Data from the
NATIONAL HEALTH SURVEY

Series 11
Number 133

Age at Menarche

United States

A discussion of current age at menarche (onset of menstruation) of American women, and analysis of variations in age at menarche associated with race, region, family income, population size of place of residence, educational level, height, weight, and skinfold thickness, as estimated from three cross-sectional programs of the Health Examination Survey conducted during the period 1960 to 1970.

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Series 11 reports present findings from the National Health Examination Survey, which obtains data through direct examination, tests, and measurements of samples of the U.S. population. Reports 1 through 38 relate to the adult program, Cycle I of the Health Examination Survey. The present report is one of a number of reports of findings from the children and youth programs, Cycles II and III of the Health Examination Survey. These latter reports from Cycles II and III are being published in Series 11 but are numbered consecutively beginning with 101. It is hoped this will guide users to the data in which they are interested.

Vital and Health Statistics-Series 11-No. 133

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NATIONAL CENTER FOR HEALTH STATISTICS

DIVISION OF HEALTH EXAMINATION STATISTICS

COOPERATION OF THE BUREAU OF THE CENSUS

In accordance with specifications established by the National Health Survey, the Bureau of the Census, under a contractual agreement, participated in the design and selection of the sample, and carried out the first stage of the field interviewing and certain parts of the statistical processing.

Vital and Health Statistics-Series 11-No. 133

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FOREWORD

The Health Examination Survey, a major program of the National Center for Health Statistics, collects, analyzes, and publishes health information gathered by direct examinations, laboratory tests, and other measurements. The survey is conducted as a series of separate cross-sectional programs, each based on a stratified, multistage probability sample of a specific segment of the civilian noninstitutionalized population of the United States.

The basic functions of the survey programs are to provide national estimates of distributions of physical, physiological, and psychological characteristics within the population, prevalences of selected conditions, and analyses of the interrelationships among demographic, socioeconomic, and health-related conditions. Such estimates along with appropriate sampling variances are published in this series of reports and disseminated nationally.

Since 1963 the National Center for Health Statistics, recognizing the value of wider exploitation of the data being accumulated in the programs of the Health Examination Survey, has called upon competent scientists outside the Center for the preparation of a number of reports. This report represents the most recent of these collaborative efforts. On the basis of preliminary discussions between staff of the Division of Health Examination Statistics and Dr. Brian MacMahon of the School of Public Health, Harvard University, the scope and general approach of this report were determined. Initial data tapes and related information requested by Dr. MacMahon were provided by James Baird, formerly with the Division. Liaison for the Center was the responsibility of Garrie J. Losee, Deputy Director of the Division of Health Examination Statistics. Substantial contributions in preparing the manuscript for publication, including the preparation of final tabulations and appendices and revision of preliminary drafts were provided by James V. Scanlon and Wesley L. Schaible of the Division Staff.

Arthur J. McDowell, Director
Division of Health Examination
Statistics

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AGE AT MENARCHE

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INTRODUCTION

In this report information from the Health Examination Survey is used to estimate current age at menarche (onset of menstruation) of women in the United States and to examine the data for differences in age at menarche among subsets of the population and for changes in age at menarche over time.

As a major program of the National Center for Health Statistics the Health Examination Survey collects and analyzes information gathered by direct physical examinations, tests, and measurements performed on probability samples of the U.S. population. Supplementary health and social information is also collected by means of several questionnaires. The survey is conducted as a series of separate, cross-sectional programs referred to as "cycles." Each cycle is limited to some specific segment of the U.S. population and to certain aspects of the health of that segment. During the period 1960-1970 three separate cycles have been completed. Information from all three cycles is used in this report. In the first cycle, which focused on adults, female respondents completed a questionnaire in which they were asked whether or not their menstrual periods had begun and if so, at what age. In Cycles II and III, which dealt with 6- through 11-year-olds and 12- through 17-year-olds, respectively, information on menarche used in this report was supplied by the parents.

METHOD

Sources of Information

The questions on menstrual status for each cycle are shown in appendix I. The nature of the samples is detailed in previous publications [1-5] and summarized in appendix II. Sample frequencies of females for each cycle along with estimates of the populations represented are shown in table 1 according to race and age. The survey designs are described briefly below:

Cycle I. The sample of Cycle I of the Health Examination Survey (HES) was selected to represent the civilian noninstitutional population of adults in the United States 18 through 79 years of age.[1] Survey operations took place during the years 1960-1962.[2] The response rate was approximately 86 percent. Among those examined were 3,581 women, who because of the sample design and estimation procedures and adjustment for nonresponse, may be considered representative of the approximately 58 million women in that age range at the time of the survey. Information on menarche was not available for about 1 percent of the women examined in Cycle I.

Cycles II and III. The data from Cycles II and III of the Health Examination Survey are combined in this report to yield estimates of current age at menarche for the female civilian noninstitutionalized population of the United States aged 6 through 17 years. The sample for Cycle II was designed to provide health information for the population of 6- through 11-year-olds, and survey operations were conducted from 1963 through 1965.[3,4] Cycle III focused on youths 12 through 17 years of age, and survey operations took place during the years 1966-1970.[5] The response rate for Cycle II was 96 percent and that for Cycle III was 90 percent.

In Cycle II, 3,487 girls were examined. The sample design, survey operation, and response results have been described in earlier reports.[3,4] Findings for these examinees may be considered representative of the approximately 11.7 million girls 6 through 11 years old in the noninstition-

alized population of the United States at the time of the survey. Cycle III included 3,223 girls, representing a population of about 11.2 million girls 12 through 17 years of age at the time of the survey. The plan and operation of this survey of youths have been described previously.[5] In sum, Cycles II and III included 6,710 girls in the age range of 6 through 17 years, representing a population of approximately 23 million. Responses to the questions on menstrual status were not available for about 3 percent of the girls 6 through 17 years old.

In this report the age recorded for each sample person was the age at last birthday on the date the questionnaire was completed.

Methods of Analysis

The samples for all three cycles of the Health Examination Survey were selected by complex multistage procedures. For each individual in each sample a statistical "weight" was subsequently assigned. This weight is the reciprocal of the probability of selection of that individual, based on a comparison of representation of individuals with specified demographic characteristics in the sample and in the total United States noninstitutional population (appendix II).

Unless otherwise specified, all descriptive statistics presented in this report have utilized this weight. The statistics therefore reflect characteristics as estimated for the U.S. population rather than for the samples. For example, in computing mean age at menarche the value reported by each individual is multiplied by the statistical weight assigned to that individual.

Since the estimates shown in this report are based on samples of the population rather than the entire population, they are subject to sampling error. Standard errors of the estimates are presented in the detailed tables and discussed in appendix II. The standard errors were computed by a half-sample pseudoreplication technique which takes into account the complex design of the samples.

A further word on the sample designs for Cycles II and III is appropriate. Because of both operational considerations and the desire to obtain longitudinal data, over 30 percent of the youths comprising the Cycle III sample had also participated as children in Cycle II. It was assumed that this overlap had no appreciable effect on the findings presented in this report.

As stated earlier, information on menstrual status was not available for about 1 percent of the women in Cycle I and for about 3 percent of the girls in Cycles II and III. Women and girls for whom no information on menstrual status was available were excluded from this analysis. It was assumed in effect that the responses of this small number of women would be essentially the same as those for whom responses were available.

For the adult women of Cycle I the only relevant measure of age at menarche is the mean age at which the event was reported to have occurred. This measure is subject to the usual random and nonrandom variability associated with anamnestic data. However, the samples of Cycles II and III are distributed throughout the age range during which menarche occurs. Relevant parameters therefore include the percentages of girls at various ages whose parent or guardian reported that the girl's menstrual periods had begun. As noted in appendix II, these percentages—at least in the years 11 through 14—give good fits to logistic curves from which estimates of the median age at menarche and its confidence limits can be derived. These data probably provide the more accurate estimate of age at menarche in the United States at the present time and are presented next in this report; data from Cycle I are than presented primarily to examine for differences in mean age at menarche among subgroups of the population and for changes in mean age at menarche over time.

RESULTS

Current Menstrual Status

In table A and in table 2 the percentages of girls whose menstrual periods had begun, as estimated from Cycles II and III of the Health Examination Survey, are shown according to age at the time of the survey and race. The data for the population 10 through 15 years old are illustrated in figure 1, together with a fitted logistic curve. The observed values lie close to the computed logistic function in which the median age at menarche is 12.77 years and the slope 1.53. A description of the logistic function is presented in appendix II. In comparing the percentages in table A with those in figure 1, it should be noted that

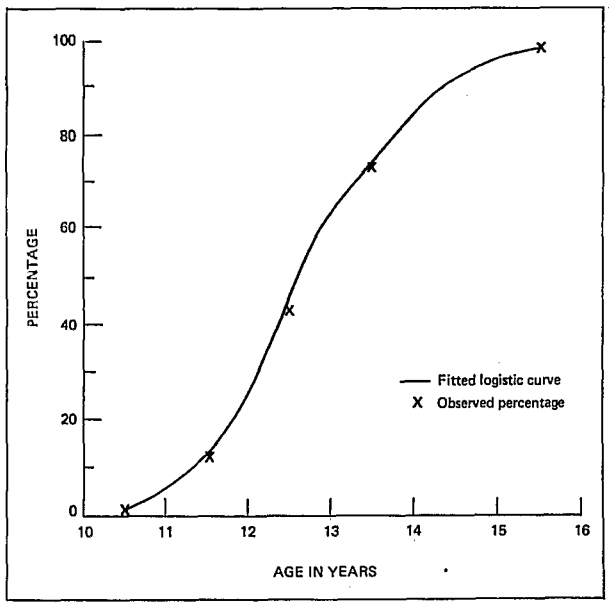

Figure 1. Percentage of girls whose menstrual periods had started and fitted logistic curve, by age: United States.

age shown in table A refers to age at last birthday. In computing the constants of the logistic and plotting the values in figure 1, it has been assumed that girls whose age at last birthday was x have a mean age of $x + 0.5$ years.

Table A shows that at all ages between 10 and 15 years the percentage of black girls whose periods had begun is higher than that in the white population. The difference is most striking at the younger ages. For example, among 11-year-old girls almost twice as many black as white girls were menstruating. This earlier menarche in black girls is also seen in table 3, which gives the constants of logistic curves fitted to the data for demographic subgroups of the population. For reasons stated in appendix II, these values are estimated only from the data for girls aged 11 through 14 years. Overall, the median age at menarche is 12.80 years for white girls and 12.52 for black girls. The racial difference is seen within categories of family income, population size of place of residence, and all geographic regions except the South.

Other differences seen in table 3 are not remarkable. There is no consistent trend in median age at menarche with family income or population size of area of residence. Variation by region among white girls is small, with medians ranging from 12.69 years in the South to 12.90 in the Midwest. As indicated in table 3 the number of black girls in certain subgroups of the sample is too small to provide reliable estimates of median age at menarche.

Table A. Percentage of girls whose menstrual periods had started, by race and age: United States

Age[1]	All races[2]	White	Black
6-17 years--	43.2	42.9	45.2
6-9 years---------	.0.2	0.2	0.2
10 years----------	1.2	0.8	4.0
11 years----------	12.8	11.6	21.3
12 years----------	43.3	41.7	51.2
13 years----------	73.2	72.9	74.1
14 years----------	91.7	91.4	93.5
15 years----------	98.3	98.2	98.7
16-17 years-------	99.7	99.6	100.0

[1]Age at last birthday.
[2]Includes data for "other races," which are not shown separately.

History of Age at Menarche

Mean ages at menarche as reported by women 18-79 years of age in Cycle I of the Health Examination Survey are given in table 4. In the data for all races and in those for white women, a trend towards older mean age at menarche with increasing age at time of the survey is evident. No such trend is seen for black women. Consideration of the trend among white women suggests that there are three broad age groups—18-34 years, 35-54 years, and 55-79 years—within which smaller age groups are reasonably homogeneous. Subsequent tabulations are therefore presented for each of these three broad groups. The means and standard deviations of reported age at menarche are shown by race and broad age group in table B.

Women in the age group 18-34 years reported a mean age at menarche (12.76 years) similar to that computed from data on the current menstrual status of girls aged 10-15 (12.77 years). However,

Table B. Mean and standard deviation of age at menarche reported by women in Cycle I of the Health Examination Survey, by race and broad age group: United States

Race and age	Mean age at menarche	Standard deviation
All races		
18-79 years--	13.08	1.576
18-34 years--------	12.76	1.411
35-54 years--------	13.06	1.512
55-79 years--------	13.53	1.753
White		
18-79 years--	13.09	1.563
18-34 years--------	12.73	1.386
35-54 years--------	13.07	1.481
55-79 years--------	13.56	1.746
Black		
18-79 years--	12.94	1.622
18-34 years--------	12.85	1.534
34-54 years--------	12.93	1.658
55-79 years--------	13.10	1.690

the means shown in table 4 and table B are the simple means of the ages reported by respondents. It could be that women who reported that their menarche occurred at age x were reporting their age at last birthday when the event occurred and that they were, on average, actually $x+0.5$. Perhaps 0.5 years should therefore be added to each of the means shown. On the other hand, it may be that women reporting menarche at age x meant that it occurred around their xth birthday, in which case 0.5 years should not be added. Girls aged 15-17 years in Cycle III whose periods had begun had a mean menarcheal age of 12.5 years if it is assumed that they were reporting their nearest birthday or 13.0 if it is assumed that they were reporting their age at last birthday. These figures, compared with the 12.8 estimated from the girls aged 10-15 years, and assuming that little secular change could have occurred over a period as short as 5 years, imply that some women reported age at menarche one way and some the other. The means for women in Cycle I are therefore presented without addition of the half year. It should be recognized, however, that, because of the difference in method of eliciting information, the means estimated from Cycle I cannot be compared with data from Cycles II and III. As already mentioned, it seems reasonable to regard the estimate based on current observations (Cycles II and III) as the best estimate of the present median age at menarche and to use the data from adult women (Cycle I) only for internal comparisons.

Among women in Cycle I—for all of whom the method of ascertainment of information was similar—there is seen in table B for white women a decline in mean age at menarche of almost 1 year in the 40 years between the central points of the two extreme age groups. The decline for black women is much smaller. It is also seen that for white women the standard deviation of reported age at menarche is greater in the older than in the younger women. It cannot be determined from these data whether there was in fact a broader range of distribution of ages at menarche 40 years ago or whether the larger standard deviation results from increasingly random (as distinct from factual) responses as interval since the event increases.

Table 5 shows the distribution of Cycle I women in the three broad age groups by age at which they reported their menstrual periods had begun. Neither the distributions in table 5 nor the means shown in table B are consistent with the earlier onset of menarche observed for black girls in Cycles II and III. For women in Cycle I the mean reported age at menarche is slightly lower for black than for white. However, the difference occurs almost exclusively among women 55-79 years of age—an age group when the interval since the event would seem to make the information least reliable. Indeed, among women 18-34 years old the percentage reporting menarche prior to age 12 is higher among white than among black women (table 5) and the mean age at menarche is

lower for white than for black women. These discrepancies accent the differences possibly introduced by the different methods of ascertaining age at menarche and reinforce suspicions regarding the accuracy of reporting of age at menarche by women several years past the event. This accuracy is certainly influenced by random misreporting, but it may also be affected by systematic differences in misreporting in different subsets of the population.

Table 6 gives mean reported menarcheal age by geographic region of current residence. Among the white population there are no notable differences. In the black population differences show no consistent trends.

Mean age at menarche by population size of place of current residence is examined in table 7. Again there are no notable differences among white women. For black women the only remarkable feature is the low menarcheal age reported by young residents of giant Standard Metropolitan Statistical Areas. A similar finding is observed in the data for Cycles II and III (table 3).

Variation in mean menarcheal age by years of education completed and by annual family income is shown in tables 8 and 9. For both races, the youngest age group shows a trend towards earlier menarche with increasing duration of education. A comparable trend of earlier menarche with increasing family income is seen for black women but not for white.

No notable variation in mean age at menarche is seen by current height (table 10), but among the young white women a very marked decline in mean menarcheal age with increase in current weight is observed (table 11). Table 12 shows for both white and black women a sharp decline in menarcheal age with increase in skinfold thickness.

DISCUSSION

In a recent review of genetic and environmental factors associated with variation in age at menarche, Zacharias and Wurtman categorize three methods of measuring age at menarche in a population as follows:[6]

The *prospective* method. Girls who have not yet started to menstruate are questioned at suitable intervals over a period of years and the age at which their first menstrual period occurs is recorded.

The *status quo* method. A cross section of girls over the range of ages during which menarche may occur is questioned as to whether or not their menstrual periods have begun. The percentages of girls at each age who are menstruating are fitted to a probit or logistic model which describes the median and variation in age at menarche.

The *retrospective* method. Women who are past menarcheal age are asked at what age they experienced their first menstrual period. The population must be past the range of menarcheal ages or the mean menarcheal age will be biased downwards by the exclusion of older girls whose menarche has not yet occurred. Such a bias has been shown in retrospective reporting of age at menopause.[7]

Little information is available that permits comparison of the parameters of menarcheal age derived from these three different methods. Four prospective studies of small groups of girls in the United States since 1948[6] give mean menarcheal ages between 12.6 and 12.9—values quite similar to that of 12.8 derived by the *status quo* method used here on the data from HES Cycles II and III. On theoretical grounds, also, there seems no reason to think that these two methods would give different results (on the same population) unless very rapid changes—i.e., changes measurable within 3 or 4 years—in menarcheal age are occurring in the populations under study.

Similarity of the mean menarcheal age reported by the young adult women in Cycle I of the Health Examination Survey and that computed from the data for the girls in Cycles II and III suggests that the *status quo* and retrospective methods also give similar results (at least when the women for whom the retrospective histories are being obtained are young)—provided it is recognized that women being interviewed retrospectively seem to report their age to the closest birthday rather than their age at last birthday. The same conclusion is suggested by a comparison of the two methods in a group of Singapore girls.[8] However, the 0.5 years average difference introduced by

reporting age at nearest, rather than last, birthday is a substantial one in the context of the differences observed between populations in mean menarcheal age and must be kept in mind when comparisons are made that involve analyses using the different methods.

Furthermore, one cannot be confident that retrospective questions are responded to in comparable fashion in different populations or in different subgroups of a single population. The fact that the cross-sectional *(status quo)* study of Cycles II and III indicates a difference between white and black girls in median age at menarche, while no such difference is reported retrospectively by the young women of Cycle I, suggests that the questions are being responded to differently by the two racial groups. Intuitively, it seems likely that the *status quo* method is less susceptible to such biases than the retrospective method and that the racial difference noted in Cycles II and III is real.

Both of the other major differences in mean age at menarche noted within this sample are compatible with previous observations on selected populations. The increase in reported age at menarche with increase in current age—suggesting a decline in age at menarche over time—has been reported in many studies. For example, in a group of mothers and their daughters a difference in mean menarcheal age of 1.52 years was noted.[9] This suggests a somewhat sharper decline than that seen in the women of Cycle I in this survey. However, in the mother-daughter study age at menarche was ascertained by the retrospective method for the mothers but by the prospective method for the daughters, and the investigators assumed that the mothers were reporting their age at last birthday—that is to say, 0.5 years was added to the reported ages. If in fact the tendency was to report age at nearest birthday—as the present data indicate might be so, at least for some women—the decline would be approximately 1 year over a generation. Such a decline is more similar to that noted in the HES sample and by other investigators.

The strong decline in menarcheal age with increase in body weight and skinfold thickness confirms previous reports of similar relationships with weight and ponderal index.[10]

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LIST OF DETAILED TABLES

Table 1. Sample frequencies and population estimates of females in Cycles I, II, and III of the Health Examination Survey, by race and age: Health Examination Surveys, 1960-70

Age	All races	White	Black	Other races	All races	White	Black	Other races
	Sample frequencies				Estimates of population in thousands			
Cycles II and III								
6-17 years	6,710	5,635	1,043	32	22,905	19,634	3,156	113
6-9 years	2,339	1,965	362	12	7,931	6,775	1,110	45
10 years	584	505	77	2	1,904	1,632	265	6
11 years	564	477	84	3	1,868	1,605	252	10
12 years	540	448	88	4	1,940	1,654	271	13
13 years	604	509	94	1	2,031	1,743	284	3
14 years	581	480	100	1	1,885	1,619	263	2
15 years	500	423	72	5	1,834	1,581	231	21
16-17 years	998	828	166	4	3,511	3,023	475	11
Cycle I								
18-79 years	3,581	3,050	469	62	58,343	51,184	6,219	940
18-19 years	149	117	28	4	2,370	1,977	337	56
20-24 years	385	322	51	12	6,059	5,253	629	177
25-29 years	383	318	53	12	5,755	4,860	719	176
30-34 years	363	304	52	7	5,536	4,796	652	89
35-39 years	419	348	65	6	6,583	5,584	908	91
40-44 years	365	322	36	7	5,741	5,138	482	121
45-49 years	396	342	51	3	5,849	5,179	622	48
50-54 years	309	259	47	3	4,692	4,107	540	45
55-59 years	245	221	23	1	4,494	4,072	407	15
60-64 years	198	171	24	3	3,626	3,260	325	41
65-69 years	173	157	15	1	3,557	3,300	236	20
70-74 years	126	110	15	1	2,635	2,384	231	20
75-79 years	70	59	9	2	1,443	1,271	131	41

Table 2. Percentage of girls in Cycles II and III of the Health Examination Survey whose menstrual periods had started, by age and race, with standard errors of the estimates: United States

Race	6-17 years	Age							
		6-9 years	10 years	11 years	12 years	13 years	14 years	15 years	16-17 years
	Percentage of girls								
All races[1]	43.2	0.2	1.2	12.8	43.3	73.2	91.7	98.3	99.7
White	42.9	0.2	0.8	11.6	41.7	72.9	91.4	98.2	99.6
Black	45.2	0.2	4.0	21.3	51.2	74.1	93.5	98.7	100.0
	Standard error								
All races[1]	0.69	0.08	0.44	1.86	2.36	2.27	1.76	0.49	0.18
White	0.75	0.09	0.44	1.73	2.60	2.28	1.99	0.55	0.21
Black	2.15	0.22	2.30	5.89	7.41	6.65	2.00	0.86	-

[1]Includes data for "other races", which are not shown separately.

Table 3. Constants of logistic curves fitted to the percentage of girls 11 through 14 years of age whose menstruation had started, by race and selected characteristics: United States

Characteristic	Median age at menarche			Slope		
	All races[1]	White	Black	All races	White	Black
Total	12.76	12.80	12.52	1.41	1.44	1.25
Geographic region						
Northeast	12.71	12.79	12.21	1.21	1.25	1.08
Midwest	12.88	12.90	12.66	1.54	1.57	1.36
South	12.68	12.69	12.67	1.50	1.56	1.34
West	12.72	12.75	12.43	1.38	1.40	1.13
Population size of place of residence						
Giant SMSA	12.57	12.65	12.23	1.40	1.63	0.90
Other large SMSA	12.96	13.01	12.76	1.44	1.39	1.64
Other SMSA	12.70	12.69	*	1.52	1.49	*
Other areas	12.80	12.83	*	1.37	1.38	*
Annual family income						
Less than $3,000	12.61	12.65	12.49	1.38	1.52	1.15
$3,000-$4,999	12.81	12.91	12.43	1.27	1.35	1.04
$5,000-$6,999	12.81	12.86	12.39	1.42	1.44	1.29
$7,000-$9,999	12.87	12.88	12.72	1.35	1.30	2.82
$10,000-$14,999	12.68	12.69	*	1.66	1.64	*
$15,000 or more	12.79	12.81	*	1.46	1.41	*

[1]Includes data for "other races," which are not shown separately.

NOTE: Constants of the logistic, i.e., median age and slope, were computed on weighted data for girls aged 11 through 14 years. See appendix II.

Table 4. Mean age at menarche reported by women in Cycle I of the Health Examination Survey, by race and age, with standard errors of the estimates: United States

Age at time of survey	All races[1]	White	Black	All races[1]	White	Black
	Mean age at menarche			Standard error		
18-79 years	13.08	13.09	12.94	0.02	0.02	0.08
18-19 years	12.75	12.60	13.39	0.12	0.15	0.35
20-24 years	12.77	12.75	12.78	0.06	0.07	0.20
25-29 years	12.73	12.69	12.80	0.07	0.08	0.21
30-34 years	12.80	12.78	12.71	0.08	0.08	0.38
35-39 years	12.96	12.95	12.93	0.06	0.08	0.17
40-44 years	13.20	13.19	13.14	0.07	0.08	0.20
45-49 years	13.02	13.06	12.60	0.08	0.10	0.26
50-54 years	13.09	13.09	13.12	0.06	0.08	0.16
55-59 years	13.47	13.47	13.35	0.10	0.12	0.32
60-64 years	13.32	13.36	12.90	0.16	0.19	0.26
65-69 years	13.54	13.53	13.36	0.14	0.17	0.58
70-74 years	13.88	13.98	12.69	0.32	0.32	0.72
75-79 years	13.61	13.61	13.13	0.36	0.37	0.52

[1]Includes data for "other races," which are not shown separately.

Table 5. Percent distribution of women in Cycle I of the Health Examination Survey, by reported age at menarche, race, and age, with standard errors of the estimates: United States

Race and age	All ages	Age at menarche							
		Less than 11 years	11 years	12 years	13 years	14 years	15 years	16 years	17 years or more
	Percent distribution								
All races[1] 18-79 years	100.0	2.8	10.8	23.6	27.8	18.7	8.4	5.4	2.4
18-34 years	100.0	3.8	13.1	27.3	30.1	15.0	6.7	3.2	0.8
35-54 years	100.0	2.2	11.2	23.6	27.9	19.6	9.0	4.6	1.9
55-79 years	100.0	2.5	7.3	18.9	24.8	22.1	9.7	9.4	5.3
White 18-79 years	100.0	2.7	10.9	23.3	28.3	18.8	8.4	5.3	2.2
18-34 years	100.0	3.8	13.8	27.1	31.1	14.2	6.5	2.9	0.7
35-54 years	100.0	1.9	11.2	23.4	28.6	19.8	8.9	4.3	1.8
55-79 years	100.0	2.5	6.9	18.6	24.4	23.0	10.1	9.4	5.2
Black 18-79 years	100.0	4.3	11.8	25.8	26.4	15.9	8.6	5.3	2.0
18-34 years	100.0	4.8	10.8	28.8	25.0	17.2	7.8	4.4	1.1
35-54 years	100.0	4.6	12.1	24.5	25.3	16.3	10.3	5.1	1.6
55-79 years	100.0	2.8	12.8	22.5	31.1	12.6	6.5	7.3	4.4
	Standard error								
All races[1] 18-79 years	-	0.42	0.52	0.84	0.74	0.65	0.49	0.43	0.26
18-34 years	-	0.55	0.78	1.26	1.30	0.95	0.82	0.58	0.29
35-54 years	-	0.38	1.01	1.40	0.95	1.08	0.68	0.77	0.35
55-79 years	-	0.77	1.04	1.60	1.78	1.30	1.35	0.74	0.97
White 18-79 years	-	0.47	0.56	0.77	0.65	0.83	0.59	0.46	0.27
18-34 years	-	0.67	0.75	1.33	1.30	1.24	0.86	0.62	0.33
35-54 years	-	0.38	1.01	1.57	1.05	1.37	0.85	0.83	0.38
55-79 years	-	0.81	1.01	1.58	1.91	1.52	1.52	0.74	1.03
Black 18-79 years	-	0.99	1.37	2.99	2.63	1.29	1.34	1.50	0.63
18-34 years	-	1.74	2.49	3.29	3.43	2.45	1.86	1.75	0.38
35-54 years	-	1.48	2.27	4.51	3.10	2.00	2.53	2.12	0.84
55-79 years	-	1.68	3.17	4.51	5.10	2.92	2.76	3.82	2.69

[1]Includes data for "other races," which are not shown separately.

Table 6. Mean age at menarche reported by women in Cycle I of the Health Examination Survey by geographic region, race, and age, with standard errors of the estimates: United States

Race and age	Mean age at menarche				Standard error			
	United States	Region			United States	Region		
		Northeast	South	West		Northeast	South	West
All races[1] 18-79 years	13.08	13.06	13.09	13.11	0.02	0.04	0.04	0.07
18-34 years	12.76	12.74	12.78	12.78	0.03	0.06	0.03	0.08
35-54 years	13.06	12.99	13.11	13.10	0.04	0.09	0.07	0.09
55-79 years	13.53	13.56	13.54	13.49	0.06	0.13	0.12	0.17
White 18-79 years	13.09	13.07	13.12	13.08	0.02	0.05	0.06	0.05
18-34 years	12.72	12.72	12.74	12.72	0.03	0.04	0.05	0.09
35-54 years	13.06	13.03	13.12	13.07	0.05	0.10	0.11	0.07
55-79 years	13.55	13.55	13.70	13.46	0.06	0.13	0.12	0.17
Black 18-79 years	12.94	12.85	12.99	12.90	0.08	0.21	0.11	0.22
18-34 years	12.85	12.89	12.94	12.58	0.17	0.62	0.15	0.24
35-54 years	12.92	12.50	13.11	13.12	0.12	0.26	0.17	0.43
55-79 years	13.10	13.75	12.85	13.20	0.17	0.39	0.25	0.46

[1]Includes data for "other races," which are not shown separately.

Table 7. Mean age at menarche reported by women in Cycle I of the Health Examination survey, by population size of place of residence, race, and age, with standard errors of the estimates: United States

Race and age	All population sizes	Population size				
		Giant SMSA	Other large SMSA	Other SMSA	Other urban area	Rural area
	Mean age at menarche					
All races[1] 18-79 years	13.08	13.15	12.99	13.03	13.03	13.19
18-34 years	12.76	12.76	12.67	12.59	12.88	12.94
35-54 years	13.06	13.09	13.01	13.03	13.04	13.14
55-79 years	13.53	13.67	13.39	13.63	13.30	13.54
White 18-79 years	13.09	13.19	12.99	13.07	13.01	13.13
18-34 years	12.72	12.83	12.63	12.58	12.82	12.80
35-54 years	13.06	13.10	13.05	13.09	12.99	13.08
55-79 years	13.55	13.67	13.37	13.68	13.38	13.53
Black 18-79 years	12.94	12.79	13.00	12.60	13.16	13.06
18-34 years	12.85	12.35	13.01	12.64	13.23	13.04
35-54 years	12.92	12.88	12.73	12.32	13.32	13.12
55-79 years	13.10	13.66	13.53	12.88	12.72	13.01
	Standard error					
All races[1] 18-79 years	0.02	0.09	0.05	0.09	0.07	0.10
18-34 years	0.03	0.10	0.09	0.13	0.09	0.10
35-54 years	0.04	0.08	0.09	0.16	0.07	0.13
55-79 years	0.06	0.27	0.20	0.17	0.15	0.11
White 18-79 years	0.02	0.10	0.06	0.08	0.09	0.06
18-34 years	0.03	0.12	0.04	0.13	0.12	0.08
35-54 years	0.05	0.12	0.08	0.15	0.13	0.12
55-79 years	0.06	0.29	0.16	0.15	0.22	0.08
Black 18-79 years	0.08	0.13	0.46	0.43	0.08	0.15
18-34 years	0.17	0.19	0.97	0.69	0.18	0.14
35-54 years	0.12	0.23	0.28	0.95	0.25	0.19
55-79 years	0.17	0.44	0.90	0.93	0.34	0.17

[1]Includes data for "other races," which are not shown separately.

Table 8. Mean age at menarche reported by women in Cycle I of the Health Examination Survey, by educational level, race, and age, with standard errors of the estimates: United States

Race and age	Mean age at menarche					Standard error				
	All educational levels	Educational level				All educational levels	Educational level			
		Less than 5 years	5-8 years	9-12 years	13 years or more		Less than 5 years	5-8 years	9-12 years	13 years or more
All races[1] 18-79 years	13.08	13.65	13.33	12.96	12.87	0.02	0.25	0.07	0.03	0.06
18-34 years	12.76	13.27	12.97	12.78	12.51	0.03	0.33	0.11	0.04	0.09
35-54 years	13.06	13.05	13.17	13.03	12.95	0.04	0.10	0.09	0.06	0.11
55-79 years	13.53	14.09	13.63	13.23	13.43	0.06	0.36	0.09	0.11	0.14
White 18-79 years	13.09	13.92	13.38	12.95	12.88	0.02	0.32	0.08	0.04	0.06
18-34 years	12.72	13.06	12.93	12.75	12.51	0.03	0.20	0.15	0.04	0.09
35-54 years	13.06	12.94	13.27	13.01	12.99	0.05	0.31	0.11	0.06	0.12
55-79 years	13.55	14.55	13.63	13.24	13.38	0.06	0.37	0.10	0.12	0.13
Black 18-79 years	12.94	12.64	13.00	13.00	12.75	0.08	0.21	0.07	0.13	0.31
18-34 years	12.85	13.05	12.85	12.91	12.40	0.17	0.87	0.17	0.16	0.42
35-54 years	12.92	12.93	12.70	13.20	12.54	0.12	0.32	0.14	0.23	0.43
55-79 years	13.10	12.31	13.62	12.73	*	0.17	0.34	0.22	0.99	*

[1]Includes data for "other races," which are not shown separately.

NOTE: Education was not recorded for 57 women whose weighted mean menarcheal age was 13.52 years, with a standard error of 0.40.

Table 9. Mean age at menarche reported by women in Cycle I of the Health Examination Survey, by annual family income, race, and age, with standard errors of the estimates: United States

Race and sex	All incomes	Annual family income					
		Less than $2,000	$2,000-$3,999	$4,000-$6,999	$7,000-$9,999	$10,000 or more	Unknown
	Mean age at menarche						
All races[1] 18-79 years	13.08	13.37	13.05	12.96	13.07	12.95	13.20
18-34 years	12.76	13.03	12.69	12.64	12.74	12.77	13.06
35-54 years	13.06	13.11	13.17	13.11	12.98	13.00	12.92
55-79 years	13.53	13.72	13.34	13.42	14.00	13.05	13.59
White 18-79 years	13.09	13.46	13.06	12.98	13.09	12.96	13.16
18-34 years	12.72	12.79	12.67	12.63	12.76	12.78	13.05
35-54 years	13.06	13.21	12.16	12.14	12.99	13.00	12.83
55-79 years	13.55	13.86	13.33	13.45	14.00	13.05	13.54
Black 18-79 years	12.94	12.96	13.00	12.68	12.84	12.61	13.22
18-34 years	12.85	13.20	12.65	12.60	12.41	12.61	13.10
35-54 years	12.92	12.80	13.22	12.69	12.85	-	13.12
55-79 years	13.10	12.91	13.50	12.89	-	-	13.49

[1]Includes data for "other races," which are not shown separately.

Table 9. Mean age at menarche reported by women in Cycle I of the Health Examination Survey, by annual family income, race, and age, with standard errors of the estimates: United States—Con.

Race and age	All incomes	Annual family income					
		Less than $2,000	$2,000-$3,999	$4,000-$6,999	$7,000-$9,999	$10,000 or more	Unknown
	Standard error						
All races[1] 18-79 years	0.02	0.12	0.05	0.04	0.10	0.07	0.10
18-34 years	0.03	0.14	0.07	0.06	0.09	0.09	0.13
35-54 years	0.04	0.13	0.08	0.05	0.15	0.06	0.11
55-79 years	0.06	0.20	0.14	0.13	0.21	0.23	0.16
White 18-79 years	0.02	0.13	0.07	0.04	0.10	0.07	0.10
18-34 years	0.03	0.15	0.09	0.06	0.08	0.11	0.16
35-54 years	0.05	0.20	0.11	0.08	0.15	0.06	0.13
55-79 years	0.06	0.20	0.13	0.13	0.22	0.23	0.15
Black 18-79 years	0.08	0.17	0.09	0.13	0.32	0.54	0.28
18-34 years	0.17	0.18	0.30	0.24	0.45	0.54	0.27
35-54 years	0.12	0.22	0.24	0.33	0.30	-	0.49
55-79 years	0.17	0.28	0.65	0.80	-	-	0.73

Table 10. Mean age at menarche reported by women in Cycle I of the Health Examination Survey, by height, race, and age, with standard errors of the estimates: United States

Race and age	All heights	Height in centimeters at time of survey				
		Less than 155	155-158	159-162	163-166	167 or more
	Mean age at menarche					
All races[1] 18-79 years	13.08	13.12	13.11	13.06	13.04	13.11
18-34 years	12.76	12.70	12.67	12.88	12.65	12.87
35-54 years	13.06	12.90	13.04	12.98	13.13	13.29
55-79 years	13.53	15.52	13.56	13.41	13.83	13.41
White 18-79 years	13.09	13.13	13.11	13.06	13.06	13.10
18-34 years	12.72	12.58	12.59	12.84	12.64	12.88
35-54 years	13.06	12.88	13.05	12.98	13.16	13.28
55-79 years	13.55	13.56	13.61	13.44	13.82	13.33
Black 18-79 years	12.94	12.91	12.86	12.86	12.89	13.23
18-34 years	12.85	12.91	12.89	13.20	12.63	12.82
35-54 years	12.92	13.03	12.76	12.65	12.86	13.40
55-79 years	13.10	12.73	13.01	12.72	13.92	14.62
	Standard error					
All races[1] 18-79 years	0.02	0.08	0.06	0.05	0.06	0.06
18-34 years	0.03	0.10	0.11	0.08	0.08	0.07
35-54 years	0.04	0.08	0.06	0.10	0.09	0.09
55-79 years	0.06	0.17	0.09	0.09	0.14	0.29
White 18-79 years	0.02	0.10	0.07	0.04	0.05	0.06
18-34 years	0.03	0.13	0.13	0.08	0.09	0.08
35-54 years	0.05	0.10	0.08	0.11	0.08	0.11
55-79 years	0.06	0.18	0.10	0.08	0.19	0.36
Black 18-79 years	0.08	0.14	0.20	0.22	0.25	0.19
18-34 years	0.17	0.39	0.23	0.37	0.25	0.42
35-54 years	0.12	0.20	0.30	0.22	0.38	0.27
55-79 years	0.17	0.29	0.40	0.48	0.59	1.39

[1]Includes data for "other races," which are not shown separately.

Table 11. Mean age at menarche reported by women in Cycle I of the Health Examination Survey, by weight, race, and age, with standard errors of the estimates: United States

Race and age	All weights	Weight in pounds at time of survey					
		Less than 115	115-129	130-144	145-164	165-199	200 or more
	Mean age at menarche						
All races[1] 18-79 years	13.08	13.14	13.07	13.05	13.23	12.98	12.94
18-34 years	12.76	13.01	12.78	12.66	12.80	12.37	12.32
35-54 years	13.06	13.22	13.06	13.08	13.10	12.89	13.04
55-79 years	13.53	13.40	13.78	13.45	13.73	13.37	13.17
White 18-79 years	13.09	13.08	13.07	13.06	13.22	13.06	12.88
18-34 years	12.72	12.95	12.75	12.64	12.76	12.36	11.94
35-54 years	13.06	13.19	13.07	13.08	13.06	12.97	13.02
55-79 years	13.55	13.32	13.81	13.47	13.73	13.43	13.21
Black 18-79 years	12.94	12.28	12.93	12.85	13.17	12.57	13.05
18-34 years	12.85	13.27	12.92	12.62	12.78	12.36	13.41
35-54 years	12.92	13.37	12.99	13.10	13.21	12.49	12.90
55-79 years	13.10	13.19	12.76	12.89	13.78	12.90	13.03
	Standard error						
All races[1] 18-79 years	0.02	0.04	0.05	0.06	0.08	0.10	0.10
18-34 years	0.03	0.06	0.06	0.11	0.10	0.15	0.28
35-54 years	0.04	0.11	0.11	0.08	0.10	0.10	0.16
55-79 years	0.06	0.24	0.21	0.14	0.17	0.15	0.19
White 18-79 years	0.02	0.05	0.05	0.06	0.08	0.11	0.09
18-34 years	0.03	0.07	0.06	0.11	0.12	0.20	0.10
35-54 years	0.05	0.12	0.12	0.09	0.11	0.12	0.14
55-79 years	0.06	0.26	0.23	0.15	0.16	0.16	0.24
Black 18-79 years	0.08	0.27	0.18	0.19	0.21	0.19	0.29
18-34 years	0.17	0.35	0.27	0.33	0.22	0.28	1.02
35-54 years	0.12	0.51	0.33	0.30	0.36	0.26	0.40
55-79 years	0.17	0.70	0.17	0.28	0.70	0.41	0.68

[1]Includes data for "other races," which are not shown separately.

Table 12. Mean age at menarche reported by women in Cycle I of the Health Examination Survey, by sum of skinfolds, race, and age, with standard errors of the estimates: United States

Race and age	Total	Sum of skinfolds in centimeters at time of survey				
		Less than 2.5	2.5-3.4	3.5-4.4	4.5-4.9	5.0 or more
	Mean age at menarche					
All races[1] 18-79 years	13.08	13.15	13.05	13.11	13.13	13.03
18-34 years	12.76	13.03	12.70	12.69	12.82	12.40
35-54 years	13.06	13.17	13.14	13.07	12.90	13.00
55-79 years	13.53	13.60	13.78	13.53	13.62	13.37
White 18-79 years	13.09	13.11	13.04	13.10	13.18	13.09
18-34 years	12.72	13.00	12.66	12.64	12.81	12.38
35-54 years	13.06	13.15	13.13	13.03	12.90	13.07
55-79 years	13.55	13.49	13.76	13.58	13.71	13.40
Black 18-79 years	12.94	13.17	13.20	13.06	12.51	12.66
18-34 years	12.85	13.11	13.04	12.43	12.75	12.48
35-54 years	12.92	13.21	13.25	13.47	12.53	12.55
55-79 years	13.10	13.34	13.79	13.08	12.11	13.05
	Standard error					
All races[1] 18-79 years	0.02	0.06	0.04	0.06	0.08	0.06
18-34 years	0.03	0.08	0.06	0.10	0.14	0.12
35-54 years	0.04	0.09	0.07	0.11	0.15	0.06
55-79 years	0.06	0.21	0.15	0.18	0.21	0.11
White 18-79 years	0.02	0.05	0.04	0.07	0.09	0.06
18-34 years	0.03	0.08	0.06	0.12	0.14	0.14
35-54 years	0.05	0.12	0.07	0.12	0.16	0.06
55-79 years	0.06	0.18	0.15	0.21	0.22	0.12
Black 18-79 years	0.08	0.20	0.22	0.18	0.32	0.15
18-34 years	0.17	0.23	0.44	0.18	0.34	0.44
35-54 years	0.12	0.49	0.30	0.27	0.46	0.20
55-79 years	0.17	0.40	0.58	0.41	0.79	0.34

[1]Includes data for "other races," which are not shown separately.

APPENDIX I

QUESTIONNAIRE ITEMS ON MENARCHE

Cycle I

WOMEN ONLY

a. Age when periods started———

b. Have periods stopped? (Not counting pregnancy) ☐ Yes ☐ No

IF YES:

c. Age when periods stopped——

d. Was this due to an operation? ☐ Yes ☐ No

IF NO:

e. Have they begun to stop? ☐ Yes ☐ No

f. Date of last period———

g. How many babies have you ever had who were born alive?———

h. Have you ever had any pregnancies that did not result in a live birth? ☐ Yes ☐ No

j. IF YES, how many?———

k. Are you pregnant now? ☐ Yes ☐ No ☐ ?

l. IF YES, how many months?———

Source: Self-Administered Medical History Questionnaire (HES-204)

Cycle II

FOR GIRLS ONLY

Have her monthly periods started?

☐ YES ☐ NO ☐ Don't know

IF YES, how old was she when they started?———Years——Months

Source: Child's Medical History Form (HES-256) completed by parent

Cycle III

FOR GIRLS ONLY[a]

Have her monthly periods (menstruation) started?

☐ YES ☐ NO (*IF NO,* OMIT QUESTIONS BELOW)

IF YES

a. Had she been told about them before hers began?

☐ YES ☐ NO ☐ Don't know

b. How old was she when they started?———Years ———Months

c. Does she have pain or discomfort?

☐ YES ☐ NO ☐ Don't know (*IF NO* OR *DON'T KNOW,* OMIT REST OF QUESTIONS)

d. If there is pain or discomfort, is it:

☐ Very often ☐ Occasionally

is it:

☐ Mild ☐ Moderate ☐ Severe

e. At that time, does she frequently: *(Check all that apply)*

☐ Take medicine ☐ Stay home from school

[a] For the teenage girls of Cycle III, information on menstrual status was also obtained from the girls themselves on a questionnaire administered by a nurse in the mobile examination center. Overall agreement between the two sources of information on menstrual status was high—96 percent. For this reason, and to maintain consistency with information on menarche for the girls 6-11 years old of Cycle II, which was provided only by a parent, it was decided to use in this report only the information on menstrual status of teenage girls provided by the parent.

☐ Go to the sick room or nurse

☐ None of these

☐ Stay in bed

f. Has she talked to a doctor about painful menstruation?

☐ YES ☐ NO ☐ Don't know

Source: Medical History of Youth completed by parent

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APPENDIX II

TECHNICAL NOTES

Survey Design

The sample designs for the first three programs, or Cycles I-III, of the Health Examination Survey have been essentially similar in that each has been a multistage, stratified probability sample of clusters of households in land-based segments. The successive elements of selection for these designs were primary sampling unit, census enumeration district, segment (a cluster of households), household, eligible person, and finally the sample person. In each cycle the target population was defined as the civilian noninstitutional population of the United States in the age range of concern.

In the first stage of this design the nearly 2,000 primary sampling units, geographic units into which the United States was divided, were grouped into 357 strata for the use of the Health Interview Survey and of the Current Population Survey of the U.S. Bureau of the Census and were then further grouped into 42 strata (40 for Cycles II and III). In Cycle I the stratification variables were geographic location and population density. The strata were formed so that each had approximately 3.5 million persons aged 18-79 years in 1950. In Cycles II and III the strata boundaries were formed so as to obtain a high degree of homogeneity within strata with respect to geographic location, population density, population size, and rate of population change.

Using a controlled selection technique, one primary sampling unit was selected from each stratum with a probability proportional to population. Generally, within each primary sampling unit, 20 census enumeration districts were selected with the probability of selection of a particular enumeration district proportional to its population in the age group being sampled. A similar method was used for selecting one segment in each enumeration district. Sample persons in the appropriate age range were systematically selected from the designated sample households in each segment.

The 40 sample areas and the segments utilized in the design of Cycle III were the same as those in Cycle II. This feature of the design along with the age groups sampled in the two cycles made it possible to gather longitudinal data on about 30 percent of the Cycle III sample. More complete accounts of the sample designs may be found in references 1 through 5.

Standard Errors

The probability design of the survey makes possible the estimation of standard errors corresponding to the weighted estimates presented. However, in complex studies such as the Health Examination Survey this task is complicated by at least three factors: (1) Measurement process error and "pure" sampling error are confounded in the data—it is not easy to find a procedure which will either completely include both or treat one or the other separately. (2) The survey design and estimation procedure are complex and accordingly require computationally involved techniques for the estimation of standard errors. (3) Thousands of statistics come from the survey, many for subclasses of the population for which there are small numbers of sample cases. Estimated standard errors of the estimates presented are derived by a technique which yields overall variability through observation of variation among subsamples of the total sample.[11,12] The method reflects "pure" sampling variance and a part of measurement variance. The estimates of standard errors presented are themselves subject to sampling error, which may be large when the number of cases in a cell is small or occasionally even when the number of cases is substantial.

When the estimated standard error of a statistic is large in relation to the size of the estimate, the usefulness of the statistic is frequently compromised to some extent. This situation usually indicates that the sample size in the cell is small and/or the occurrence of measurements from the general population falling into this category is infrequent.

In accordance with usual practice, a 68-percent confidence interval may be considered that range within one standard error of the estimate and a 95-percent confidence interval that range within two standard errors. An approximate standard error of a difference, $d = x - y$, of two statistics, x and y is given by the formula:

$$s_d = \left\{ s_x^2 + s_y^2 \right\}^{1/2}$$

where s_x and s_y are the standard errors of x and y respectively.

Logistic Curves

Age at menarche in the girls of HES Cycles II and III has been described in terms of constants of logistic curves fitted to the percentage of the population whose menstrual periods had begun at each year of age between 10 and 15, or, as noted below, between 11 and 14. The curves were fitted by maximum likelihood. The curves were of the form:

$$P_i = \frac{e^{b(x_i - a)}}{1+e^{b(x_i - a)}}$$

where P_i is the percentage whose menstrual periods had begun by age x_i, the constant b is a measure of the slope of the curve, and the constant a is the age at which P is 0.5. The latter may be considered the median age at occurrence of menarche, and since the distribution is essentially normal, is also an estimate of the mean. The constants a and b are descriptive and should not be interpreted in terms of theory underlying the logistic. The method of computation has been described in detail in an earlier report on age at menopause in the United States population.[7]

The constants used in figure 1 and table 3 are derived from curves computed using percentages of postmenarcheal girls at each age estimated for the population as a whole. That is to say, the sample has been weighted to derive population estimates as described under "Methods of Analysis" in the body of this report. However, for such estimates obtained from the present sample design, it was not considered feasible to evaluate the goodness of fit of the data to the logistic model other than by the visual inspection possible from, for example, figure 1. For a more formal evaluation it has been assumed that the sample of girls aged 10 through 15 years is a random sample of the target population, and the percentages have been computed directly from the sample values without weighting. The data are given in table I. The constants of the logistic fitted to the unweighted percentages ($a = 12.79, b = 1.48$) are very similar to those fitted to the weighted data ($a = 12.77, b = 1.53$). The X^2 test for goodness of fit for the curve based on unweighted percentages gives $X^2 = 13.5$, 4 degrees of freedom and $p < 0.01$. However, more than half the total X^2 is contributed by the youngest age group; the fit in the central and older ages appears good.

Virtually identical constants ($a = 12.76, b = 1.40$) are obtained if curves are fitted to the data for the 4 years 11 through 14. In this case, X^2 for goodness of fit is 3.36, degrees of freedom 2, and $p > 0.1$. It would appear, therefore, that the logistic gives a good fit over the range of ages when menarche most frequently occurs, but extrapolation to ages under 11 (when the observed number of post menarcheal girls is very small) leads to significant deviation from the model. Specifically, among 569 girls aged 10 years, seven reported that menses had begun, whereas, from the logistic fitted to the entire age range 10-15 years, 18 would have been expected. While such discrepancies close to the zero or 100 percent points make large contributions to the X^2 for goodness of fit, they are of little consequence in estimating the median age at menarche in the population as a whole. Nevertheless, it seems most appropriate to compute the parameters of the logistic from the age range over which the model gives a good fit. The constants given for subdivisions of the population in table 3 are therefore estimated from the data for girls in the age range 11 through 14 years.

Table I. Percentage of girls aged 10-15 years in the unweighted sample whose menarche had occurred

Age	Number in sample	Percentage with menarche		Contribution to X^2
		Observed	Computed[1]	
10 years	569	1.2	3.2	7.31
11 years	507	12.8	12.9	0.00
12 years	579	43.7	39.4	4.42
13 years	575	73.4	74.2	0.18
14 years	581	91.4	92.7	1.42
15 years	500	98.0	98.2	0.17

[1]Computed from the fitted logistic curve with constants a = 12.79, b = 1.48.

While estimates of standard errors can be made by the pseudoreplication technique outlined above for the percentages of the population postmenarcheal at each age, it was not felt practical in this instance to obtain estimates of the standard errors of the constants of the fitted logistic functions by the pseudoreplication method. As already noted, however, for the total population these constants are similar whether computed from the population estimates or from the unweighted sample. Table II therefore provides estimates of the median ages at menarche and their standard errors for the same demographic subdivisions as given in table 3 but computed on the assumption that the sample aged 11 through 14 years was a simple random sample of the target population. The median values are almost identical to those of table 3, and the standard errors can be used to provide approximate confidence limits of the estimates.

Table II. Median and standard error of age at menarche, derived from the logistic fitted to the unweighted percentage of the females in the sample whose menstruation had begun, according to race, region and population size of residence, and income: United States

Demographic variable	Median			Standard error		
	All races[1]	White	Black	All races[1]	White	Black
Total	12.76	12.80	12.52	.038	.041	.111
Region						
Northeast	12.72	12.81	12.19	.087	.093	.276
Midwest	12.88	12.91	12.57	.069	.072	.240
South	12.70	12.70	12.69	.073	.084	.152
West	12.72	12.75	12.36	.077	.079	.362
Population size of place of residence						
Giant SMSA	12.58	12.67	12.23	.079	.081	.235
Other large SMSA	12.90	12.95	12.76	.074	.086	.148
Other SMSA	12.74	12.73	*	.073	.078	*
Other areas	12.82	12.85	*	.078	.079	*
Annual family income						
Less than $3,000	12.61	12.66	12.49	.106	.124	.203
$3,000-$4,999	12.79	12.93	12.35	.103	.114	.265
$5,000-$6,999	12.80	12.86	12.42	.089	.096	.246
$7,000-$9,999	12.85	12.86	12.73	.083	.088	.188
$10,000-$14,999	12.67	12.68	*	.081	.083	*
$15,000 or more	12.83	12.85	*	.136	.143	*

[1]Includes data for "other races," which are not shown separately.

NOTE: Based on data for the sample aged 11 through 14 years only.

APPENDIX III

DEMOGRAPHIC TERMS

Age.—The age recorded for each person was the age at last birthday. Age was recorded in single years.

Race.—Race was recorded by observation in the survey as "white," "Negro, " or "other races." The last category included American Indians, Chinese, Japanese, and all races other than white or Negro. In this report, the term "black" replaces the term "Negro."

Geographic region.—For the purpose of classifying the population by geographic area in Cycle I, the United States was divided into three major regions. This division was made specifically for the design of the HES sample. The regions and the States included were as follows:

Region	*States Included*
Northeast	Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Ohio, and Michigan
South	Delaware, Maryland, District of Columbia, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas
West	Washington, Oregon, California, Idaho, Nevada, Montana, Utah, Arizona, Wyoming, Colorado, New Mexico, North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, Missouri, Wisconsin, Illinois, and Indiana

For Cycles II and III, region was defined in terms of four broad geographic groups of approximately equal population. These regions, which correspond closely with those used by the U.S. Bureau of the Census, were as follows:

Region	*States Included*
Northeast	Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, and Pennsylvania
South	Delaware, Maryland, District of Columbia, West Virginia, Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Arkansas
Midwest	Ohio, Illinois, Indiana, Michigan, Wisconsin, Minnesota, Iowa, and Missouri
West	Washington, Oregon, California, Nevada, New Mexico, Arizona, Texas, Oklahoma, Kansas, Nebraska, North Dakota, South Dakota, Idaho, Utah, Colorado, Montana, Wyoming, Alaska, and Hawaii

Population size of place of residence.—In Cycle I, the five population size classes were derived from the design of the sample, which accomplished a stratification of the primary sampling units by population size in each of three broad geographic locations. Because the survey was started in 1960, the primary sampling units within each of the five population-size classes were necessarily based on populations and definitions of the 1950 census. The name of each selected primary sampling unit within each population-size class and geographic location, along with other selected sample data, is presented in an earlier report.[2]

The definition for each of the five population-size classes is as follows:

Giant SMSA's include primary sampling units defined as standard metropolitan statistical areas (SMSA's) with a population of 3,000,000 persons or more as determined in the 1950 census.

Other large SMSA's include primary sampling units defined as SMSA's with a population of 500,000 to 3,000,000 as determined in the 1950 census.

Other SMSA's include primary sampling units defined as SMSA's with a population of less than 500,000 as determined in the 1950 census.

Other urban areas include primary sampling units which are highly urban in composition but are not defined as SMSA's.

Rural areas include primary sampling units which are primarily rural in composition according to census definitions.

In Cycles II and III, four population density groups were used to divide the U.S. population into four approximately equal parts. These groups were defined differently for each of the four geographic regions to obtain a division of each region into the following four classes:

1. The largest metropolitan areas are referred to in this report as *Giant SMSA's.*
2. Standard metropolitan statistical areas of specified size are referred to in this report as *Other large SMSA's.*
3. Other SMSA's or specified highly urban areas are referred to in this report as *Other SMSA's.*
4. Other urban areas and rural areas are referred to as *Other areas.*

Additional information on this classification is presented in an earlier report.[4]

Income of family or unrelated individuals.—Each member of a family was classified according to the total income of the family of which she was a member. Within the household all persons related to each other by blood, marriage, or adoption were considered to constitute a family. Unrelated individuals were classified according to their own income.

The income recorded was the total of all income received by members of the family in the 12-month period preceding the week of interview. Income from all sources was included, e.g., wages, salaries, rents from properties, pensions, and help from relatives.

Education.—Each person was classified by education in terms of the highest grade of school completed. Only grades completed in regular schools, where persons are given a formal education, are included. A "regular" school is one which advances a person toward an elementary or high school diploma or a college, university, or professional school degree. Thus education in vocational, trade, or business schools outside the regular school system was not counted in determining the highest grade of school completed.

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