.6	19.9	41.4	24.3	3.8
25-29 years	3,210	135	100.0	11.1	20.3	37.7	22.5	8.4
30-34 years	3,260	81	100.0	11.1	20.7	32.4	27.2	8.6
35 years and over	3,300	73	100.0	6.1	23.6	30.3	29.4	10.5
$3,000-$4,999								
All ages	3,280	1,030	100.0	7.7	18.7	39.8	25.0	8.8
Under 20 years	3,230	156	100.0	6.9	21.4	42.6	21.9	7.3
20-24 years	3,260	426	100.0	7.8	18.8	43.0	22.4	8.1
25-29 years	3,290	252	100.0	7.6	17.6	37.7	29.7	7.4
30-34 years	3,340	123	100.0	6.7	19.6	34.9	25.0	13.8
35 years and over	3,310	72	100.0	11.4	14.8	30.5	30.3	13.0
$5,000-$6,999								
All ages	3,310	920	100.0	5.7	18.1	39.6	28.2	8.4
Under 20 years	3,210	58	100.0	4.9	24.4	43.0	19.6	8.1
20-24 years	3,270	344	100.0	6.5	19.5	40.4	26.0	7.5
25-29 years	3,360	276	100.0	3.8	17.2	36.5	32.9	9.7
30-34 years	3,330	155	100.0	6.4	15.3	41.1	30.3	6.8
35 years and over	3,310	86	100.0	8.3	15.6	41.7	23.6	10.8
$7,000 and over								
All ages	3,330	973	100.0	5.5	19.6	38.0	28.3	8.6
Under 20 years	3,370	24	100.0	4.1	7.9	52.9	31.8	3.3
20-24 years	3,280	250	100.0	5.5	21.5	40.1	26.1	6.8
25-29 years	3,360	317	100.0	4.1	19.8	38.0	27.7	10.4
30-34 years	3,370	219	100.0	4.4	18.4	36.4	31.8	9.1
35 years and over	3,260	163	100.0	10.2	19.6	34.6	28.0	7.6
Unknown								
All ages	3,300	55	100.0	3.5	20.9	45.8	18.4	11.3

Table 7. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to family income in 1962 and whether mother was employed during pregnancy: United States, 1963 legitimate live births

1962 family income and employment status	Average birth weight	Births	Birth weight					
			Total	2,500 grams or less	2,501-3,000 grams	3,001-3,500 grams	3,501-4,000 grams	4,001 grams or more
All incomes	Grams	Number in thousands	Percent distribution					
Total	3,280	3,797	100.0	7.2	19.4	39.2	26.1	8.0
Not employed	3,290	2,564	100.0	7.6	19.4	37.0	27.6	8.4
Employed	3,250	1,179	100.0	6.5	19.5	43.7	23.2	7.0
Under $3,000								
Total	3,180	819	100.0	10.4	21.6	39.2	23.2	5.6
Not employed	3,180	598	100.0	11.1	21.3	37.7	24.4	5.5
Employed	3,180	221	100.0	8.6	22.4	43.2	20.0	5.9
$3,000-$4,999								
Total	3,280	1,030	100.0	7.7	18.7	39.8	25.0	8.8
Not employed	3,290	726	100.0	7.2	18.8	39.0	25.8	9.3
Employed	3,230	304	100.0	9.1	18.4	41.8	23.0	7.8
$5,000-$6,999								
Total	3,310	920	100.0	5.7	18.1	39.6	28.2	8.4
Not employed	3,320	628	100.0	6.1	18.7	36.8	29.7	8.7
Employed	3,280	292	100.0	4.9	16.6	45.8	24.9	7.8
$7,000 and over								
Total	3,330	973	100.0	5.5	19.6	38.0	28.3	8.6
Not employed	3,360	612	100.0	6.2	18.7	34.4	30.9	9.8
Employed	3,280	361	100.0	4.4	21.1	44.0	24.0	6.4
$7,000-$9,999								
Total	3,330	667	100.0	5.0	20.5	36.8	29.1	8.6
Not employed	3,360	420	100.0	5.5	19.8	33.6	31.2	10.0
Employed	3,280	246	100.0	4.1	21.8	42.3	25.7	6.2
$10,000 and over								
Total	3,310	306	100.0	6.8	17.6	40.6	26.6	8.5
Not employed	3,340	191	100.0	7.7	16.3	36.2	30.3	9.5
Employed	3,260	115	100.0	5.2	19.8	47.7	20.5	6.8
Unknown								
Total	3,300	55	100.0	3.5	20.9	45.8	18.4	11.3

Table 8. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to trimester of first visit for medical care and color of mother: United States, 1963 legitimate live births

Trimester of first visit and color	Average birth weight	Births	Birth weight					
			Total	2,500 grams or less	2,501-3,000 grams	3,001-3,500 grams	3,501-4,000 grams	4,001 grams or more
All trimesters	Grams	Number in thousands	Percent distribution					
Total	3,280	3,797	100.0	7.2	19.4	39.2	26.1	8.0
White	3,300	3,315	100.0	6.5	18.8	39.1	27.1	8.5
Nonwhite	3,130	482	100.0	11.8	23.7	40.0	19.8	4.7
First trimester								
Total	3,300	2,246	100.0	6.7	18.2	39.4	27.2	8.5
White	3,310	2,069	100.0	6.1	17.7	39.4	27.9	8.8
Nonwhite	3,090	177	100.0	13.9	23.8	39.4	18.5	4.4
Second trimester								
Total	3,230	724	100.0	7.5	20.4	41.7	23.9	6.6
White	3,250	611	100.0	6.8	20.1	41.4	24.0	7.7
Nonwhite	3,110	113	100.0	11.1	22.1	43.1	23.0	0.7
Third trimester								
Total	3,250	679	100.0	8.6	23.2	35.3	25.8	7.2
White	3,280	531	100.0	7.8	21.8	34.3	29.0	7.1
Nonwhite	3,140	148	100.0	11.2	28.2	38.9	14.2	7.5
No prenatal care								
Total	3,250	79	100.0	11.5	12.0	41.9	24.1	10.5
White	3,160	46	100.0	13.0	15.3	49.4	10.9	11.3
Nonwhite	3,370	33	100.0	9.5	7.2	31.4	42.6	9.3
Unknown								
Total	3,370	69	100.0	1.7	21.0	44.6	21.3	11.5
White	3,390	58	100.0	2.0	19.8	42.0	22.4	13.7
Nonwhite	*	*	*	*	*	*	*	*

Table 9. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to number of visits for medical care and color of mother: United States, 1963 legitimate live births

Number of visits and color	Average birth weight	Births	Birth weight					
			Total	2,500 grams or less	2,501-3,000 grams	3,001-3,500 grams	3,501-4,000 grams	4,001 grams or more
All visits	Grams	Number in thousands	Percent distribution					
Total	3,280	3,797	100.0	7.2	19.4	39.2	26.1	8.0
White	3,300	3,315	100.0	6.5	18.8	39.1	27.1	8.5
Nonwhite	3,130	482	100.0	11.8	23.7	40.0	19.8	4.7
No visits								
Total	3,250	79	100.0	11.5	12.0	41.9	24.1	10.5
White	3,160	46	100.0	13.0	15.3	49.4	10.9	11.3
Nonwhite	3,370	33	100.0	9.5	7.2	31.4	42.6	9.3
1-4 visits								
Total	3,170	678	100.0	10.2	26.0	34.8	22.7	6.3
White	3,210	523	100.0	9.1	23.9	34.8	25.3	6.9
Nonwhite	3,040	155	100.0	14.1	32.8	34.9	14.0	4.2
5-9 visits								
Total	3,200	699	100.0	10.6	19.5	39.5	24.5	5.9
White	3,210	557	100.0	9.6	19.6	39.7	25.1	6.0
Nonwhite	3,150	142	100.0	14.5	19.0	38.6	22.3	5.5
10-14 visits								
Total	3,310	1,132	100.0	5.6	19.2	38.9	28.4	7.9
White	3,320	1,054	100.0	5.3	18.8	38.5	29.2	8.2
Nonwhite	3,130	78	100.0	9.9	24.0	44.8	17.7	3.6
15-19 visits								
Total	3,360	697	100.0	3.9	17.3	42.1	26.7	10.1
White	3,370	657	100.0	3.7	17.5	41.8	26.6	10.4
Nonwhite	3,260	41	100.0	6.1	14.1	47.0	28.2	4.6
20 or more visits								
Total	3,350	430	100.0	6.1	14.0	41.4	28.2	10.3
White	3,360	407	100.0	6.2	13.4	40.3	29.4	10.7
Nonwhite	3,140	23	100.0	4.1	23.9	60.5	8.2	3.3
Unknown								
Total	3,310	83	100.0	5.2	22.4	39.9	22.9	9.6
White	3,330	73	100.0	59	20.3	38.1	24.9	10.9
Nonwhite	*	*	*	*	*	*	*	*

Table 10. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to trimester of first visit for medical care and number of visits: United States, 1963 legitimate live births

Trimester of first visit and number of visits	Average birth weight	Births	Birth weight					
			Total	2,500 grams or less	2,501-3,000 grams	3,001-3,500 grams	3,501-4,000 grams	4,001 grams or more
All trimesters	Grams	Number in thousands	Percent distribution					
All visits	3,280	3,797	100.0	7.2	19.5	39.3	26.2	8.0
No visits	3,250	79	100.0	11.5	12.0	41.9	24.1	10.5
1-9 visits	3,180	1,377	100.0	10.5	22.7	37.3	23.7	6.1
10 or more visits	3,330	2,258	100.0	5.2	17.6	40.4	27.9	9.0
Unknown	3,310	83	100.0	5.2	22.7	40.3	23.2	9.7
First trimester								
All visits	3,300	2,246	100.0	6.7	18.2	39.4	27.2	8.5
1-9 visits	3,140	40	100.0	12.7	21.4	37.5	22.6	5.8
10 or more visits	3,330	1,835	100.0	5.3	17.6	40.0	28.2	9.1
Unknown	*	*	*	*	*	*	*	*
Second trimester								
All visits	3,230	724	100.0	7.5	20.4	41.7	23.9	6.6
1-9 visits	3,150	363	100.0	11.0	21.1	41.0	22.1	5.5
10 or more visits	3,310	359	100.0	4.0	19.4	42.8	26.0	7.8
Unknown	*	*	*	*	*	*	*	*
Third trimester								
All visits	3,250	679	100.0	8.6	23.2	35.3	25.8	7.2
1-9 visits	3,230	612	100.0	8.7	24.6	34.9	25.4	6.7
10 or more visits	3,410	62	100.0	7.8	9.8	38.9	30.6	12.9
Unknown	*	*	*	*	*	*	*	*
Trimester unknown								
Total	3,370	69	100.0	1.7	21.0	44.6	21.3	11.5
No prenatal care								
Total	3,250	79	100.0	11.5	12.0	41.9	24.1	10.5

Table 11. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to family income in 1962 and trimester of first visit for medical care: United States, 1963 legitimate live births

1962 family income and trimester of first visit	Average birth weight	Births	Birth weight					
			Total	2,500 grams or less	2,501-3,000 grams	3,001-3,500 grams	3,501-4,000 grams	4,001 grams or more
	Grams	Number in thousands	Percent distribution					
All incomes								
All trimesters	3,280	3,797	100.0	7.2	19.4	39.2	26.1	8.0
First	3,300	2,246	100.0	6.7	18.2	39.4	27.2	8.5
Second	3,230	724	100.0	7.5	20.4	41.7	23.9	6.6
Third	3,250	679	100.0	8.6	23.2	35.3	25.8	7.2
No prenatal care	3,250	79	100.0	11.5	12.0	41.9	24.1	10.5
Trimester unknown	3,370	69	100.0	1.7	21.0	44.6	21.3	11.5
Under $3,000								
All trimesters	3,180	819	100.0	10.4	21.6	39.2	23.2	5.6
First	3,140	348	100.0	11.9	21.2	38.5	23.6	4.8
Second	3,160	212	100.0	11.0	20.8	42.0	22.2	4.0
Third	3,220	215	100.0	8.6	25.3	37.0	21.8	7.2
No prenatal care	3,420	35	100.0	5.9	10.4	39.9	29.0	14.8
Trimester unknown	*	*	*	*	*	*	*	*
$3,000-$4,999								
All trimesters	3,280	1,030	100.0	7.7	18.7	39.8	25.0	8.8
First	3,310	562	100.0	6.7	17.7	39.8	26.0	9.8
Second	3,260	233	100.0	5.3	21.3	42.1	22.8	8.5
Third	3,200	208	100.0	12.3	19.2	38.0	24.7	5.8
No prenatal care	3,150	21	100.0	17.8	12.5	33.0	27.2	9.6
Trimester unknown	*	*	*	*	*	*	*	*
$5,000-$6,999								
All trimesters	3,310	920	100.0	5.7	18.1	39.6	28.2	8.4
First	3,320	615	100.0	5.6	17.5	39.4	29.0	8.6
Second	3,270	151	100.0	6.8	14.7	46.0	25.6	6.8
Third	3,320	140	100.0	4.5	23.9	32.9	29.3	9.3
No prenatal care	*	*	*	*	*	*	*	*
Trimester unknown	*	*	*	*	*	*	*	*
$7,000 and over								
All trimesters	3,330	973	100.0	5.5	19.6	38.0	28.3	8.6
First	3,340	718	100.0	5.2	17.8	39.5	28.5	9.0
Second	3,260	126	100.0	6.4	24.4	35.1	26.9	7.1
Third	3,320	115	100.0	6.7	25.8	29.3	30.9	7.3
No prenatal care	*	*	*	*	*	*	*	*
Trimester unknown	*	*	*	*	*	*	*	*
Unknown								
Total	3,300	55	100.0	3.5	20.9	45.8	18.4	11.3

Table 12. Average birth weight, number of births, and percent distribution, by birth-weight intervals according to family income in 1962 and number of visits: United States, 1963 legitimate live births

1962 family income and number of visits	Average birth weight	Births	Birth weight					
			Total	2,500 grams or less	2,501-3,000 grams	3,001-3,500 grams	3,501-4,000 grams	4,001 grams or more
	Grams	Number in thousands	Percent distribution					
All incomes								
All visits	3,280	3,797	100.0	7.2	19.4	39.2	26.1	8.0
No visits	3,250	79	100.0	11.5	12.0	41.9	24.1	10.5
1-4 visits	3,170	678	100.0	10.2	26.0	34.8	22.7	6.3
5-9 visits	3,200	699	100.0	10.6	19.5	39.5	24.5	5.9
10-14 visits	3,310	1,132	100.0	5.6	19.2	38.9	28.4	7.9
15-19 visits	3,360	697	100.0	3.9	17.3	42.1	26.7	10.1
20 visits or more	3,350	430	100.0	6.1	14.0	41.4	28.2	10.3
Unknown	3,310	83	100.0	5.2	22.4	39.9	22.9	9.6
Under $3,000								
All visits	3,180	819	100.0	10.4	21.6	39.2	23.2	5.6
No visits	3,420	35	100.0	5.9	10.4	39.9	29.0	14.8
1-4 visits	3,130	217	100.0	12.8	26.1	34.7	20.5	5.9
5-9 visits	3,120	203	100.0	13.7	20.0	42.0	20.4	4.0
10-14 visits	3,230	198	100.0	8.2	21.2	36.6	28.5	5.5
15-19 visits	3,230	104	100.0	5.9	21.3	43.6	21.7	7.6
20 visits or more	3,200	52	100.0	10.0	15.4	49.4	23.4	1.9
Unknown	*	*	*	*	*	*	*	*
$3,000-$4,999								
All visits	3,280	1,030	100.0	7.7	18.7	39.8	25.0	8.8
No visits	3,150	21	100.0	17.8	12.5	33.0	27.2	9.6
1-4 visits	3,150	206	100.0	11.0	23.0	40.1	21.3	4.5
5-9 visits	3,220	225	100.0	9.0	20.4	37.2	27.4	6.1
10-14 visits	3,330	284	100.0	5.2	16.4	43.5	26.3	8.6
15-19 visits	3,320	174	100.0	6.6	20.6	40.4	20.0	12.4
20 visits or more	3,440	112	100.0	5.5	10.9	35.5	31.8	16.3
Unknown	*	*	*	*	*	*	*	*
$5,000-$6,999								
All visits	3,310	920	100.0	5.7	18.1	39.6	28.2	8.4
No visits	*	*	*	*	*	*	*	*
1-4 visits	3,160	115	100.0	9.0	29.2	28.2	26.7	6.9
5-9 visits	3,220	162	100.0	8.4	17.4	43.8	26.1	4.4
10-14 visits	3,360	313	100.0	5.0	17.6	36.6	30.8	10.0
15-19 visits	3,390	193	100.0	2.1	14.2	44.7	29.5	9.5
20 visits or more	3,330	118	100.0	5.2	16.1	43.2	25.9	9.6
Unknown	*	*	*	*	*	*	*	*
$7,000 and over								
All visits	3,330	973	100.0	5.5	19.6	38.0	28.3	8.6
No visits	*	*	*	*	*	*	*	*
1-4 visits	3,280	138	100.0	6.3	27.1	32.4	25.0	9.0
5-9 visits	3,260	107	100.0	11.8	20.2	32.8	24.6	10.5
10-14 visits	3,300	335	100.0	4.8	21.8	38.7	28.0	6.7
15-19 visits	3,430	225	100.0	2.3	15.7	40.1	31.9	10.0
20 visits or more	3,340	148	100.0	6.0	14.2	41.5	29.1	9.2
Unknown	*	*	*	*	*	*	*	*
Income unknown								
Total	3,300	55	100.0	3.5	20.9	45.8	18.4	11.3

APPENDIX I

TECHNICAL NOTES ON METHODS

Background of This Report

This report presents estimates of the average birth weight and of the percent distribution of births by birthweight intervals for live births in 1963. It is based on data collected in the 1963 National Natality Survey. The survey, which was conducted by the Division of Health Records Statistics of the National Center for Health Statistics (in part under contract with the Division of Radiological Health, Public Health Service), was designed primarily to provide national estimates of the amount and type of exposure to ionizing radiation experienced by women during pregnancy. In addition to obtaining radiation data from physicians and medical facilities, certain socioeconomic and demographic data which were thought to be relevant to the study were obtained from the mothers.

Sources of Data

The first source of data was the birth certificate. In addition survey procedures included a questionnaire mailed to each mother selected in the sample, to the attendant at birth, and to the hospital reported as the place of birth. These sources of information are identified on the birth record itself and are referred to as primary sources.

Each of these primary sources was requested to identify other physicians, dentists, or medical facilities from whom the mother received any care during the year prior to the birth of her child. These additional sources of information are referred to as secondary sources. Questionnaires were also mailed to these secondary sources. Regardless of whether they were primary or secondary, the same information was obtained from all medical and dental sources.

Information about the number of visits, the dates of the first and last visit, X-ray examinations, and other medical aspects was obtained only from physicians, medical facilities, and dentists. The medical section of the questionnaire sent to the mother was limited to identification of physicians and dentists from whom she received care. The mother was also requested to furnish certain socioeconomic and demographic information to supplement that recorded on the birth certificate.

This report uses information obtained from three sources. Color, live-birth order, age of mother, birth weight, weeks of gestation, and legitimacy status were either recorded on the certificates or derived from entries on the certificates. Family income, employment during pregnancy, and names of sources of medical care was obtained from the questionnaire mailed to mothers of legitimate births. All information on the number of visits and the date of the first visit came from the questionnaire sent to physicians, hospitals, or clinics. Each physician, hospital, or clinic was also asked for names of other persons or facilities who might have furnished care to this mother and these additional sources of medical care were then sent questionnaires.

Sample Design

The sampling frame for the 1963 National Natality Survey was the file of microfilms of birth records received each month by the National Center for Health Statistics from the 54 birth registration areas of the United States. As a general rule, for each registration area these microfilm images are assigned a number prior to or during filming of the birth record. Each thousand consecutive images are defined as a "reel" and assigned a reel number starting from zero. Within each reel, the images are numbered from 1 to 1,000.

The sampling for the survey was based on a probability design which made use of these preassigned reel and image numbers on the birth records. Each reel of the microfilm copies of the birth certificates constituted a primary sampling unit. Within each reel one record was chosen at random. Thus, a sample of 1 out of 1,000 births was selected from the monthly shipment of records from the registration areas.

The national sample included a total of 4,096 births for the year 1963. Of these 4,096 births, 214 were reported as illegitimate on the birth record. However, legitimacy is reported in only 35 of the 54 registration areas in the United States. Hence, a procedure was developed to infer legitimacy on the basis of indirect evidence on the birth certificate for the 19 registration areas not reporting this item. If the surname of the father on the birth record was different from the sur-

Table I. Total number of births in the United States and the number in the survey of mothers: 1963 National Natality Survey

Item	Size
Total count of births in the United States	4,098,000
Number of births selected in the sample	4,096
Number of births excluded from survey:	
Number of illegitimate births	316
Number of births from Missouri:	
July-December 1963	45
Other	9
Number of births included for the survey of mothers	3,726

name of the child or if the surname of the father was not reported, the birth was imputed to be illegitimate. On the basis of this procedure, 102 births in the sample were inferred to be illegitimate in addition to those mentioned above.

The mothers of these 316 illegitimate births plus the mothers of an additional 54 births were not queried. The State of Missouri withdrew from the survey after June 1963, so that the 45 births selected in the sample from Missouri for the period July through December 1963 were excluded from the survey. Nine additional births were excluded from the survey either because residence was outside the United States or because no usable mailing address was available. Thus, the final sample of mothers to whom questionnaires were mailed was 3,726. Table I shows the size of the original sample drawn from the birth records and the final sample of mothers to whom questionnaires were mailed.

In contrast with the survey of mothers, in which illegitimate births were excluded, medical inquiries were sent in all instances where a medical source of information was identified. Hence, statistics relating to medical care which did not require information provided by the mother were obtained for all births selected in the sample.

The Birth Certificate and Questionnaires

Facsimiles of the Standard Certificate of Live Birth and of the questionnaire used in the survey are shown in appendix III.

Although not all States use the standard certificate, most do include the basic information used in this report. The major exception is legitimacy (item 23) which is not reported in 19 States. The procedure which was developed to overcome this omission is discussed under sample design.

The questionnaire sent to the mother was designed primarily to obtain names and addresses of any physicians and medical facilities which she visited during the year in addition to those named on the birth certificate. In addition, there were six questions concerning the family income during 1962 (the last calendar year before the birth), the educational attainment of the parents, the father's employment status at the time of the birth, and the mother's employment at any time during her pregnancy.

The questionnaires sent to physicians and medical facilities were essentially alike. The respondent to this questionnaire was asked whether the mother had received any examination or treatment by X-ray during the 12 months preceding the birth of her child. If so, he was asked for details about the X-ray procedures. Whether the mother had received an X-ray examination or not, the respondent was asked to report the number of times the mother had been seen for medical care during the 12 months and the dates of the first and last visits during that period.

The questionnaire sent to dentists was similar to that sent to physicians and medical facilities except that fewer questions were asked about the X-ray examinations. No information obtained from dentists is included in this report.

Collection of Data

Data for the 1963 National Natality Survey were collected primarily by mail. Using the addresses given on the birth certificate, questionnaires were sent to the mother, the physician who delivered the baby, and the medical facility where the baby was born.

For these mothers, followup procedures consisted of a certified mailing 2 weeks after the initial mailing and a regular first-class mailing 3 weeks after the certified mail. Telephone or personal interviews were conducted by Bureau of the Census interviewers with mothers who did not respond after all three mailings and who lived in one of the field survey areas of the Current Population Survey program of the Bureau of the Census. These procedures resulted in a response rate of 86.4 percent from mothers included in the survey (table II).

Followup procedures for physicians, dentists, and institutions were similar to those for the mothers with two differences: (1) The first followup was by first class mail and the second followup was by certified mail. (2) No telephone or personal interviews were conducted after the three mailings. The response rate from each of these sources was higher than 90 percent.

Reporting of visits to physicians and medical facilities was relatively independent of the mother since the primary sources were named on the birth certificate and the names of secondary sources were elicited on the questionnaire sent to the named sources. Comparison of the responses from the primary medical sources and from the mother showed that almost all the secondary sources were named by primary sources and few

Table II. Response received from mothers, physicians, medical facilities, and dentists, by mailing waves: 1963 National Natality Survey

Response status	Mothers	Physicians	Medical facilities	Dentists
Total included in survey	3,726	4,474	4,432	1,360
	Percent			
Total response	86.4	93.1	97.6	97.0
Response to original mail	45.3	66.5	77.4	81.2
Response to second mail	29.0	17.6	15.3	11.5
Response to third mail	6.8	9.0	4.9	4.3
Response to interview	5.1	...	...	...
Total nonresponse	13.6	6.9	2.4	3.0

additional names were elicited from the mother query. However, it is possible that some sources of medical care were missed in the case of illegitimate births where the mother was not queried.

Processing of Data

The completed questionnaires were edited and coded in accordance with predetermined specifications. The questionnaires were checked both for completeness and for consistency of response. If the reported data were inadequate for certain essential items, further mail inquiries were made to obtain them.

After the edited and coded data had been transcribed onto punchcards the data were processed on electronic computers. The computer processing included consistency checks, interval edits, assignment of weights, and imputation for missing data.[3]

Nonresponse and Imputation of Missing Data

Failure to obtain response represents one of the main sources of error in a survey. The extent of nonresponse and imputation of missing data in the 1963 natality survey are discussed below.

A total of 508 mothers, or 13.6 percent, had not responded after all followup procedures were completed. Included among the 508 are 28 respondents who returned the questionnaires substantially incomplete; for the purpose of processing the data, these respondents were treated in the same manner as the women who did not respond at all. A large proportion of this nonresponse was accounted for by mothers in the younger ages. Almost 57.6 percent of the 508 mothers not responding, compared with 45.0 percent of the respondents, were less than 25 years of age (table III).

Besides these mothers who did not respond at all by mail or interview ("unit nonresponse"), those who returned questionnaires but omitted part of the information also affect the quality of data derived from the survey. Nonresponse to items on questionnaires returned by mothers was minimal in most instances and accounted for no more than 3.1 percent of the respondents for any single item. Table IV shows the percent not ascertained for specified items by age of mother and live-birth order. The principal problem of incompleteness in the returned questionnaires arose from failure to obtain information about the total income of the family, a problem which was found disproportionately among mothers under 25 years of age and among mothers who were having their first birth or fifth or later birth.

Statistics derived from the survey of mothers were adjusted for unit nonresponse by imputing to nonre-

Table III. Percent of respondents for whom specified items were not ascertained

Item	Percent not ascertained
Family income	3.1
Education of mother	0.2
Education of father	0.8
Mother's employment status	0.1
Father's employment status	0.7

Table IV. Approximate standard errors for estimated numbers shown in this report

Size of estimate	Relative standard error	Standard error
25,000	16.8	4,200
50,000	12.0	6,000
75,000	9.8	7,350
100,000	8.5	8,500
250,000	5.0	12,500
500,000	3.3	16,500
750,000	2.5	18,750
1,000,000	2.0	20,000
1,500,000	1.5	22,500

spondents the characteristics of similar respondents. Similar respondents were mothers who responded to later mailings within each of the 24 age-of-mother, color, and live-birth-order groups. Two assumptions are inherent in this imputation procedure. First, the three birth record characteristics—age of mother, color, and live-birth order—which are available for responding as well as nonresponding mothers are related to the socioeconomic characteristics. Second, the nonrespondents are more like those who responded to the later mailings than those who responded to the first mail. The latter assumption is based on the pattern of response by mailing waves observed in relation to the educational and income level of the respondents.

Thus, an array of known values was established in the computer using the respondents to later mailings within the 24 age, color, and birth-order groups as the population from which values were imputed to the nonrespondents. Values in the cells of the array were continually replaced by succesive known values as the file of records was processed; as a nonresponse record was read, values from the last known record in the appropriate cell of the array were imputed to the nonresponse record.

Data are also adjusted for item nonresponse. Imputation procedures for missing data on questionnaires returned by mothers were based on the premise that "the presence of several correlated variables permits a reasonably good prediction of the missing variable. . . ." [4]

Thus, missing data for items on employment of father, education of father, and family income were imputed on the computer on the same principle as for unit nonresponse, that is, imputation was made by assigning within homogeneous groups the characteristics of respondents to later mailings with known data to those respondents with missing data. Age, color, and birth order used for imputation of unit nonresponse was also used for imputation of missing data on employment of father. Missing information on education of father was imputed using age of father and education of mother. Missing information on family income was imputed using age and education of father.

Missing data on employment status of mother during pregnancy for three cases and on the education of mother for eight cases were imputed arbitrarily.

Birth Records

With the exception of color of child for births selected from New Jersey, age of father, and completed weeks of pregnancy, the information on the birth record was in most cases complete. During 1962 the item on color of child was removed from the New Jersey birth record. Although this item was replaced in late 1962, almost all births occurring during 1963 were registered on birth records not containing the question on color. Thus, information on color of child was missing on approximately 100 records from New Jersey selected in the sample. Imputation for color of child was carried out by means of a procedure using detailed geographic information on place of residence of mother and proportion of nonwhite population in that location according to the 1960 census.

In addition, information on completed weeks of pregnancy was unknown on 214 birth records; number of previous fetal deaths was unknown for 92 records; and age of father was missing on 255 records. Imputation for these items was also carried out on the computer by substituting known values from the age, color, and birth-order array described earlier. For items such as birth weight, sex of child, and birthplace of mother, where the number of unknown cases was small, imputation was made arbitrarily.

Physicians and Medical Facilities

No imputation for nonresponse was undertaken for physicians and medical facilities because of the low nonresponse rate and the completeness of the information on the returned questionnaires.

Estimation

Statistics based on the survey are estimates prepared by the use of a post-stratified ratio estimation procedure. The purpose of ratio estimation is to take into account available relevant information in the estimation process, thereby reducing the variability of the

estimate. This procedure was carried out for each of the following 24 groups:

Group	Age	Live-birth order
	White	
1	Under 20 years	1
2	Under 20 years	2+
3	20-24 years	1
4	20-24 years	2
5	20-24 years	3+
6	25-29 years	1
7	25-29 years	2
8	25-29 years	3-4
9	25-29 years	5+
10	30-34 years	1-2
11	30-34 years	3-4
12	30-34 years	5+
13	35 years or more	1-4
14	35 years or more	5+
	Nonwhite	
15	Under 20 years	1
16	Under 20 years	2+
17	20-24 years	1-2
18	20-24 years	3+
19	25-29 years	1-2
20	25-29 years	3-4
21	25-29 years	5+
22	30-34 years	1-4
23	30-34 years	5+
24	35 years or more	ALL

For each group, the ratio of the number of births in the United States in 1963 (based on a 50-percent sample) to the number of births in the sample was determined.[5] These 24 ratios comprised the sample weights used in estimating national totals for each of the 24 groups. The effect of this ratio adjustment was to make the estimates from the sample consistent with the count of births for each of the groups used in the estimation procedure.

Thus, estimates of characteristics from the sample are produced using the following formula:

$$X' = \sum_{i=1}^{24} \frac{x_i}{y_i} Y_i$$

where

X' is the estimate of the number of births with a particular characteristic in group i,

x_i is the count of sample births with the characteristic in group i,

y_i is the count of all sample births in group i, and

Y_i is the total number of births in group i based on the 50-percent sample.

Reliability of Estimates

Since the statistics derived from this survey are estimates based on a sample, they may differ from the figures that would have been obtained had a count of all births in 1963 been conducted using the same questionnaires and procedures. In addition to sampling errors, survey results are subject to errors in conceptual formulation, ambiguities in definitions and in the questionnaire construction, coding errors, biases due to nonresponse or incomplete response, mistakes in editing, and tabulation errors.

The probability design of the sample for the survey makes possible the calculation of sampling errors. The standard error is a measure of the sampling variation that occurs by chance because only a sample rather than the entire population is surveyed. The chances are about 68 out of 100 that an estimate from the sample differs from the value for the entire population by less than the standard error. The chances are about 95 out of 100 that the difference is less than twice the standard error. The standard error of a difference between two sample estimates is approximately the square root of the sum of squares of each standard error considered separately.

Estimates of sampling variability for the statistics derived from this survey were based on 20 random half-sample replications. This technique yields overall variability through observation of variability among random subsamples of the total sample. It reflects both the error that arises from sampling and a part of the measurement error, but it does not measure any systematic biases in the data. A general discussion of the development and evaluation of a replication technique for estimating variance has been published elsewhere.[6] However, the procedures and computations required to estimate variances by this method in the 1963 natality survey are briefly described below.

For this survey, each record from the entire file of records was assigned systematically to a random group between 1 and 40. Twenty pairs of random groups were created from these groups. A half sample was formed by randomly selecting one group from each of the 20 pairs. This process was repeated until 20 "replicate half samples" were formed from which variance estimates were derived. The composition of the 20 half samples was determined by an orthogonal plan.

After the composition of each of the half samples was determined, all the estimation procedures used to produce the final estimates from the entire sample were applied separately to each of the resulting half samples.

Table V. Approximate standard error for estimated percents shown in this report

Base of percent	Estimated percent					
	2 or 98	5 or 95	10 or 90	20 or 80	30 or 70	50
	Standard error expressed in percentage points					
30,000	2.0	3.1	4.2	5.6	6.4	7.0
50,000	1.5	2.4	3.3	4.3	5.0	5.4
100,000	1.1	1.7	2.3	3.1	3.5	3.8
250,000	0.7	1.1	1.5	1.9	2.2	2.4
500,000	0.5	0.7	1.0	1.4	1.6	1.7
1,000,000	0.3	0.5	0.7	1.0	1.1	1.2
2,000,000	0.2	0.4	0.5	0.7	0.8	0.9
3,000,000	0.2	0.3	0.4	0.6	0.6	0.7
4,000,000	0.2	0.3	0.4	0.5	0.5	0.6

An estimated variance $S^2_{x'}$ of an estimated statistic x' of the parameter X is obtained by applying the following formula:

$$S^2_{x'} = \frac{1}{20} \sum_{i=1}^{20} (x''_i - x')^2$$

where

x' is the estimate of X based on the entire sample, and x''_i is the estimate of X based on half sample i.

Rules to determine the approximate standard errors for estimates presented in this report are as follows:

1. *Estimates of aggregates:* Approximate standard errors of estimates of aggregates, such as the number of births with a given characteristic are given in table IV.
2. *Estimates of percentages in a percent distribution:* Approximate standard errors for percentages are determined in one of the two following ways, depending upon the source of the base of the percentage:
   a. Where both numerator and denominator are estimates from the sample data, such as the percentage of employed wives who had babies weighing 2,500 grams or less in 1963, the approximate standard errors are given in table V.
   b. Where the denominator is a value found in one of the 24 ratio estimates cells shown on page 29 and is therefore not subject to sampling error, the relative standard error of the percent is equivalent to the relative standard error of the numerator, which can be obtained from table IV.
3. *Estimates of the average birth weight:* Approximate standard errors of the average birth weight are given in table VI.
4. *Difference between two sample estimates:* The standard error of a difference is approximately the square root of the sum of the squares of each standard error considered separately. This formula will represent the actual standard error quite accurately for the difference between separate and uncorrelated characteristics, although it is only a rough approximation in most cases.

Rounding of Numbers

The original tabulations on which the data in this report are based show figures to the nearest whole unit. In the published tables, estimates of aggregates are rounded to the nearest thousand although they are not necessarily accurate to that detail. All percentages, ratios, and averages were computed using unrounded figures.

Table VI. Relative standard errors of average birth weights as percent of the estimate, 1963 Natality Survey

Average birth weight	Number of births in base				
	50,000	100,000	250,000	500,000	1,000,000
2,900 grams	1.43	1.15	1.12	1.06	.94
3,000 grams	1.37	1.10	1.01	.93	.82
3,100 grams	1.32	1.06	.90	.81	.78
3,200 grams	1.24	1.03	.78	.69	.63
3,300 grams	1.19	.98	.67	.56	.50

———ooo———

APPENDIX II

DEFINITIONS OF CERTAIN TERMS USED IN THIS REPORT

Information From the Certificate of Live Birth

Legitimacy status.—For States reporting legitimacy on the birth record, it is recorded from the entry on the birth certificate. For States not reporting legitimacy on the birth record, it is inferred from other evidence on the certificate. The following 16 States did not report legitimacy on the birth record in 1963: Arizona, Arkansas, California, Colorado, Connecticut, Georgia, Idaho, Maryland, Massachusetts, Montana, Nebraska, New Hampshire, New Mexico, New York, Oklahoma, and Vermont.

Live-birth order.—Live-birth order is derived from entries on the birth certificate and refers to the number of children born alive to the mother including the sample child.

Color.—Color is recorded or derived from entries on the birth certificate. The category "white" includes births to parents classified as white, Mexican, or Puerto Rican. Nonwhite births include births to parents classified as Negro, American Indian, Chinese, Japanese, Aleut, Eskimo, Hawaiian, or part-Hawaiian.

Age of mother.—Age of mother is recorded or derived from entries on the birth certificate.

Birth weight.—In almost all cases weight was recorded on the certificate in pounds and ounces. It has been converted into grams by taking one pound equal to 454 grams.

Completed weeks of gestation.—This item is presented in this report exactly as recorded on the certificate.

Information From the Questionnaire

Employment status.—This term covers the categories "not employed" and "employed."

Mother's employment during pregnancy.—This is defined by the mother's response that she was employed either full time or part time outside the home at any time during pregnancy.

Family income.—Family income refers to the total of all income received during the preceding year by all persons related to each other by blood, marriage, or adoption and living in the household when the baby was born. Income from all sources is included, such as wages, salaries, unemployment compensation, and help from relatives.

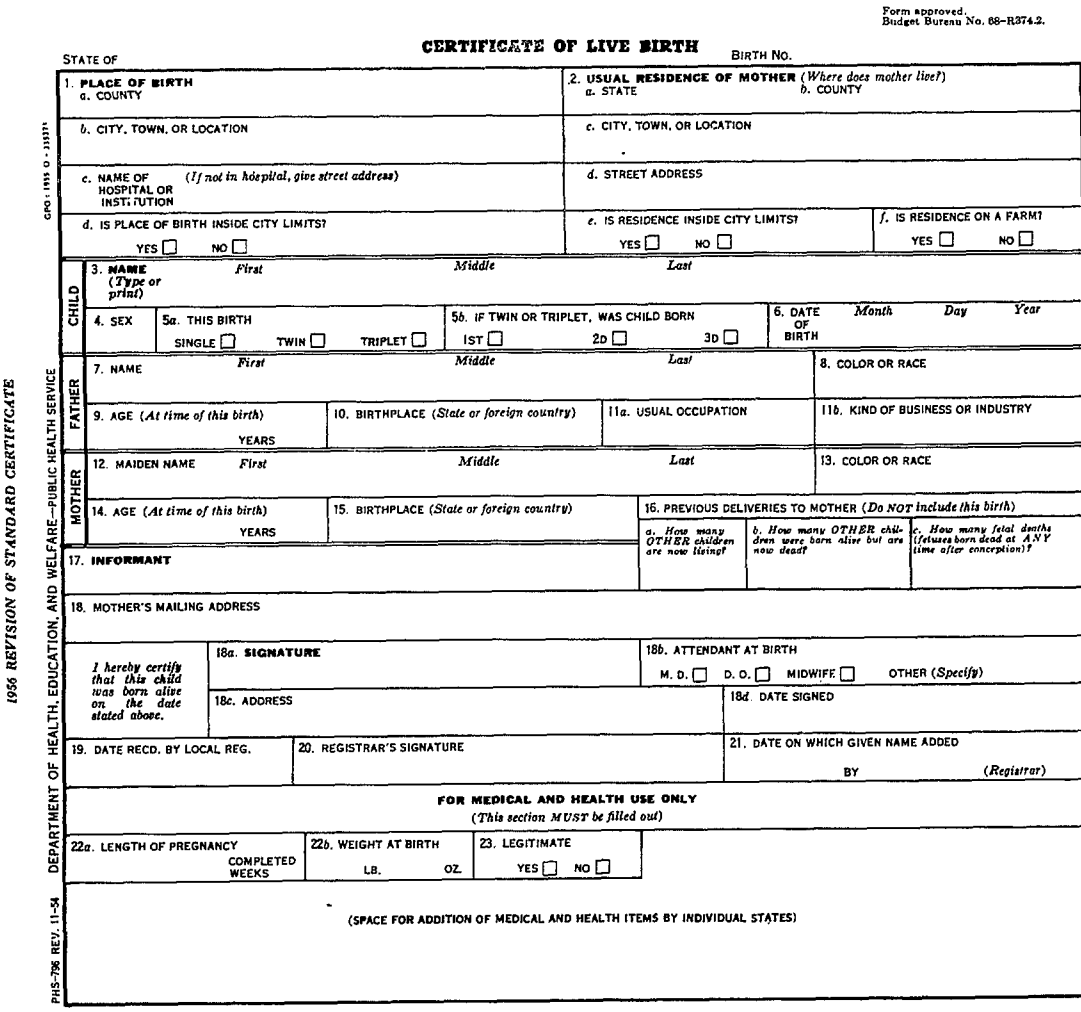
Visit for medical care.—A visit is defined by the response from a physician or a medical facility that the woman had been seen during the 12-month period before her child was born. The number of visits was obtained by adding all visits reported from all sources which furnished care to the woman.

———ooo———

APPENDIX III

SOURCE FORMS

Certificate of Live Birth



Form approved.
Budget Bureau No. 68-R374.2.

CERTIFICATE OF LIVE BIRTH

STATE OF _____ BIRTH NO. _____

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 ☐

CHILD

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)

1956 REVISION OF STANDARD CERTIFICATE
DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—PUBLIC HEALTH SERVICE
PHS-796 REV. 11-54
GPO : 1955 O - 355371

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE — WASHINGTON 25, D. C.

The U. S. Public Health Service is doing a national study to find out how much and what kinds of medical and dental care women are receiving during the year before the birth of a child. Nothing is known about the extent of the care received by expectant mothers, even though such care is of the greatest importance for the future health of both mother and baby. A knowledge of what is actually happening throughout the Nation will go a long way in helping to improve the health of mothers and babies.

The information needed for this study will be based on the experience of the mothers of 4,000 babies out of the 4 million born during 1963. These mothers were selected as a random sample of all mothers who have a baby, and you are one of those so selected. We are therefore asking you to answer the questions on the following pages of this form, and to return it to us in the enclosed envelope which requires no postage.

Please notice that in the first part of the form the questions ask about every doctor, dentist, hospital, or clinic from which you received any care during the entire year before your baby was born. Your answers should not be just for the care connected with pregnancy, but for any and all medical and dental care or checkups during these 12 months.

All information about you and your baby will be kept completely confidential. Your answers will be used for health research only and for no other purpose. As you might expect, it is particularly important that we receive your answers and those of all the other 4,000 mothers, since each of you really represents 1,000 mothers.

Your cooperation in this study is deeply appreciated.

Sincerely yours,

O. K. Sagen

O. K. Sagen, Ph. D., Chief
National Vital Statistics Division
National Center for Health Statistics

Name of Child	
Date of Birth	*File Number*

M

Physician Questionnaire

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE — WASHINGTON 25, D. C.

Your assistance is needed in a small but important sample survey conducted by the U. S. Public Health Service with the approval of your State Health Department. The primary purpose of this survey is to estimate how often mothers are exposed to ionizing radiation in the year preceding a birth. The survey will also provide useful data on the extent to which expectant mothers avail themselves of medical care. The mothers on whom data are being collected were identified from a random sample of about 4,000 births out of the 4 million occurring in the United States during 1963.

According to our records, the mother named below was seen or treated by you at some time during the year prior to the recent birth of her child. We ask your cooperation in answering the questions on the following pages, which relate to the medical care she received during the one-year period preceding childbirth. The exact dates covered by this period are shown below. Information is needed on each exposure to ionizing radiation this woman experienced during this period, irrespective of its relationship to pregnancy.

Since the survey is based on only a small sample of mothers, it is particularly important that we obtain full information on each. A postage-free envelope is enclosed for your convenience in replying. You may be assured that your report will be held in strictest confidence and used only for statistical research.

Your cooperation in this study is deeply appreciated.

Sincerely yours,

O. K. Sagen, Ph. D., Chief
National Vital Statistics Division
National Center for Health Statistics

P

Name of Mother	*Maiden Name*	
Address	*Place of Birth of Child*	
City-State	*Date of Birth*	*File Number*
PERIOD COVERED BY THIS SURVEY: FROM	TO	

Hospital Questionnaire

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE — WASHINGTON 25, D. C.

Your assistance is needed in a small but important sample survey conducted by the U. S. Public Health Service with the approval of your State Health Department. The primary purpose of this survey is to estimate how often mothers are exposed to ionizing radiation in the year preceding a birth. The survey will also provide useful data on the extent to which expectant mothers avail themselves of medical care. The mothers on whom data are being collected were identified from a random sample of about 4,000 births out of the 4 million occurring in the United States during 1963.

According to our records, the mother named below was seen or treated at your institution at some time during the year prior to the recent birth of her child. We ask your cooperation in answering the questions on the following pages, which relate to the medical care she received during the one-year period preceding childbirth. The exact dates covered by this period are shown below. Information is needed on each exposure to ionizing radiation this woman experienced during this period, irrespective of its relationship to pregnancy.

Since the survey is based on only a small sample of mothers, it is particularly important that we obtain full information on each. A postage-free envelope is enclosed for your convenience in replying. You may be assured that your report will be held in strictest confidence and used only for statistical research.

Your cooperation in this study is deeply appreciated.

Sincerely yours,

O. K. Sagen

O. K. Sagen, Ph. D., Chief
National Vital Statistics Division
National Center for Health Statistics

I

Name of Mother	*Maiden Name*	
Address	*Place of Birth of Child*	
City-State	*Date of Birth*	*File Number*
PERIOD COVERED BY THIS SURVEY: FROM	TO	

☆ U. S. GOVERNMENT PRINTING OFFICE: 1968—342042/19

OUTLINE OF REPORT SERIES FOR VITAL AND HEALTH STATISTICS

Public Health Service Publication No. 1000

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

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

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

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

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

Series 11. Data from the Health Examination Survey.—Data from direct examination, testing, and measurement of national samples of the population provide the basis for two types of reports: (1) estimates of the medically defined prevalence of specific diseases in the United States and the distributions of the population with respect to physical, physiological, and psychological characteristics; and (2) analysis of relationships among the various measurements without reference to an explicit finite universe of persons.

Series 12. Data from the Institutional Population Surveys.—Statistics relating to the health characteristics of persons in institutions, and on medical, nursing, and personal care received, based on national samples of establishments providing these services and samples of the residents or patients.

Series 13. Data from the Hospital Discharge Survey.—Statistics relating to discharged patients in short-stay hospitals, based on a sample of patient records in a national sample of hospitals.

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

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

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

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

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