

VITAL and HEALTH STATISTICS

DATA FROM THE NATIONAL HEALTH SURVEY

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Selected Dental Findings in Adults by Age, Race, and Sex

United States - 1960 - 1962

The dental examination and information on edentulous persons, decayed, missing, and filled (DMF) teeth, periodontal disease and oral hygiene by age, race, and sex.

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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.

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SYMBOLS

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SELECTED DENTAL FINDINGS FOR ADULTS

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In mid-December 1962 the U.S. Public Health Service completed the first cycle of the nationwide Health Examination Survey which it had begun more than 2 years earlier. The examinations, without parallel in the United States, were given by invitation to persons selected by probability sampling to represent the civilian, noninstitutional population 18-79 years of age. The conduct of examinations and selection of sample persons have been described in detail in previously published reports.^{1, 2}

This report is based upon dental findings from the Health Examination Survey. It contains national estimates of the prevalence and distribution of selected conditions by age, sex, and race. It also includes a description of the dental examination, an account of examiner training and an assessment of the scope and effect of nonresponse and examiner variability.

SOURCE OF DATA

The Health Examination Survey began as the result of enactment in 1956 of the National Health Survey Act (P.L. 652, 84th Congress) charging the Public Health Service with securing "accurate and current statistical information on the amount, distribution, and effects of illness and disability in the United States and the services received for or because of such conditions." There are three programs within the National Center for Health Statistics that gather statistical information on health from a broad range of sources. As their names indicate, each program obtains information from essentially different sources, using and frequently developing appropriate collecting techniques and procedures. The Health Interview Survey collects health data from respondents by

household interview; the Health Records Survey is concerned with information obtained from the records of facilities or establishments that provide hospital, medical, nursing, personal, or residential services; and the Health Examination Survey produces data by the direct examination of probability samples of the U.S. population.

The initial cycle of health examinations was undertaken to obtain national estimates on the prevalence of rheumatism and arthritis, diabetes, and cardiovascular disease, on certain dental conditions, and on distributions of several anthropometric and sensory characteristics in the U.S. civilian population. A sample of 7,710 men and women was drawn from the noninstitutional adult population 18-79 years of age. Approximately 160 sample persons were examined in each of 42 areas (a total of 6,672 persons) within the continental United States. At each Survey location, standardized examinations lasting nearly 2 hours were conducted in mobile centers by traveling staffs of physicians, dentists, nurses, and technicians.

DENTAL EXAMINATION PROCEDURE

Each dental examination was conducted in a prescribed, uniform manner (Appendix I). The examination procedure differed in some respects from the examination ordinarily given to patients seeking dental care. X-rays were not taken, teeth under inspection were not dried or isolated, oral calculus and debris were not removed prior to observation, and tooth surfaces were not probed unless overt signs of decay were observed. Moreover, to further increase agreement both within and between examiners, many questionable or borderline conditions were by design not recorded.

While these measures undoubtedly increased the comparability of the Survey findings, they also reduced the sensitivity of the examination. As a result, Survey findings in some instances are conservative in contrast to what would be obtained by clinical evaluations. While filled, nonfunctional, and, especially, decayed teeth are systematically underestimated from a clinical viewpoint, complementary counts of normal and functional teeth are correspondingly overestimated. Estimates of other conditions, however, such as number of edentulous persons, full dentures in use, and missing teeth, are derived from objective counts highly comparable by any examination procedure.

Most dental examinations were completed in about 10 minutes. An adjustable examining chair and standard light source were used during the examination of teeth and gums by mouth mirror and explorer. The condition of each tooth was recorded and assessments were made of periodontal disease and oral hygiene. The evaluation of oral hygiene was based upon amounts of debris and calculus on selected tooth surfaces, while the evaluation of periodontal disease was determined by the presence and extent of gingival inflammation and pocket formation.

EXAMINER VARIABILITY

The dental findings of the Health Examination Survey were obtained by only five examiners who, before joining the examining staff, were carefully trained in a standardized examination procedure (Appendix II). Training included a series of at least 140 replicate dental examinations given independently by each new examiner and by at least one of the two original examiners, A and B. A second set of replicate examinations also was completed by each examiner at or near the end of his field assignment. Findings of original examiners served as a standard. The replicate examinations provided measures of interexaminer differences.

No attempt was made to assign sample persons randomly or equally among examiners. At most places all dental examinations were performed by a single examiner. The two original examiners, A and B, examined substantially fewer persons than did the other three; Examiner D, the dentist with the largest number, examined

nearly one in three of all sample persons. Moreover, the proportion of examinations by individual dentists, even in major geographic areas, varied widely. Examiners B and E, for instance, examined relatively few persons in the West, while Examiners A and C examined only a small number in the South (table A).

Interexaminer differences cannot be separated from inherent differences existing in the various groups of examined persons. It nonetheless is true that differences in some observations largely reflect the dissimilar dental status of assigned groups. For instance, proportions of edentulous persons seen by individual examiners—observations virtually free of examiner error—varied significantly. Examiner C found 19.1 percent without any permanent teeth but Examiner E found only 16.2 percent. Relatively little of the observed difference is due to dissimilar age-sex composition since adjusted rates indicate that four examiners saw slightly more edentulous adults than expected while Examiner E saw by contrast slightly fewer than expected (table B).

Counts of decayed, missing, and filled (DMF) teeth also are relatively objective and, when determined by trained examiners, highly comparable. In the series of replicate examinations conducted on nonsample persons, counts differed within narrow ranges (Appendix II). Although determinations of decayed teeth probably show greater examiner variability than do counts of either missing or filled teeth, decayed teeth in the sample population accounted for only about 6 of each 100 DMF teeth. As a result, it seems likely that the differing DMF rates reported by the five examiners were due predominantly to real differences in the dental status of examined sample persons, not to appreciable differences between examiners.

Oral hygiene scores range from a possible minimum value of 0 in persons with little or no oral calculus and debris to a maximum of 6.0 in persons with copious amounts covering specified teeth. Yet, variations between examiners in the Simplified Oral Hygiene Index³ of sample persons were comparatively slight. The highest value, 1.68, was recorded by Examiner D and the lowest 1.44, by Examiner E. Moreover, differences between the reported mean value for males and for

Table A. Percent distribution of examined adults, by dentist according to region:
Health Examination Survey, 1960-62

Region	Dentist					
	All examiners	A	B	C	D	E
	Percent distribution					
All regions-----	100.0	9.1	8.5	27.5	33.0	21.8
Northeast-----	100.0	10.6	8.5	22.3	32.9	25.7
South-----	100.0	6.8	13.5	7.3	40.5	32.0
West-----	100.0	10.1	3.6	52.6	25.7	8.0

NOTE: Values in this table do not constitute estimates for the population of the United States.

Table B. Percent of adults who are edentulous, actual and expected,¹ for each examiner, by sex: Health Examination Survey, 1960-62

Examiner	Both sexes	Men	Women
Percent of adults			
<u>A</u>			
Actual-----	17.9	16.5	19.1
Expected-----	17.2	16.2	18.1
<u>B</u>			
Actual-----	16.3	13.9	18.5
Expected-----	15.6	15.1	16.0
<u>C</u>			
Actual-----	19.1	17.4	20.7
Expected-----	18.5	16.5	20.3
<u>D</u>			
Actual-----	17.4	16.8	17.9
Expected-----	17.2	15.6	18.4
<u>E</u>			
Actual-----	16.2	13.8	18.4
Expected-----	18.1	16.4	19.5

¹If p_i is the proportion of persons edentulous in a given age-sex group and n_i is the number of persons in that age-sex group examined by a given examiner, then the expected proportion edentulous for that examiner is $(\sum_i p_i n_i) / (\sum_i n_i)$ where i ranges over the specified age-sex groups.

NOTE: Values in this table do not constitute estimates for the population of the United States.

females were remarkably consistent from one examiner to another, ranging from a low of 0.44 to a high of only 0.53 (table C).

Comparatively wide variations in the prevalence and severity of periodontal disease were obtained by the five examiners. The Periodontal Index, a method of assessing periodontal disease quantitatively, may range from a low of 0 for individuals with normal tissues supporting the teeth to a high of 8.0 for individuals with severe destructive disease involving each tooth. The highest mean Periodontal Index, 1.59, recorded by Examiner A, was slightly more than twice as great as that recorded by Examiner E. In nearly every age-sex group, index values of Examiner E

were lower than the corresponding values of other examiners.

While the training of examiners, as well as the examination procedure, was designed to minimize examiner variability, the actual extent of measurement error in the examination of sample persons cannot be determined. Comparison of the findings of individual examiners suggests that agreement was at a relatively high level. But, regardless of magnitude, the possible effect of inter-examiner differences, for example in the evaluation of periodontal disease, varies with each characteristic. Since all examiners, for instance, examined approximately the same proportion in each age-sex group, the effect of examiner dis-

Table C. Selected dental findings, by examiner: Health Examination Survey, 1960-62

Selected dental findings	Examiner				
	A	B	C	D	E
Number of persons examined-----	603	569	1,831	2,197	1,453
Percent of persons edentulous-----	17.9	16.3	19.1	17.4	16.2
<u>Average number of DMF teeth per person</u>					
Total-----	19.8	19.3	21.0	19.6	20.0
Decayed-----	1.2	1.7	1.3	1.1	1.3
Missing-----	12.8	12.6	13.6	13.1	13.3
Filled-----	5.8	5.0	6.0	5.4	5.4
<u>Average Periodontal Index</u>					
Both sexes-----	1.59	1.26	0.99	1.45	0.75
Men-----	1.69	1.68	1.22	1.70	0.96
Women-----	1.50	0.88	0.76	1.24	0.57
<u>Average Simplified Oral Hygiene Index</u>					
Both sexes-----	1.53	1.59	1.61	1.68	1.44
Men-----	1.77	1.86	1.84	1.95	1.71
Women-----	1.33	1.33	1.38	1.47	1.20

NOTE: Values in this table do not constitute estimates for the population of the United States.

agreements on age-sex differentials is negligible. On the other hand, there was a disproportionately large number of Negroes among the sample persons examined by Examiner B and a disproportionately small number of Negroes examined by Examiner C (table D).

RESPONSE

Of the 7,710 sample adults 6,672 were actually examined, of whom 6,653 received dental examinations. The response rate of 86.5 percent reflects unflagging efforts throughout the 2½-year-examination period to obtain the cooperation of all sample persons. In contrast with most other comparable surveys which, though not nationwide, involved the examination of large, broadly representative sample populations in the United States, the response rate attained by the Health Examination Survey seems remarkably high.

Yet, 13.5 percent of the sample were not examined, and so large a number of nonrespondents could introduce serious bias. In this Survey, response was lower in the older age groups than in the younger and lower among women than among men. Minor response differentials also were associated with race. Bias from nonresponse arises, however, only when respondents and nonrespondents differ significantly in parameters that are to be estimated. In the instance of the Health Examination Survey, careful analysis of household in-

terviews and physician inquiries indicates that examined and nonexamined sample persons share many important health and demographic characteristics.²

Since the dental examination was but a part of a multiphase health survey, it seems unlikely that an appreciable share of nonresponse is attributable to the dental examination. However, no information was obtained about dental conditions in nonexamined sample persons.

In each of the Survey's sample households, information was obtained by interview on both examined and nonexamined sample persons. As figure 1 shows, the proportions of examined and nonexamined persons who reported visits within specified intervals were about the same. Although relatively more nonexamined persons either failed to respond or answered "Don't know," the 96 nonexamined persons in these categories represented only 1.2 percent of the identified sample.

Interval since last dental visit, an indicator of frequency of visits, undoubtedly reflects to a large degree the dental status of respondents. Data collected by the Health Interview Survey during July 1957-June 1958 show that nearly 60 percent of all edentulous persons had not seen a dentist within the past 5 years, compared with only about 8 percent of all other persons.⁴

The response to two other questions asked by the Health Examination Survey further points out the similarity of the examined and nonexamined

Table D. Percent distribution of examined adults, by dentist according to race: Health Examination Survey, 1960-62

Race	All examiners	Dentist				
		A	B	C	D	E
		Percent distribution				
All races-----	100.0	9.1	8.5	27.5	33.0	21.8
White-----	100.0	9.2	7.3	30.1	31.2	22.1
Negro-----	100.0	9.2	18.0	12.1	38.5	22.2
Other-----	100.0	4.0	0.0	9.5	80.2	6.3

NOTE: Values in this table do not constitute estimates for the population of the United States.

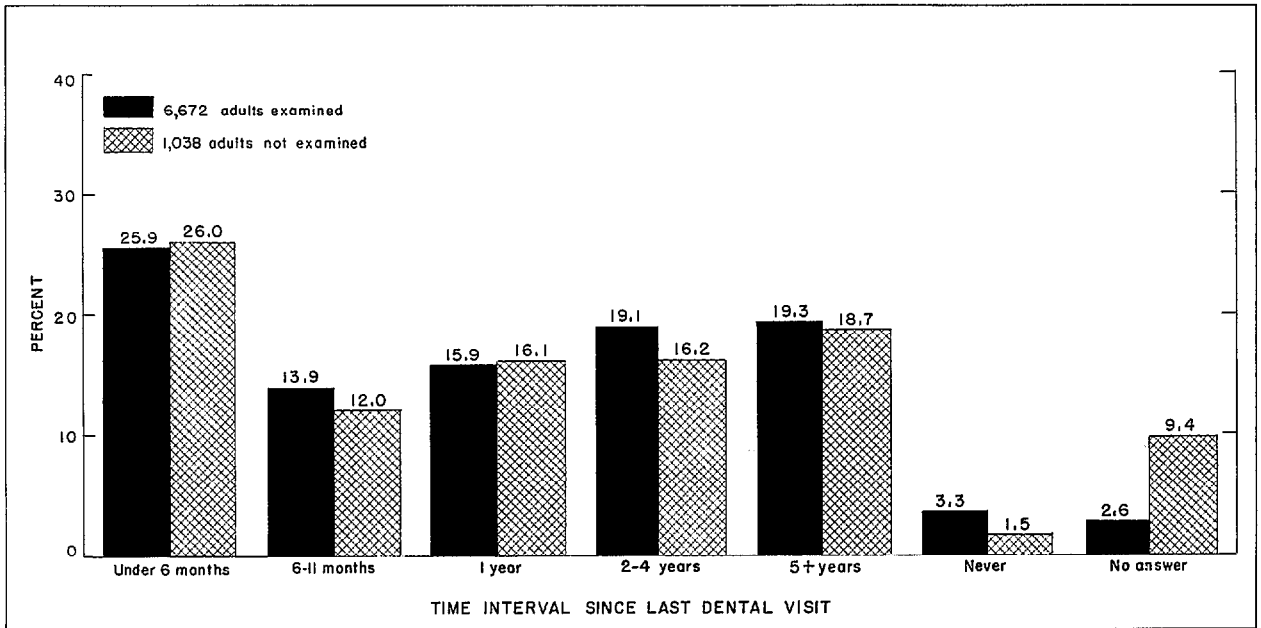


Figure 1. Percent of examined and of nonexamined adults according to time interval since last dental visit.

groups. Figures 2 and 3 illustrate the distribution of answers to "Do you go to a dentist as often as once a year?" and "Do you have a dentist you usually go to?"

FINDINGS

This report deals only with selected findings of decayed, missing, and filled (DMF) teeth, periodontal disease, oral hygiene, and edentulous persons—with each finding considered separately. Differences by age, race, and sex are presented and briefly discussed. Comparison of racial differences is limited to findings for white and Negro persons since the sample was too small to permit adequate representation of other nonwhite races. No presentation is made of the numerous other demographic variables that are available, nor of the implications of the Survey findings for dental care.

Edentulous Persons

In the total U.S. civilian, noninstitutional population of 111 million adults 18-79 years of age, more than 20 million had lost all 32 of their

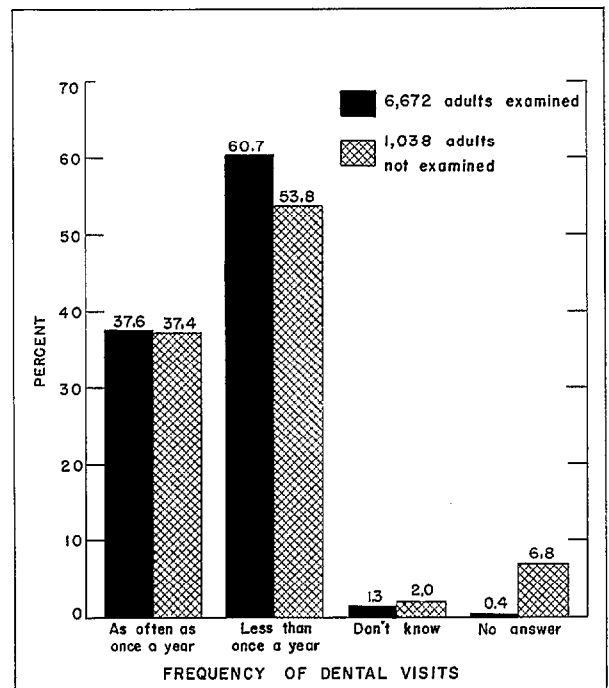


Figure 2. Percent of examined and of nonexamined adults according to frequency of dental visits.

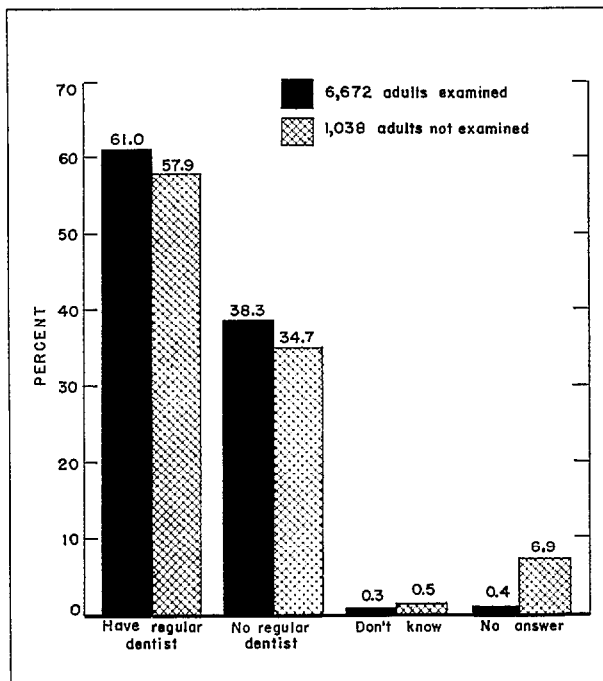


Figure 3. Percent of examined and of nonexamined adults according to whether they have a regular dentist.

permanent teeth and nearly 10 million more had lost all 16 teeth in either the upper or the lower jaw. This means that among every 100 adults an estimated 18 had no natural teeth at all, while 9 others had natural teeth in only one jaw (table 1).

Only 1.3 percent of men and 1.4 percent of women in the 18-24 year age group were edentulous. In each succeeding age group, the percent of both men and women who had lost all permanent teeth was increasingly higher. At ages 35-44, only 5.9 percent of men and 10.0 percent of women were edentulous, but by ages 75-79, the percent of edentulous persons had risen to 55.7 and 64.8, respectively. In each of the seven age groups represented in the sample, relatively more women than men had lost all of their natural teeth (fig. 4).

Rates of edentulous persons also differed greatly by race. While 19.2 percent of the total white population had lost all their permanent teeth, only 11.3 percent of Negro adults were

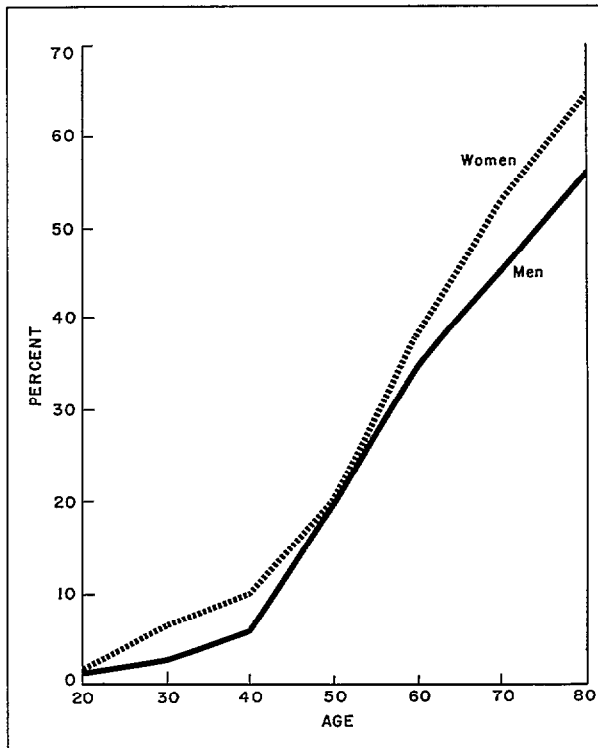


Figure 4. Percent of men and women who are edentulous, by age.

edentulous. In nearly every age group, proportionately more white than Negro adults had lost all their natural teeth (tables 2 and 3, fig. 5).

In each of the age groups under 45 years approximately the same number of men and women had lost all their teeth in one jaw as in both jaws. At age 45, the percent of edentulous persons increased abruptly and continued to rise in each succeeding age group. In fact, at age 75-79 years men were more than twice as likely and women were five times as likely to have no teeth in either jaw as to have no teeth in one jaw.

The estimated overall prevalence of edentulous persons based on the Health Examination Survey was 19.6 per 100 persons aged 25-74 years, only slightly lower than a comparable estimate of 20.5 derived from the Health Interview Survey for these age groups.⁴ The latter report was based on an independent survey during the period July 1957-June 1958 in which interviews were con-

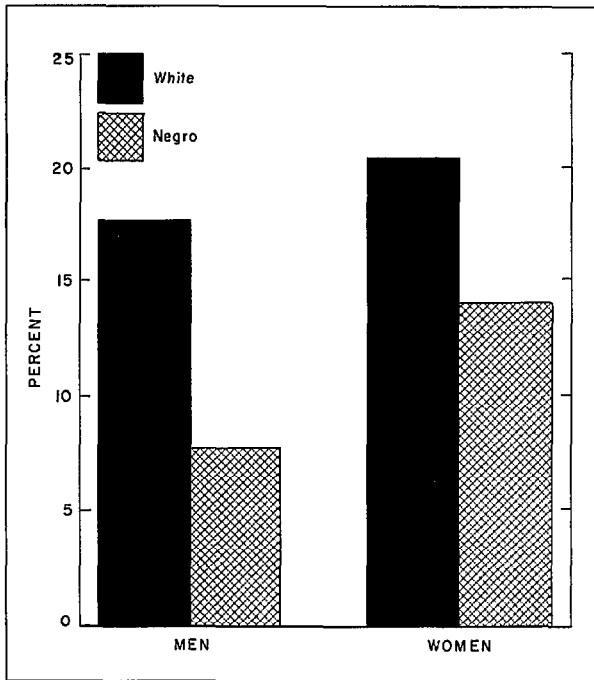


Figure 5. Percent of men and women who are edentulous for white and Negro adults.

ducted in approximately 36,000 households and included about 115,000 persons. In all but the youngest age group, the Health Interview Survey estimates are slightly higher than those of the Health Examination Survey. The higher rates reported by the Health Interview Survey might have resulted from including with edentulous persons some who were actually edentulous in only one jaw.

DMF Teeth

DMF teeth, first explained and used by Klein and Palmer,⁵ are the sum of permanent teeth in a person's mouth that are decayed, filled, and missing or indicated for extraction. In younger adults where relatively few teeth are lost from periodontal disease, DMF teeth are a measure of the cumulative toll of dental decay. In older adults who lose an increasing number of teeth because of advanced periodontal disease DMF teeth provide a convenient summary of the lifetime toll of dental disease in the permanent dentition. DMF counts

in this report are based on 32 teeth, including third molars. Since *unerupted* third molars were not identified they are included, along with *extracted* molars, in the counts of missing teeth. This procedure results in overestimates of DMF counts as a measure of the impact of dental disease, especially for the younger adults, many of whom have unerupted third molars (Appendix III).

Dental examinations indicated that the 111 million adults in the United States had the staggering total of 2½ billion decayed, missing, and filled teeth. Of the average 20.4 DMF teeth per person, 13.5 teeth were classified as missing, 5.7 filled, and 1.2 decayed. Mean scores for men and women of comparable age were similar, but those for women generally were one or two DMF teeth higher. As might be expected, the overall DMF count, as well as the missing component, increased in both sexes with advancing age, whereas, by contrast, the number of decayed teeth decreased. The average number of filled teeth reached a peak at ages 25-34 and decreased

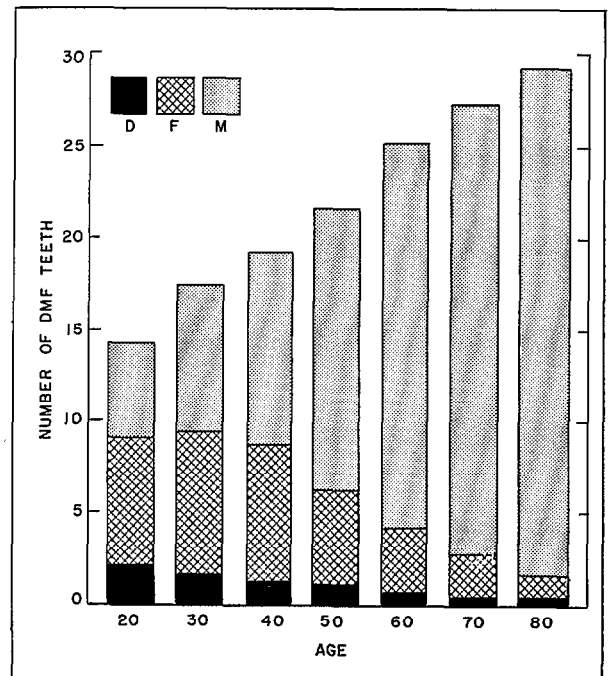


Figure 6. Average DMF and components for adults, by age.

thereafter. The exclusion of edentulous persons from the counts reduces the level by about one-eighth, but leaves the relationship by age, sex, and race essentially unchanged (tables 4 and 5, figs. 6 and 7).

From 18-44 years of age persons of both sexes had approximately seven to eight filled teeth. Thereafter, the mean number of filled teeth decreased sharply. By age 65, the average number of filled teeth was 1.9 for men and 2.6 for women, and for the oldest age group (75-79 years) the figures dropped to 0.9 for men and 1.5 for women.

The average DMF count for white adults was

approximately half again as high as that for Negro adults, with an average per person of 21.2 and 14.5, respectively (tables 6 and 7, figs. 7 and 8). This higher DMF count resulted from a much larger number of filled teeth for white adults, 6.3, as compared with only 1.3 for Negro adults, as well as to a slight excess in the number of missing teeth, 13.9 compared with 11.3. On the other hand, Negro adults averaged somewhat higher numbers of decayed teeth than did white adults (fig. 8). In both races DMF counts were higher for women than for men, with the differences more pronounced in the Negro race.

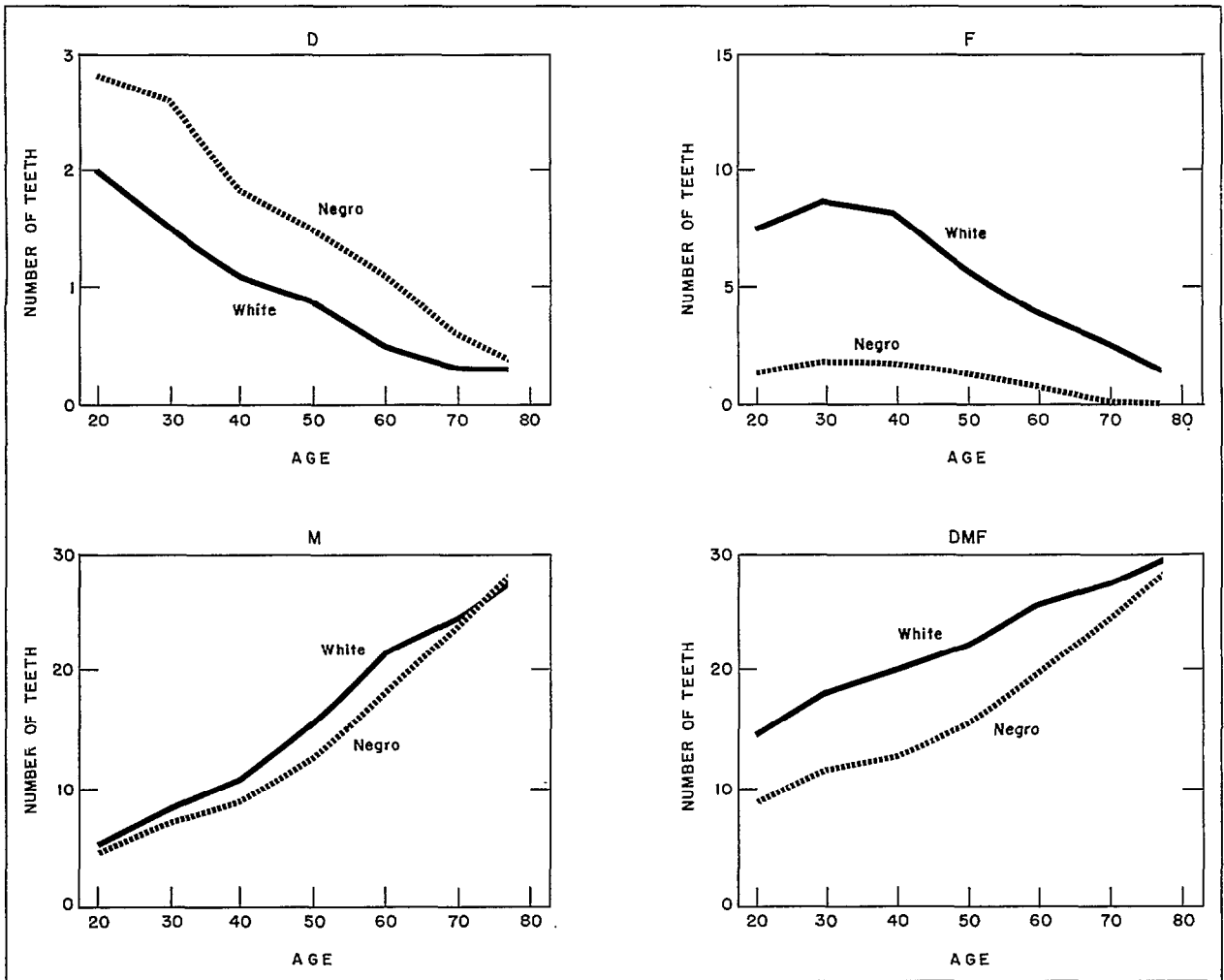


Figure 7. Average DMF and components for white and Negro adults, by age.

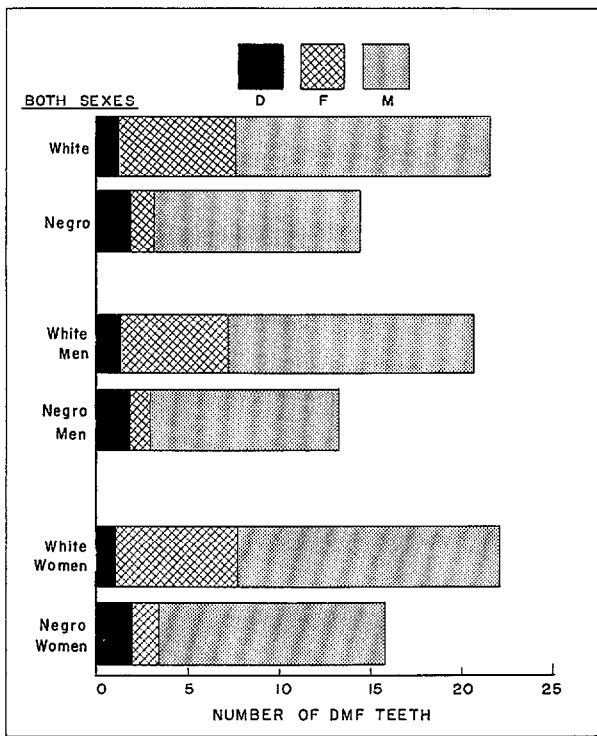


Figure 8. Average DMF and components for white and Negro adults, by sex.

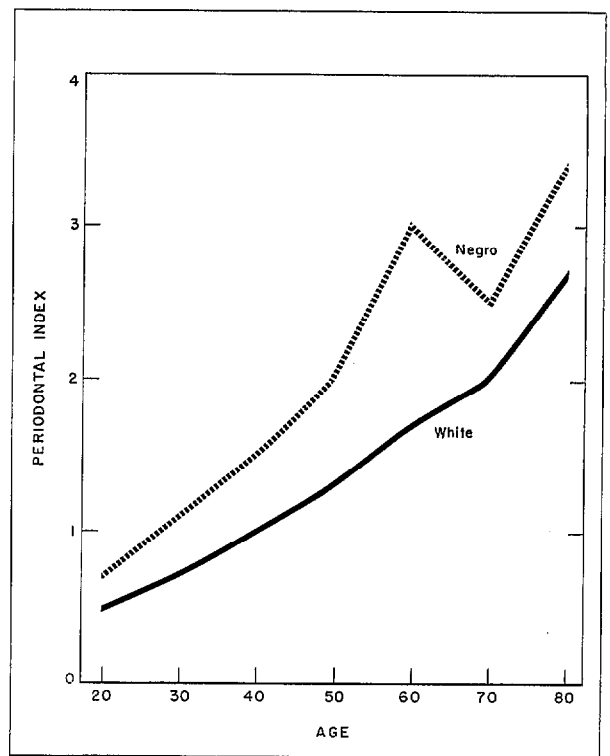


Figure 9. Average Periodontal Index for white and Negro adults, by age.

Periodontal Disease

The prevalence and severity of periodontal disease in the U.S. adult population were measured by the Periodontal Index (PI), a method first proposed by Russell in 1956.⁶ Index classification of individuals is determined by visual appraisal of the condition of the tissues supporting each tooth in the mouth. Since by definition periodontal scores cannot be assigned to missing teeth, the lifetime experience of individuals with periodontal disease may be underestimated. However, individuals who already have lost teeth because of periodontal disease very likely will show extensive disease involving their remaining teeth.

Zero is assigned when there is no evidence of periodontal disease. When overt signs of periodontal disease are present, teeth are assigned scores of 1, 2, 6, or 8, corresponding to the observed extent of gingival inflammation and destructive disease. The values of all teeth in the mouth then are averaged to obtain an individual's score or his PI.

The periodontal score is not a clinical diagnosis. According to Russell, however, most persons with clinically diagnosed gingivitis have scores ranging "from 0.1 to 1.0, those with frankly established destructive disease from 1.5 to 5.0, and those with disease in terminal stages from about 4.0 to 8.0."⁷

Periodontal scores were estimated for the approximately 90 million adults who had at least one natural tooth (table 8). The average score for all persons 18-79 years of age was 1.13. The average score increased with advancing age from a low of 0.62 and 0.48 for men and women, respectively, in the youngest age group to a high of 2.91 for men and 2.94 for women in the oldest age group. Within each of the various age groups, average scores generally were higher for men than for women.

The mean periodontal score for Negro adults was higher than that for white adults, 1.60 compared with 1.06 (fig. 9). In corresponding age groups of both races, the average for males was greater than that for females.

Matching the pattern of the Periodontal Index findings the percent of persons with destructive periodontal disease—that is, disease which had advanced to the point of pocket formation—increased rapidly with age (table 9, fig. 10). For men and women alike, the prevalence rose from approximately 1 in 10 for 18-24-year-old persons to more than 5 in 10 for the oldest age groups. In every age group destructive periodontal disease was more common for men than for women.

Half again as many Negro adults as white had one or more periodontal pockets, 36.0 versus 23.9 percent (table E). The percent for Negro men was 38.9 as compared with 28.9 for white men. The difference by race between women was even greater, 33.3 and 19.2, respectively.

Simplified Oral Hygiene Index

The Simplified Oral Hygiene Index is a method devised by Greene and Vermillion³ for recording degrees of debris and calculus formation in six

different areas of the mouth and then averaging them to provide a final whole mouth score between 0 (no debris, stain, or calculus present) and 6 (more than two-thirds of the exposed tooth surfaces of the six specified teeth covered with debris and calculus). In this Survey oral hygiene evaluations were made only if at least one of the six specified teeth was present. Accordingly, edentulous persons and persons with none of the preselected teeth were excluded from these ratings.

The average Simplified Oral Hygiene Index for all adults was 1.5. The index for white persons was lower than that for Negroes—1.5 compared with 2.2. In both races the findings for men were generally slightly higher than for women, and the index increased with advancing age (table 10).

Debris scores remained relatively constant with ascending age. Calculus scores, in contrast, showed definite increases with age, which are directly reflected in the Simplified Oral Hygiene Index. Both the debris and the calculus indexes

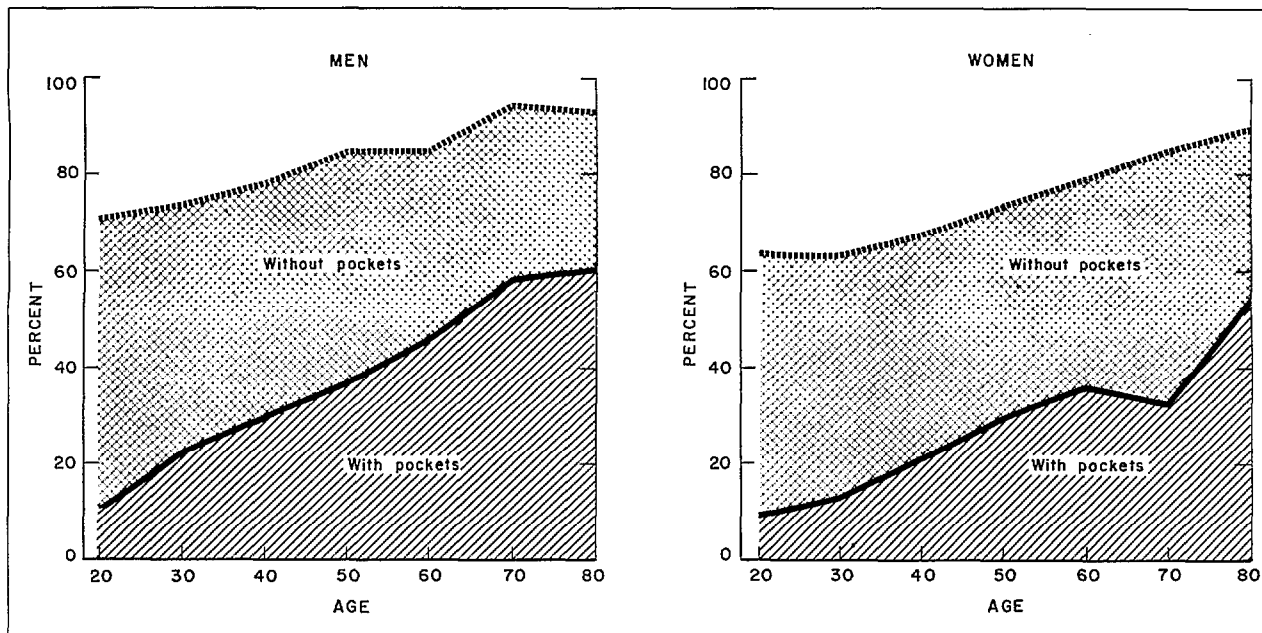


Figure 10. Percent of men and women with periodontal disease, with and without pockets, by age: United States, 1960-62.

Table E. Percent distribution of adults, by status of periodontal disease according to race and sex: United States, 1960-62

Race and sex	Total	Status of periodontal disease		
		Without periodontal disease	With periodontal disease	
			Without pockets	With pockets
<u>White</u>				
Percent distribution				
Both sexes-----	100.0	27.8	48.3	23.9
Men-----	100.0	22.4	48.7	28.9
Women-----	100.0	33.0	47.8	19.2
<u>Negro</u>				
Both sexes-----	100.0	15.8	48.2	36.0
Men-----	100.0	12.2	48.9	38.9
Women-----	100.0	19.1	47.6	33.3

were slightly higher for men than for women and slightly higher for Negro adults than for white (fig. 11).

SUMMARY

Conservative estimates based on examination findings on 6,672 persons, a probability sample representative of the entire U.S. civilian, noninstitutional population 18-79 years of age, indicate the intensity with which dental disease strikes in the American population. At least one in four adults had no natural teeth remaining in either one or both jaws. The 111 million adults represented by the sample had an average of 20.4 decayed, missing, and filled teeth per person. Moreover, about three of every four persons with natural teeth remaining showed some evidence of gingivitis or destructive periodontal disease.

The accumulated effects of dental disease rose abruptly with age. While only about 1 in every 100 persons 18-24 years of age was edentulous, by age 65-74 years nearly 1 in 2 had lost all of his teeth. The mean number of decayed, missing,

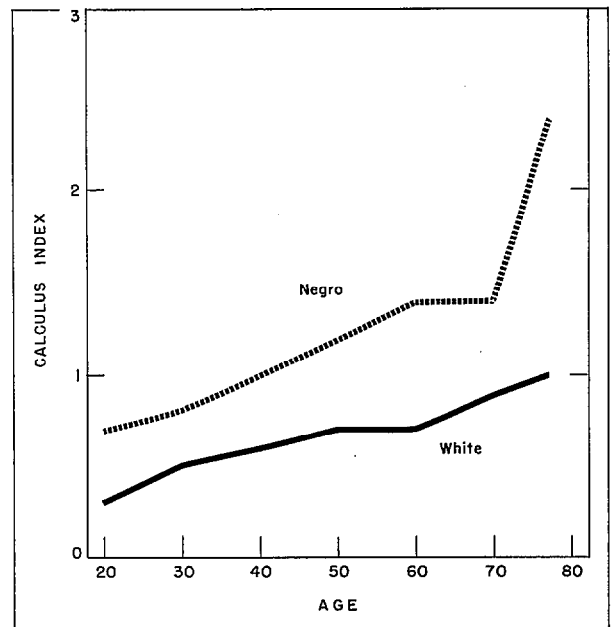


Figure 11. Average Calculus Index for white and Negro adults, by age.

and filled teeth showed a twofold increase from the youngest to the oldest age groups, rising from a low of about 14 teeth to a high of about 29. The prevalence and severity of periodontal disease in persons with natural teeth and therefore still susceptible to the disease also increased sharply with age. At ages 75-79 years, no fewer than 9 of every 10 such persons showed evidence of periodontal disease and more than half had evidence of destructive disease.

More women than men had lost all their permanent teeth. The mean number of decayed, missing, and filled teeth also was generally higher for women than for men of comparable age. Perio-

dontal disease, by contrast, was less severe and less prevalent in women. Within most age groups, differences by sex were not large.

Substantial differences in dental status were found between white and Negro adults. White adults were twice as likely as Negro to have lost all their natural teeth, either in one or both jaws. The average number of decayed, missing, and filled teeth in Negroes was only about two-thirds of the number found in white persons, 14.5 and 21.2 teeth, respectively. On the other hand, destructive periodontal disease was half again as prevalent among Negro as among white adults.

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Table 1. Number and percent distribution of adults, by number of edentulous arches according to sex and age: United States, 1960-62

Sex and age	Total	With no arch edentulous	With one arch edentulous	With both arches edentulous
<u>Both sexes</u>				
Number of adults in thousands				
Total-18-79 years-----	111,087	81,001	9,979	20,107
<u>Men</u>				
Total-18-79 years-----	52,744	39,908	4,180	8,656
18-24 years-----	7,139	6,928	116	95
25-34 years-----	10,281	9,733	275	274
35-44 years-----	11,373	10,025	680	667
45-54 years-----	10,034	7,088	948	1,998
55-64 years-----	7,517	3,917	1,008	2,592
65-74 years-----	4,972	1,891	846	2,235
75-79 years-----	1,428	327	306	795
<u>Women</u>				
Total-18-79 years-----	58,343	41,092	5,799	11,451
18-24 years-----	8,430	8,239	75	116
25-34 years-----	11,291	9,857	740	694
35-44 years-----	12,325	9,943	1,145	1,237
45-54 years-----	10,542	7,054	1,377	2,111
55-64 years-----	8,121	3,719	1,318	3,083
65-74 years-----	6,192	1,956	961	3,275
75-79 years-----	1,443	325	184	935
Percent distribution of specified population group				
Total-18-79 years-----	100.0	72.9	9.0	18.1
<u>Men</u>				
Total-18-79 years-----	100.0	75.7	7.9	16.4
18-24 years-----	100.0	97.0	1.6	1.3
25-34 years-----	100.0	94.7	2.7	2.7
35-44 years-----	100.0	88.1	6.0	5.9
45-54 years-----	100.0	70.6	9.4	19.9
55-64 years-----	100.0	52.1	13.4	34.5
65-74 years-----	100.0	38.0	17.0	45.0
75-79 years-----	100.0	22.9	21.4	55.7
<u>Women</u>				
Total-18-79 years-----	100.0	70.4	9.9	19.6
18-24 years-----	100.0	97.7	0.9	1.4
25-34 years-----	100.0	87.3	6.6	6.1
35-44 years-----	100.0	80.7	9.3	10.0
45-54 years-----	100.0	66.9	13.1	20.0
55-64 years-----	100.0	45.8	16.2	38.0
65-74 years-----	100.0	31.6	15.5	52.9
75-79 years-----	100.0	22.5	12.8	64.8

Table 2. Number and percent distribution of white adults, by number of edentulous arches according to sex and age: United States, 1960-62

Sex and age	Total	With no arch edentulous	With one arch edentulous	With both arches edentulous
<u>Both sexes</u>				
Number of adults in thousands				
Total-18-79 years-----	97,745	69,463	9,529	18,753
<u>Men</u>				
Total-18-79 years-----	46,561	34,295	4,032	8,235
18-24 years-----	6,265	6,061	116	87
25-34 years-----	8,999	8,451	275	274
35-44 years-----	9,956	8,637	659	660
45-54 years-----	8,766	5,940	921	1,905
55-64 years-----	6,660	3,224	984	2,451
65-74 years-----	4,590	1,683	811	2,096
75-79 years-----	1,326	299	265	762
<u>Women</u>				
Total-18-79 years-----	51,184	35,167	5,498	10,518
18-24 years-----	7,230	7,039	75	116
25-34 years-----	9,656	8,347	706	603
35-44 years-----	10,722	8,539	1,048	1,136
45-54 years-----	9,286	6,062	1,295	1,930
55-64 years-----	7,333	3,224	1,239	2,870
65-74 years-----	5,685	1,734	951	3,000
75-79 years-----	1,271	224	184	864
Percent distribution of specified population group				
<u>Both sexes</u>				
Total-18-79 years-----	100.0	71.1	9.7	19.2
<u>Men</u>				
Total-18-79 years-----	100.0	73.7	8.7	17.7
18-24 years-----	100.0	96.7	1.9	1.4
25-34 years-----	100.0	93.9	3.1	3.0
35-44 years-----	100.0	86.8	6.6	6.6
45-54 years-----	100.0	67.8	10.5	21.7
55-64 years-----	100.0	48.4	14.8	36.8
65-74 years-----	100.0	36.7	17.7	45.7
75-79 years-----	100.0	22.5	20.0	57.5
<u>Women</u>				
Total-18-79 years-----	100.0	68.7	10.7	20.5
18-24 years-----	100.0	97.4	1.0	1.6
25-34 years-----	100.0	86.4	7.3	6.2
35-44 years-----	100.0	79.6	9.8	10.6
45-54 years-----	100.0	65.3	13.9	20.8
55-64 years-----	100.0	44.0	16.9	39.1
65-74 years-----	100.0	30.5	16.7	52.8
75-79 years-----	100.0	17.6	14.5	68.0

Table 3. Number and percent distribution of Negro adults, by number of edentulous arches according to sex and age: United States, 1960-62

Sex and age	Total	With no arch edentulous	With one arch edentulous	With both arches edentulous
<u>Both sexes</u>				
Number of adults in thousands				
Total-18-79 years-----	11,413	9,739	385	1,290
<u>Men</u>				
Total-18-79 years-----	5,195	4,641	148	405
18-24 years-----	739	731	-	8
25-34 years-----	902	902	-	7
35-44 years-----	1,184	1,157	21	7
45-54 years-----	1,148	1,044	27	77
55-64 years-----	737	572	23	141
65-74 years-----	382	208	36	139
75-79 years-----	102	28	41	33
<u>Women</u>				
Total-18-79 years-----	6,219	5,097	237	885
18-24 years-----	966	966	-	-
25-34 years-----	1,370	1,266	13	91
35-44 years-----	1,390	1,192	97	101
45-54 years-----	1,162	965	64	133
55-64 years-----	732	467	52	213
65-74 years-----	467	181	11	275
75-79 years-----	131	60	-	71
Percent distribution of specified population group				
<u>Both sexes</u>				
Total-18-79 years-----	100.0	85.3	3.4	11.3
<u>Men</u>				
Total-18-79 years-----	100.0	89.3	2.8	7.8
18-24 years-----	100.0	98.9	-	1.1
25-34 years-----	100.0	100.0	-	-
35-44 years-----	100.0	97.7	1.8	0.6
45-54 years-----	100.0	90.9	2.4	6.7
55-64 years-----	100.0	77.6	3.1	19.1
65-74 years-----	100.0	54.5	9.4	36.4
75-79 years-----	100.0	27.5	40.2	32.4
<u>Women</u>				
Total-18-79 years-----	100.0	82.0	3.8	14.2
18-24 years-----	100.0	100.0	-	-
25-34 years-----	100.0	92.4	0.9	6.6
35-44 years-----	100.0	85.8	7.0	7.3
45-54 years-----	100.0	83.0	5.5	11.4
55-64 years-----	100.0	63.8	7.1	29.1
65-74 years-----	100.0	38.8	2.4	58.9
75-79 years-----	100.0	45.8	-	54.2

Table 4. Average DMF score of white and Negro adults including and excluding edentulous persons, by sex and age: United States, 1960-62

Sex and age	Including edentulous persons			Excluding edentulous persons		
	All races	White	Negro	All races	White	Negro
<u>Both sexes</u>	Average DMF score					
Total-18-79 years-----	20.4	21.2	14.5	17.9	18.7	12.2
<u>Men</u>						
Total-18-79 years-----	19.6	20.6	12.9	17.2	18.1	11.3
18-24 years-----	13.6	14.4	8.3	13.4	14.1	8.1
25-34 years-----	16.2	17.3	8.4	15.8	16.8	8.4
35-44 years-----	18.1	19.3	9.4	17.2	18.4	9.2
45-54 years-----	20.8	21.6	14.9	18.0	18.8	13.6
55-64 years-----	24.5	25.4	18.4	20.4	21.5	15.2
65-74 years-----	26.7	26.9	23.7	22.3	22.7	19.0
75-79 years-----	28.6	28.8	26.6	24.4	24.4	24.0
<u>Women</u>						
Total-18-79 years-----	21.1	21.9	15.7	18.5	19.2	13.0
18-24 years-----	14.4	15.1	9.2	14.1	14.8	9.2
25-34 years-----	18.4	19.2	13.6	17.5	18.4	12.3
35-44 years-----	20.1	20.8	15.1	18.8	19.5	13.8
45-54 years-----	22.1	22.8	15.8	19.6	20.4	13.7
55-64 years-----	25.7	26.2	21.2	21.9	22.5	16.8
65-74 years-----	27.7	27.9	25.2	22.9	23.4	14.6
75-79 years-----	29.6	29.8	30.1	25.1	25.0	27.3

NOTE: DMF is the sum of decayed, filled, missing, and nonfunctional teeth. Third molars are included in the count.

Table 5. Average DMF score of adults, by sex and age: United States, 1960-62

Sex and age	DMF	Decayed	Missing	Filled
<u>Both sexes</u>				
Number of teeth per person				
Total-18-79 years-----	20.4	1.2	13.5	5.7
<u>Men</u>				
Total-18-79 years-----	19.6	1.2	12.9	5.5
18-24 years-----	13.6	2.2	5.0	6.5
25-34 years-----	16.2	1.7	6.9	7.6
35-44 years-----	18.1	1.2	9.5	7.4
45-54 years-----	20.8	1.0	15.2	4.6
55-64 years-----	24.5	0.7	20.7	3.0
65-74 years-----	26.7	0.4	24.3	1.9
75-79 years-----	28.6	0.3	27.4	0.9
<u>Women</u>				
Total-18-79 years-----	21.1	1.1	14.0	6.0
18-24 years-----	14.4	2.0	5.3	7.1
25-34 years-----	18.4	1.5	9.0	7.9
35-44 years-----	20.1	1.2	11.5	7.5
45-54 years-----	22.1	0.9	15.6	5.6
55-64 years-----	25.7	0.5	21.3	3.9
65-74 years-----	27.7	0.3	24.8	2.6
75-79 years-----	29.6	0.2	27.9	1.5

NOTE: Filled teeth include only teeth with satisfactory fillings. Decayed teeth include not only teeth with caries but also filled teeth with carious lesions or defective fillings. Missing teeth include both missing and nonfunctional teeth. DMF is the total of these three categories. Third molars are included in the count.

Table 6. Average DMF score of white adults, by sex and age: United States, 1960-62

Sex and age	DMF	Decayed	Missing	Filled	
<u>Both sexes</u>		Number of teeth per person			
Total-18-79 years-----	21.2	1.1	13.9	6.3	
<u>Men</u>					
Total-18-79 years-----	20.6	1.2	13.4	6.0	
18-24 years-----	14.4	2.1	5.0	7.2	
25-34 years-----	17.3	1.7	7.3	8.3	
35-44 years-----	19.3	1.2	10.0	8.1	
45-54 years-----	21.6	1.0	15.6	5.1	
55-64 years-----	25.4	0.7	21.4	3.3	
65-74 years-----	26.9	0.4	24.5	2.1	
75-79 years-----	28.8	0.3	27.5	0.9	
<u>Women</u>					
Total-18-79 years-----	21.9	1.0	14.3	6.6	
18-24 years-----	15.1	1.9	5.5	7.7	
25-34 years-----	19.2	1.3	9.1	8.9	
35-44 years-----	20.8	1.0	11.5	8.3	
45-54 years-----	22.8	0.9	15.8	6.2	
55-64 years-----	26.2	0.4	21.5	4.3	
65-74 years-----	27.9	0.3	24.8	2.8	
75-79 years-----	29.8	0.2	27.9	1.6	

NOTE: Filled teeth include only teeth with satisfactory fillings. Decayed teeth include not only teeth with caries but also filled teeth with carious lesions or defective fillings. Missing teeth include both missing and nonfunctional teeth. DMF is the total of these three categories. Third molars are included in the count.

Table 7. Average DMF score of Negro adults, by sex and age: United States, 1960-62

Sex and age	DMF	Decayed	Missing	Filled
<u>Both sexes</u>		Number of teeth per person		
Total-18-79 years-----	14.5	1.8	11.3	1.3
<u>Men</u>				
Total-18-79 years-----	12.9	1.7	10.2	1.1
18-24 years-----	8.3	2.6	4.9	0.8
25-34 years-----	8.4	1.9	4.8	1.8
35-44 years-----	9.4	1.7	6.4	1.3
45-54 years-----	14.9	1.5	12.3	1.1
55-64 years-----	18.4	1.2	16.4	0.8
65-74 years-----	23.7	1.2	22.3	0.2
75-79 years-----	26.6	0.3	26.2	0.1
<u>Women</u>				
Total-18-79 years-----	15.7	1.9	12.3	1.5
18-24 years-----	9.2	3.0	4.6	1.7
25-34 years-----	13.6	3.0	8.7	1.9
35-44 years-----	15.1	1.8	11.3	2.0
45-54 years-----	15.8	1.4	12.9	1.4
55-64 years-----	21.2	0.9	19.7	0.5
65-74 years-----	25.2	0.2	24.9	0.1
75-79 years-----	30.1	0.4	29.6	-

NOTE: Filled teeth include only teeth with satisfactory fillings. Decayed teeth include not only teeth with caries but also filled teeth with carious lesions or defective fillings. Missing teeth include both missing and nonfunctional teeth. DMF is the total of these three categories. Third molars are included in the count.

Table 8. Average Periodontal Index of white and Negro adults, by sex and age: United States, 1960-62

Sex and age	All races	White	Negro
<u>Both sexes</u>			
Total-18-79 years-----	1.13	1.06	1.60
<u>Men</u>			
Total-18-79 years-----	1.34	1.28	1.79
18-24 years-----	0.62	0.58	0.78
25-34 years-----	0.92	0.87	1.30
35-44 years-----	1.27	1.22	1.67
45-54 years-----	1.62	1.55	2.06
55-64 years-----	2.15	2.00	3.13
65-74 years-----	2.50	2.47	2.83
75-79 years-----	2.91	3.01	2.16
<u>Women</u>			
Total-18-79 years-----	0.93	0.85	1.43
18-24 years-----	0.48	0.46	0.62
25-34 years-----	0.60	0.53	0.95
35-44 years-----	0.82	0.74	1.30
45-54 years-----	1.23	1.11	1.92
55-64 years-----	1.56	1.39	2.90
65-74 years-----	1.62	1.51	2.03
75-79 years-----	2.94	2.41	5.53

Table 9. Percent distribution of adults, by status of periodontal disease according to sex and age: United States, 1960-62

Sex and age	Status of periodontal disease			
	Total	Without periodontal disease	With periodontal disease	
			Without pockets	With pockets
<u>Both sexes</u>				
Total-18-79 years-----	100.0	26.1	48.5	25.4
<u>Men</u>				
Total-18-79 years-----	100.0	20.9	49.0	30.1
18-24 years-----	100.0	29.0	60.6	10.3
25-34 years-----	100.0	26.3	51.7	22.0
35-44 years-----	100.0	22.1	48.1	29.7
45-54 years-----	100.0	15.0	48.1	36.9
55-64 years-----	100.0	15.3	39.1	45.6
65-74 years-----	100.0	5.6	36.0	58.4
75-79 years-----	100.0	6.2	33.7	60.0
<u>Women</u>				
Total-18-79 years-----	100.0	31.0	47.9	21.0
18-24 years-----	100.0	36.8	53.6	9.6
25-34 years-----	100.0	37.6	50.2	12.3
35-44 years-----	100.0	33.3	46.2	20.5
45-54 years-----	100.0	26.6	43.7	29.6
55-64 years-----	100.0	20.8	43.6	35.5
65-74 years-----	100.0	15.2	52.0	32.8
75-79 years-----	100.0	11.0	35.3	53.8

Table 10. Average Simplified Oral Hygiene, Debris, and Calculus Indexes of white and Negro adults, by sex and age: United States, 1960-62

Sex and age	Average Simplified Oral Hygiene Index			Average Debris Index			Average Calculus Index		
	All races	White	Negro	All races	White	Negro	All races	White	Negro
<u>Both sexes</u>									
Total-18-79 years-	1.5	1.5	2.2	0.9	0.9	1.2	0.6	0.6	1.0
<u>Men</u>									
Total-18-79 years-	1.8	1.7	2.4	1.1	1.0	1.3	0.7	0.7	1.1
18-24 years-----	1.5	1.5	2.0	1.1	1.1	1.3	0.4	0.4	0.7
25-34 years-----	1.6	1.6	2.0	1.0	1.0	1.1	0.6	0.6	0.9
35-44 years-----	1.7	1.7	2.5	1.0	1.0	1.3	0.7	0.7	1.2
45-54 years-----	1.9	1.9	2.6	1.1	1.1	1.4	0.8	0.8	1.2
55-64 years-----	2.1	1.9	2.8	1.2	1.1	1.5	0.9	0.8	1.3
65-74 years-----	2.5	2.5	3.3	1.4	1.4	1.6	1.1	1.1	1.7
75-79 years-----	2.2	2.1	2.7	1.0	1.0	0.9	1.2	1.1	1.8
<u>Women</u>									
Total-18-79 years-	1.3	1.3	2.0	0.8	0.8	1.1	0.5	0.5	0.9
18-24 years-----	1.2	1.1	1.8	0.9	0.8	1.1	0.3	0.3	0.7
25-34 years-----	1.2	1.1	1.9	0.8	0.7	1.1	0.4	0.4	0.8
35-44 years-----	1.2	1.1	1.8	0.8	0.7	1.0	0.5	0.4	0.8
45-54 years-----	1.5	1.4	2.3	0.8	0.8	1.1	0.7	0.6	1.2
55-64 years-----	1.6	1.4	2.7	0.9	0.8	1.3	0.7	0.6	1.4
65-74 years-----	1.6	1.6	2.3	0.9	0.9	1.2	0.7	0.7	1.1
75-79 years-----	1.9	1.5	4.6	0.9	0.7	2.3	1.0	0.8	2.3

APPENDIX I

THE DENTAL EXAMINATION

The dental examination of the Health Examination Survey is designed to gather comparable information on the dental health status of the population. As a result, the examination procedure has been standardized so that not only the same examiner but different examiners obtain their findings on a uniform basis. The dental examination consists of determining the condition of the teeth, whether, for instance, a tooth is decayed, missing, and filled, and of assessing malocclusion, oral hygiene, and periodontal disease through the use of "indexes." The presence or absence of fluoride and nonfluoride opacities of the maxillary anterior teeth is also recorded. The dental examination is performed by the dentist member of the health survey team. A portable chair and light are used, and the mouth mirror and explorer examination of the teeth and gums usually requires about 10 minutes.

To determine the condition of individual teeth on a uniform basis and to restrict the examining dentist's judgment to as narrow a range as possible, objective criteria have been set up and are followed throughout the examination procedure. The various criteria represent a line drawn at a high common denominator of specific conditions, a line or denominator which, in most instances, is visible evidence of a condition which, when seen by most dentists, would bring agreement that the condition does indeed exist. A tooth, for example, is considered "nonfunctional—loss of supporting structure" when its total mobility labiolingually or buccolingually exceeds three millimeters. Similarly, when determining whether a tooth is carious, the examiner first looks for evidence of decay—undermined enamel in pits and fissures, opacity of marginal ridges, and decalcified areas on smooth surfaces. Once observed, suspected lesions are considered carious only when a break in the enamel can be demonstrated with an explorer.

The "indexes" which are included in the examination are objective assessments of the oral hygiene status and of the severity of malocclusion and periodontal disease in individuals. The oral hygiene assessment is based upon the amount of oral debris and calculus on selected teeth; the assessments of malocclusion and periodontal disease are based, respectively, upon the number of malaligned teeth and their degree of malalignment, and the presence and extent of gingival inflammation and pocket formation.

"Should see own dentist at an early date" is checked when the individual presents a condition which suggests that an examination by his own dentist is desirable in order to arrive at a clinical diagnosis of the condition and to determine whether or not treatment is needed; otherwise, "at next regular appointment" is checked. Each person examined is informed by the examining dentist that the Survey examination must not be considered a substitute for an examination by his own dentist.

EXPLANATION OF FINDINGS

Edentulous Arches

An edentulous arch is identified by a check in the appropriate box. The box which indicates the presence or absence of a denture for that arch is then checked. A denture is scored present only when in the examinee's mouth at the time of the examination and not defective.

An arch in which the crown of an erupting tooth can be seen or in which roots only are present is also considered edentulous if a full denture is being used. The presence of erupting teeth and roots under a full denture is noted in the remarks.

The box which designates a defective denture should be checked only when there is visible evidence that the denture is causing extensive destruction of the primary stress-bearing areas of the ridge or palate. Tissue in these areas may be acutely inflamed; bone resorption may have occurred; hypertrophied tissue may be present. The denture is also defective if it is in the possession of the examinee at the time of the examination but not in the mouth.

Status of Tooth Spaces

The status of each tooth space in an arch should be recorded when that arch has at least one tooth or root present and a full denture is not being used. The symbol indicating the condition of the space is written in the upper section of each respective tooth space box.

Primary teeth are numbered and scored the same as permanent teeth but with a circle around the symbol. When the succedaneous tooth is also present, the symbols for the primary tooth are placed above the upper arch, or below the lower, circled, and a line is

drawn from the circle to the tooth's position in the permanent arch.

The examiner should determine the condition of tooth spaces in accordance with the criteria listed below. Circumstances which in some instances may prevent a reasonable application of the criteria should be explained by the examiner under "Remarks."

(N) Normal.—Unfilled teeth free from carious lesions are scored (N).

(D) Carious.—Unfilled teeth with carious lesions are scored (D).

Each tooth is first examined visually for evidence of decay—decalcified areas, opacity of marginal ridges, and undermined enamel in pits and fissures. Once observed, suspected smooth surface lesions are considered carious only when a break in the enamel can be demonstrated with an explorer.

(M) Missing.—When a missing tooth is not replaced by a prosthesis the tooth space normally occupied by that tooth is scored (M).

(MSC) Missing—space closed.—A tooth space is scored (MSC) when less than 3 mm. separates the teeth bounding it mesiodistally.

(F) Filled (including crown).—Teeth which have satisfactory fillings or crowns and present no carious lesions are scored (F).

(FD) Filled defective (or tooth both filled and carious).—Filled (or crowned) teeth with new or recurrent carious lesions are scored (FD). Filled teeth which are not carious are scored similarly when the restoration is:

1. Loose
2. Temporary
3. Fractured and the base or pulpal wall of the cavity preparation exposed.

(XD) Nonfunctional—carious.—When caries has penetrated the pulp chamber of a tooth, that tooth is scored (XD). Teeth are scored so when there is:

1. Visible evidence of periapical abscess or exposure.
2. Visible evidence of extensive undermining of all enamel walls.

NOTE: All roots are scored (XD) and X is placed in the lower section of the tooth space box.

(XP) Nonfunctional—loss of supporting structure.—When the mobility of a tooth exceeds 3 mm. as measured at the incisal or occlusal third of the crown, or when the tooth is depressible in its socket, the tooth is scored (XP).

(XO) Nonfunctional—other.—An (XO) score is entered for all teeth with occlusal surfaces contacting the opposing alveolar ridge when the remaining teeth are in occlusion.

(R) Replaced on fixed bridge or removable partial denture.—When a missing tooth is replaced on a fixed bridge or removable partial denture, the space

normally occupied by the missing tooth is scored (R).

(RD) Replaced defective.—Missing teeth replaced on a defective fixed bridge or a defective removable partial denture are scored (RD).

Fixed bridges are defective:

1. When one of the abutment teeth is nonfunctional due either to caries or loss of supporting structure, or when there is visible evidence of periapical pathology.
2. When the connection of the pontic with its abutment is broken.
3. When an abutment crown or inlay is defective due to one of the following reasons:
 - A. Tooth structure exposed by abrasion of the crown or inlay is carious.
 - B. A carious lesion at one of the margins of the restoration has resulted in extensive undermining of an enamel wall.

Removable partial dentures are defective:

1. When one of the abutment teeth is nonfunctional due either to caries or loss of supporting structure or when there is visible evidence of periapical pathology.
2. When there is visible evidence that the denture is causing extensive destruction of the stress-bearing areas of the ridge or palate.

Periodontal Score⁶

A periodontal score is recorded in the lower section of each tooth space box for every tooth, other than roots, that is present. Criteria for the periodontal score:

Score 0 - Negative.—There is neither overt inflammation in the investing tissues nor loss of function due to destruction of supporting tissues.

1 - Mild gingivitis.—There is an overt area of inflammation in the free gingivae, but this area does not circumscribe the tooth.

2 - Gingivitis.—Inflammation completely circumscribes the tooth, but there is no apparent break in the epithelial attachment.

6 - Gingivitis with pocket formation.—The epithelial attachment has been broken and there is a pocket (not merely a deepened gingival crevice due to swelling in the free gingivae). There is no interference with normal masticatory function; the tooth is firm in its socket and has not drifted.

8 - Advanced destruction with loss of masticatory function.—The tooth may be

loose; may have drifted; may sound dull on percussion with a metallic instrument; may be depressible in its socket.

Simplified Oral Hygiene Index³

Selected surfaces of six teeth are used in making this estimation of oral hygiene status. For the purposes of this examination, each surface that is used, buccal or lingual, is considered to encompass half of the circumference of the tooth. The buccal surface of a molar, for example, is considered to include half of the mesial surface and half of the distal.

The posterior teeth used for the assessment are the first fully erupted teeth distal to the bicuspid area on each side of each arch. In most cases this will be a first molar, but in others it may be a second or third molar. The buccal surfaces of upper molars and the lingual of lowers are examined. In the anterior portion of the mouth, the labial surfaces of the upper right central incisor and the lower left central incisor are examined. When one or both of these teeth is missing, the adjacent central incisor is substituted.

A. Examining for Oral Debris

The surface area covered by debris is estimated by running a number five explorer along the surface being examined and noting the occlusal or incisal extent of the surface being examined and noting the occlusal or incisal extent of the debris as it is removed from the tooth surface and adheres to the explorer.

Scoring:

- 0 - No debris or stain present.
- 1 - (a) Soft debris covering not more than the gingival third of the tooth surface, or
(b) the presence of the extrinsic stains without debris regardless of surface area covered.
- 2 - Soft debris covering more than one-third but not more than two-thirds of the exposed tooth surface.
- 3 - Soft debris covering more than two-thirds of the exposed tooth surface.

B. Examining for Oral Calculus

A number five explorer is also used to estimate surface area covered by supragingival calculus and to probe for subgingival calculus.

- Scoring: 0 - No calculus present.
1 - Supragingival calculus cov-

ering not more than one-third of the exposed tooth surface.

- 2 - Supragingival calculus covering more than one-third but not more than two-thirds of the exposed tooth surface, and/or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth.
- 3 - Supragingival calculus covering more than two-thirds of exposed tooth surface and/or a continuous heavy band of subgingival calculus around the cervical portion of the tooth.

C. Calculating the Index

The debris scores are totaled and divided by the number of surfaces scored. The calculus score is determined similarly. The debris and calculus scores are then added to give the examinee's Simplified Oral Hygiene Index.

Nonfluoride Opacities

These lesions are often round or oval. They are clearly differentiated from adjacent normal enamel. They are usually pigmented at the time of eruption, often creamy-yellow to dark reddish-orange. Any tooth may be affected. They do not follow a standard pattern of distribution.

Score:

- None - Less than two of the eight upper anterior teeth are affected.
- Mild - Two or more of the eight upper anterior teeth are affected but the areas cover less than half of the labial surface.
- Objectionable - At least half of the labial surfaces of two or more of the eight upper anterior teeth are affected.

Fluorosis

In the space provided, one of the following three classifications is checked.

None.—The enamel presents the usual translucent and semivitriform type of structure. The surface is smooth, glossy, and usually of a pale creamy white color.

Mild.—At least two of the eight upper anterior teeth have small, opaque, paper-white areas scattered irregularly over them but the areas do not involve as much as approximately 50 percent of the labial surface.

Objectionable.—Half or more of the labial surfaces of at least two of the eight upper anterior teeth are affected and surfaces subject to attrition show marked wear. Brown stain is frequently a disfiguring feature. There may be discrete or confluent pitting.

NOTE: When less than two of the eight upper anterior teeth are present, the "not applicable" box is checked.

Malocclusion Score

Each tooth is scored individually but subtotals are recorded for six segments of the mouth:

Maxillary anterior (cuspid to cuspid inclusive)
Right maxillary posterior (bicuspid and molars)
Left maxillary posterior (bicuspid and molars)
Mandibular anterior (cuspid to cuspid inclusive)
Right mandibular posterior (bicuspid and molars)
Left mandibular posterior (bicuspid and molars)

In each segment, the teeth present are scored:

Score 0 - Ideal alignment.—The line projected through the contact areas of the observed tooth is coincident with the line projected through the contact areas of the tooth if it were in ideal alignment.

Score 1 - Minor malalignment

1. Rotation (measured by plastic instrument). The angle formed by the line projected through the contact areas of the observed tooth and the line projected through the contact areas if it were in ideal position is less than 45 degrees.
2. Displacement (measured by plastic instrument). Both contact areas of the tooth are away from ideal position but less than 1.5 mm. away.

Score 2 - Major malalignment

1. Rotation (measured by plastic instrument). The angle formed by the line projected through the contact areas of the observed tooth and the line projected through the contact areas if the tooth were in ideal position is 45 degrees or larger.
2. Displacement (measured by plastic instrument). Both contact areas of the tooth are away from ideal position 1.5 mm. or greater.

A tooth may be in more than one of the above positions, i.e., both rotation and displacement; if so, it is assessed according to the position of highest score value.

PHS-3026
REV. 5-60

Health Examination Survey
DENTAL EXAMINATION FINDINGS
HES-206

Mr. _____
Mrs. _____
Miss _____
ADDRESS _____

MALE
 FEMALE
 WHITE
 NEGRO
 OTHER

Report to Dentist YES NO

DATE OF BIRTH
Month | Day | Year
_____|_____|_____

EDENTULOUS ARCHES:

Upper Arch Edentulous: YES NO Full Upper Dentures: Absent Defective Present
Lower Arch Edentulous: YES NO Full Lower Dentures: Absent Defective Present

STATUS OF TOOTH SPACES IN ARCHES WHICH ARE NOT EDENTULOUS:

(N) Normal, (D) Carious, (M) Missing, (F) Filled, (FD) Filled Defective, (XD) Non-Functional - Carious, (XP) Non-Functional - Loss of Supporting Tissue, (XO) Non-Functional - Other Reasons, (R) Replaced on Bridge or Partial Denture, (RD) Replaced - Defective, (SC) Space Closed.

PERIODONTAL SCORE for each tooth occupies the lower segment of the box

Right								UPPER ARCH								Left		
3 Mo	2 Mo	1 Mo	2 Bi	1 Bi	Cusp	L In	C In	C In	L In	Cusp	1 Bi	2 Bi	1 Mo	2 Mo	3 Mo			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			

LOWER ARCH																		
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17			

SIMPLIFIED ORAL HYGIENE INDEX:

Type	U.R. Molar	U.R. Cen.	U.L. Molar	L.L. Molar	L.L. Cen.	L.R. Molar	Total Score
Debris							
Calculus							

Debris - Total Score _____ ÷ Number of Segments = _____

Calculus - Total Score _____ ÷ Number of Segments = _____

Simplified Oral Hygiene Index = _____

NON-FLUORIDE OPACITIES: NONE MILD OBJECTIONABLE NOT APPLICABLE
FLUOROSIS: NONE MILD OBJECTIONABLE

MALOCCLUSION SCORE:

Upper Arch: Anterior _____ R. Posterior _____ L. Posterior _____ Total _____
Lower Arch: Anterior _____ R. Posterior _____ L. Posterior _____ (Both Arches) _____

SHOULD SEE OWN DENTIST: At Next Regular Appointment At An Early Date

REMARKS _____

EXAMINER _____ DATE _____ PLACE OF EXAMINATION _____

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
U.S. National Health Survey
591429 O - 61 (Set 1)

Serial Number _____



APPENDIX II

TRAINING OF DENTAL EXAMINERS FOR CYCLE I OF THE HEALTH EXAMINATION SURVEY

The first of a series of examinations to standardize and calibrate dental examiners for the Health Examination Survey was completed in November 1958. Each of approximately 200 individuals, most of whom were from 14 to 17 years of age, was seen by two examiners using mouth mirrors and explorers and a standard dental light. Unlike the ones to follow, however, these initial examinations were not only to train examiners in a standard procedure but, more important, to determine whether a proposed examination procedure was sufficiently objective to allow different examiners to obtain comparable findings.

Before the start of the examinations, a small number of persons were seen by both examiners. Any differences in findings recorded by examiners for individuals were discussed in an effort to attain as uniform an application of the examination criteria as was possible. No comparisons of oral hygiene were made on replicate examinations since one dentist's assessment prohibits a valid appraisal of the same mouth by a second dentist. Examination of the first of 207 persons was then begun with the examiners working independently. The results of the two examiners are shown in table I.

To compare the findings resulting from the examination procedure with the findings of a trained examiner experienced in DMF surveys, a dentist from the Epidemiology and Biometry Branch, National Institute of Dental Research (NIDR) reexamined 87 of the 207 sample persons. His results are shown in table II with the results for the same 87 persons obtained earlier by Examiners A and B.

A third examiner (Examiner C) was trained in July 1960, a fourth (Examiner D) in April 1961, and a fifth (Examiner E) in July 1961. Results of these series of examinations are shown in the following tables (III, IV,

and V). In all tables, the same examiner is given the same letter. For example, Examiner A in Table I is also Examiner A in Table IV.

The findings in table VI are derived from the examination of the same 56 persons by each examiner including a second series by Examiner A. Examiner C completed his examinations as a training exercise prior to returning to the field following a 10-month clinical assignment. The examinations by Examiners D and E were performed at or near the close of their field assignments.

Table I. Mean dental findings for 207 persons examined in November 1958, Health Examination Survey

Findings	Examiner	
	A	B
Decayed, missing, and filled----	11.6	11.6
Total teeth present-----	26.9	26.9
Normal-----	20.3	20.4
Carious-----	3.4	3.2
Filled-----	2.4	2.3
Filled defective-----	0.5	0.6
Replaced-----	0.0	0.0
Nonfunctional--carious-----	0.3	0.3
Missing-----	5.0	5.1
Malocclusion Index-----	10.2	11.0
Periodontal Index-----	0.29	0.31

Table II. Mean dental findings for 87 persons examined in November and December 1958, Health Examination Survey

Findings	Examiner		
	A	B	NIDR ¹
Decayed, missing, and filled-----	11.4	11.2	11.0
Normal-----	20.6	20.8	20.8
Cariou-----	3.4	3.3	3.0
Missing-----	4.9	4.9	4.8
Filled-----	2.8	2.8	2.9
Nonfunctional-cariou-----	0.3	0.2	0.3
Periodontal Index-----	0.33	0.37	0.35

¹National Institute of Dental Research.

Table IV. Mean dental findings for 181 persons examined in March 1961, Health Examination Survey

Findings	Examiner	
	A	D
Decayed, missing, and filled--	11.5	11.4
Total teeth present-----	26.3	26.3
Normal-----	20.5	20.5
Cariou-----	2.1	2.0
Filled-----	2.4	2.3
Filled defective-----	1.0	1.1
Replaced-----	-	-
Nonfunctional-cariou-----	0.3	0.3
Missing-----	5.8	5.7
Malocclusion Index-----	11.7	11.4
Periodontal Index-----	0.52	0.41

Table III. Mean dental findings for 170 persons examined in July 1960, Health Examination Survey

Findings	Examiner		
	A	B	C
Decayed, missing, and filled-----	11.5	11.5	11.9
Total teeth present--	27.1	27.1	27.1
Normal-----	20.4	20.7	20.1
Cariou-----	2.9	2.8	2.3
Filled-----	2.5	2.5	2.3
Filled defective-----	0.6	0.5	0.6
Replaced-----	-	-	-
Nonfunctional-cariou-----	0.7	0.8	0.8
Missing-----	4.8	4.9	4.9
Malocclusion Index-----	9.4	9.3	7.7
Periodontal Index-----	0.54	0.64	0.56

Table V. Mean dental findings for 147 persons examined in July 1961, Health Examination Survey

Findings	Examiner	
	A	E
Decayed, missing, and filled--	11.4	11.2
Total teeth present-----	27.6	27.6
Normal-----	20.8	21.0
Cariou-----	2.9	2.6
Filled-----	2.1	1.9
Filled defective-----	0.4	0.4
Replaced-----	-	-
Nonfunctional-cariou-----	0.5	0.9
Missing-----	5.4	5.3
Malocclusion Index-----	9.4	10.1
Periodontal Index-----	0.45	0.41

Table VI. Mean dental findings for 56 persons examined by various examiners at various times at the close of field assignment. (All findings are adjusted for treatment which took place between first and last examinations.)

Findings	Examination date and examiners					
	May 1962		June 1962		July 1962	
	A	E	A	D	B	C
Decayed, missing, and filled----	10.2	11.1	10.5	10.0	10.7	11.4
Total teeth present-----	26.8	26.9	26.9	27.0	27.0	27.0
Normal-----	21.8	20.9	21.5	22.0	21.4	20.6
Carious-----	2.1	3.0	2.4	1.7	2.7	3.4
Filled-----	2.1	2.0	2.1	2.0	2.0	1.9
Filled defective-----	0.4	0.6	0.5	0.6	0.6	0.7
Nonfunctional—carious-----	0.4	0.4	0.4	0.7	0.3	0.4
Missing-----	5.2	5.1	5.1	5.0	5.1	5.0
Malocclusion Index-----	9.2	8.9	10.7	11.4	11.1	12.5
Periodontal Index-----	0.30	0.12	0.29	0.28	0.36	0.34

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APPENDIX III.

STATISTICAL NOTES

The Survey Design

The Health Examination Survey is designed as a highly stratified multistage sampling of the civilian, noninstitutional population, aged 18-79 years, of the conterminous United States. The first stage of the plan is a sample of the 42 primary sampling units (PSU's) from 1,900 geographic units into which the United States has been divided. A PSU is a county, two or three contiguous counties, or a standard metropolitan statistical area. Later stages result in the random selection of clusters of about four persons from a small neighborhood within the PSU. The total sample included 7,710 persons in the 42 PSU's in 29 different States. The detailed structure of the design and the conduct of the Survey have been described in previous reports.^{1, 2}

Reliability in Probability Surveys

The methodological strength of the Survey derives especially from its use of scientific probability sampling techniques and of highly standardized and closely controlled measurement processes. This does not imply that statistics from the Survey are exact or without error. Data presented are imperfect for three important reasons: (1) results are subject to sampling error, (2) the actual conduct of a survey never agrees perfectly with the design, and (3) the measurement process itself is inexact, even when standardized and controlled. The faithfulness with which the study design was carried out has been analyzed in a previous report.²

Of the total of 7,710 sample persons, 86 percent or 6,672 were examined. Analysis indicates that the examined persons are a highly representative sample of the adult civilian, noninstitutional population of the United States. Imputation for the nonrespondents was accomplished by attributing to nonexamined persons the characteristics of comparable examined persons. The specific procedure used² consisted of inflating the sampling weight for each examined person to compensate for nonexamined sample persons at the same stand and of the same age-sex group.

Of the examined adults there were 19 who did not have the dental examination. These persons are included in the "Total" and "With neither arch edentulous" columns of detailed tables 1, 2, and 3, and are excluded from all other tables.

Sampling and Measurement Error

In this report and its appendices, several references have been made to efforts to evaluate both bias and variability of the measurement techniques. The probability design of the Survey makes possible the calculation of sampling errors. Traditionally the role of the sampling error has been the determination of how imprecise the survey results may be because they come from a sample rather than from measurement of all elements in the universe.

The task of presenting sampling errors for a study of the type of the Health Examination Survey is complicated by at least three factors. (1) Measurement 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 calculation of variances. (3) Thousands of statistics come from the Survey, many for subclasses of the population for which there are small numbers of sample cases. Estimates of sampling error are obtained from the sample data and are themselves subject to sampling error, which may be large when the number of cases in a cell is small, or even occasionally when the number of cases is substantial.

In the present report, estimates of approximate sampling variability for selected statistics are presented in table VII. These estimates have been prepared by a replication technique which yields overall variability through observation of variability among random subsamples of the total sample. The method reflects both "pure" sampling variance and a part of measurement variance.

In accordance with usual practice, a 68 percent confidence interval may be considered the range within one

Table VII. Relative standard errors

Statistic and race	Both sexes	Men	Women	Men or women		
				18-24 25-34 years	35-44 45-54 55-64 years	65-74 75-79 years
<u>Persons with no arch edentulous</u>						
Total-----	0.01	0.01	0.02	0.01	0.02	0.10
White-----	0.03	0.03	0.04	0.04	0.05	0.20
Negro-----	0.12	0.13	0.14	0.16	0.20	0.40
<u>Persons with one arch edentulous</u>						
Total-----	0.03	0.05	0.05	0.35	0.10	0.30
White-----	0.04	0.06	0.06	0.40	0.15	0.40
Negro-----	0.30	0.40	0.30	*	0.50	*
<u>Persons with both arches edentulous</u>						
Total-----	0.04	0.04	0.05	0.30	0.10	0.08
White-----	0.03	0.03	0.05	0.30	0.12	0.10
Negro-----	0.20	0.35	0.20	*	*	0.40
<u>Average DMF score per person</u>						
Total-----	0.01	0.01	0.01	0.02	0.02	0.04
White-----	0.02	0.02	0.02	0.03	0.03	0.06
Negro-----	0.03	0.04	0.04	0.10	0.10	0.20
<u>Average decayed teeth per person</u>						
Total-----	0.05	0.04	0.07	0.07	0.09	0.20
White-----	0.05	0.05	0.06	0.08	0.10	0.20
Negro-----	0.06	0.10	0.06	0.10	0.20	*
<u>Average missing teeth per person</u>						
Total-----	0.02	0.02	0.03	0.04	0.04	0.03
White-----	0.02	0.02	0.03	0.05	0.04	0.04
Negro-----	0.04	0.05	0.05	0.10	0.10	0.10
<u>Average filled teeth per person</u>						
Total-----	0.02	0.02	0.03	0.03	0.05	0.20
White-----	0.03	0.03	0.04	0.04	0.06	0.30
Negro-----	0.11	0.17	0.10	0.35	0.35	*
<u>Average Periodontal Index</u>						
Total-----	0.04	0.04	0.05	0.08	0.08	0.10
White-----	0.04	0.04	0.04	0.09	0.09	0.15
Negro-----	0.05	0.06	0.08	0.15	0.20	0.25
<u>Average Oral Hygiene Index</u>						
Total-----	0.02	0.02	0.03	0.03	0.05	0.20
White-----	0.03	0.03	0.04	0.04	0.06	0.25
Negro-----	0.03	0.05	0.04	0.08	0.10	0.30
<u>Average Debris Index</u>						
Total-----	0.02	0.03	0.03	0.05	0.05	0.06
White-----	0.03	0.03	0.04	0.06	0.06	0.08
Negro-----	0.05	0.08	0.04	0.10	0.15	0.15
<u>Average Calculus Index</u>						
Total-----	0.03	0.04	0.04	0.10	0.06	0.05
White-----	0.03	0.04	0.05	0.10	0.08	0.05
Negro-----	0.05	0.08	0.04	0.15	0.12	0.10

standard error of the tabulated statistic and a 95 per cent confidence interval the range within two standard errors.

An overestimate of the standard error of a difference $d=x-y$ of two statistics x and y is given by the formula $S_d = [x^2V_x^2 + y^2V_y^2]^{1/2}$ where V_x^2 and V_y^2 are relvariances respectively of x and y , or the squares of the relative errors shown in table VII. For example table 5 shows the average DMF score for men is $x=19.6$ and for women $y=21.1$, while from table VII relvariances are found to be: $V_x^2=0.0001$ and $V_y^2=0.0001$. The formula yields the estimate of standard error of the difference ($d=1.5$) as $S_d=0.3$. Thus, as the observed difference is nearly five times its sampling error, it can be concluded that the evidence from this Survey shows that the average DMF score for women is higher than for men.

Small Numbers

In some tables magnitudes are shown for cells for which sample size is so small that the sampling error may be several times as great as the statistic itself. Obviously in such instances the statistic has no meaning in itself except to indicate that the true quantity is small. Such numbers, if shown, have been included to convey an impression of the overall story of the table.

Overestimation of DMF Counts

In order to estimate the amount by which the DMF counts might have been overstated, because of including unerupted third molars, a special study was made of the youngest age groups. The average numbers of missing second and third molars per adult, by single years of age for ages 18-34, are

shown in table VIII and figure I. These data indicate that for ages 18-24 the number of missing third molars cannot be more than 2.1 and is almost surely less than 1.7. Thus, it is probable that the missing component of the DMF counts for 18-24 year olds is exaggerated at least by 0.4 and not more than 2.1, as a result of including unerupted third molars.

Table VIII. Average number of missing second and third molars per adult, by single years of age for ages 18-34 years: Health Examination Survey, 1960-62

Age	Average number of missing molars	
	Second	Third
18-24 years-----	0.4	2.1
18 years-----	0.2	2.9
19 years-----	0.2	2.3
20 years-----	0.4	2.2
21 years-----	0.4	2.0
22 years-----	0.4	1.8
23 years-----	0.6	1.7
24 years-----	0.6	1.7
25-34 years-----	0.8	2.3
25 years-----	0.6	1.9
26 years-----	0.8	2.1
27 years-----	0.6	2.0
28 years-----	0.7	2.1
29 years-----	0.9	2.1
30 years-----	0.7	2.3
31 years-----	0.8	2.3
32 years-----	0.8	2.5
33 years-----	0.9	2.6
34 years-----	0.8	2.5

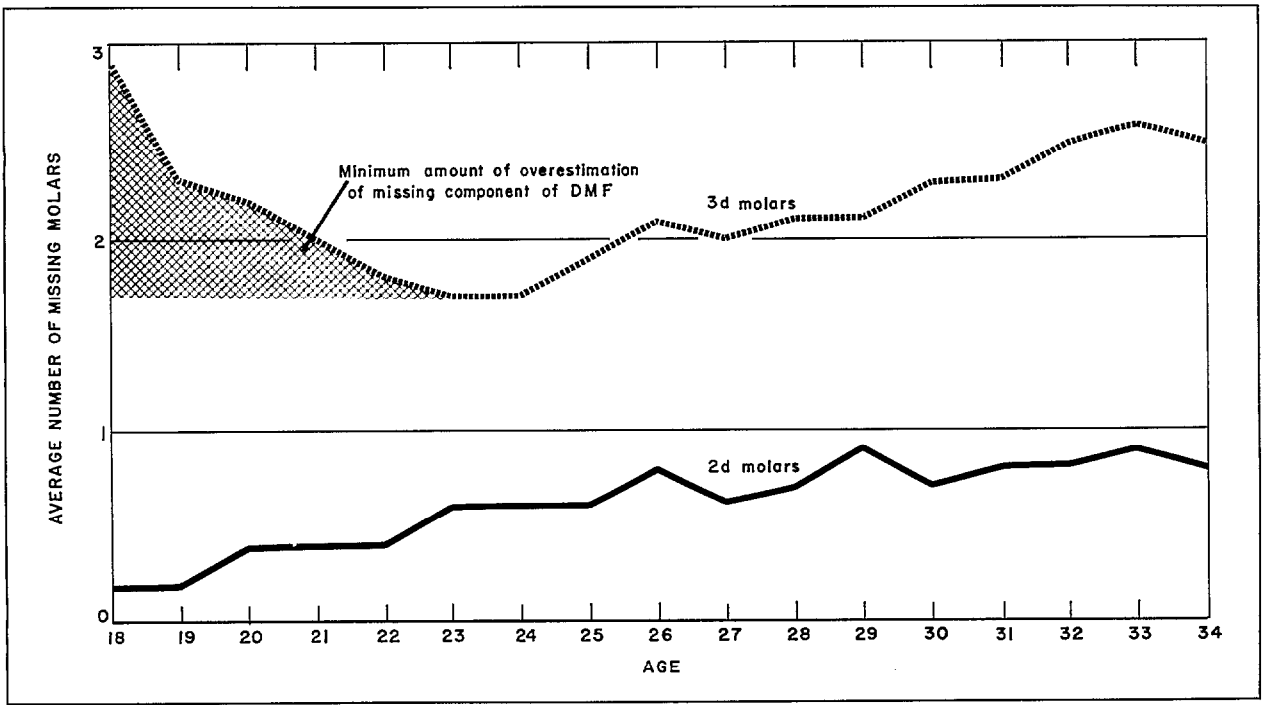


Figure 1. Average number of missing second and third molars per adult, by single years of age for ages 18-34 years.

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