VITAL and HEALTH STATISTICS

DATA FROM THE NATIONAL HEALTH SURVEY

Decayed, Missing, and Filled Teeth in Adults

United States - 1960 - 1962

Estimates of decayed, missing, and filled (DMF) teeth by age, sex, race, and other major demographic characteristics, with a brief description of prevailing trends.

CONTENTS

IN THIS REPORT are presented detailed national estimates of the number of decayed, missing, and filled (DMF) teeth occurring in the adult population of the United States. Trends appearing among white and Negro men and women by various demographic features are described, and in a final section similar trends among young adults aged 18-34 years are briefly discussed.

The estimates encompass approximately 91 million men and women (some 20 million others are excluded) who still had one or more of their natural teeth. All of the estimates are based on examinations conducted by the Health Examination Survey during 1960-62 on a probability sample of U.S. adults aged 18-79 years selected from the civilian population at large.

The number of DMF teeth increased rapidly and steadily with advancing age. At any given age, however, women had slightly more DMF teeth than men of the same race, and white adults had substantially more than Negro adults of the same sex.

Trends in DMF teeth were also traced by family income, education, and specified place of residence. For instance, higher counts of DMF teeth were more frequent among people with greater income or education and among residents of more densely inhabited places. In addition, men and women living in the Northeast had significantly high counts, and those living in the South had significantly low ones.

Finally, trends encountered in the adult population as a whole were also found to prevail among young adults 18-34 years old, suggesting that demographic differences in DMF teeth stem at least in part from corresponding variations in the incidence of dental decay.

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DECAYED, MISSING, AND FILLED TEETH IN ADULTS

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INTRODUCTION

During their lifetime, most Americans are destined to fall victim to dental disease. Onset often commences in early childhood and frequently ceases only when there are no surviving teeth. Repeated attacks and the failure to receive prompt and adequate dental care cause a vast but needless loss of teeth among large numbers of men and women.

Among the more common conditions that result from unstayed dental disease, none is more disabling or disfiguring than the total loss of one's natural teeth. In taking a nationwide inventory among adults, the Health Examination Survey found that an estimated 20 million men and women (18 in every 100) had lost all of their natural teeth. The proportion of toothless persons increased drastically with advancing age, and by ages 65-79 years every other man and woman had lost all of his or her teeth.[1]

Teeth that are lost are almost always the result of deep decay or advanced periodontal disease. Undecayed or repaired teeth with healthy supporting structures will last until they are literally worn away. Severe attrition of tooth substance occurs only after extraordinary heavy and continuous use. It is rarely encountered in this country, although at one time, when tobacco chewing was widely indulged in, it was frequently seen. Today dental decay and periodontal disease are unchallenged as the leading causes of tooth loss, the former in persons under 35 years of age and the latter in older men and women.[2]

Since early decay and all but the most advanced periodontal disease can usually be arrested, it is difficult to understand why so many people take few if any measures to save their teeth. Perhaps their attitude of seeming indifference is encouraged by the skill with which natural teeth can be replaced by artificial ones. Under different circumstances, it seems likely that tooth removal might be submitted to more grudgingly and recommended much less often than has been the custom. In any event, only about one in every two persons visits a dentist at least once a year; a large number of these visits are for extractions and other surgery and, of course, for restoring previously extracted teeth.[3]

Other estimates which clearly show the unsparing onset of dental disease in the Nation at large have also been published by the Health Examination Survey.[1] Excluding the 20 million men and women whose only teeth were artificial, there were 90 million who had on the average 18 teeth which if not missing were either filled or in need of filling. Among these persons, moreover, were almost 10 million who had lost all 16 teeth from one jaw or the other.

Dental decay—a commonplace term in most 20th century American households—is still not fully comprehended by those who have studied it most thoroughly. Clinical studies and laboratory experiments have brought to light many of the dynamic events that are believed to lead to the origination and development of a carious lesion. Tooth decay is assuredly a complicated process involving diet, tooth susceptibility, and the pres-

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ence of microorganisms to actuate and sustain it. However, no one really knows just how a cavity begins, exactly how it progresses, or, for that matter, all of the numerous interlacing factors that might be involved.

In the most widely accepted explanation, demineralization of the tooth's outer enamel layer by acids is postulated. The acids are produced from various foodstuffs, especially sweet and starchy ones, by the action of certain kinds of bacteria commonly found in teeming numbers on enamel surfaces.

After the enamel has been deeply penetrated and the underlying dentin bared, the inmost structure of the tooth lies open to invasion. Dentin, unlike enamel, incorporates a relatively large amount of organic matter (about 20 percent by weight as compared with only about 1 percent for enamel). The peculiar, tubelike organization of its structural components permits the intrusion of bacteria and provides channels along which they can proliferate internally. The progressive destruction of dentin is explained by the occurrence of two different chemical processes—a demineralization similar to that occurring in enamel of the inorganic constituents by acid and a dissolution of the organic material (matrix) by enzymes produced by encroaching microorganisms.

As to the occurrence of dental decay, two observations are sufficiently evident that seldom are they seriously controverted: nearly everyone develops it at one time or another, and among most people the number of attacks continues to mount with age. There is little ground for further generalization because few surveys have carefully and thoroughly examined the prevalence and distribution of caries by any demographic characteristic other than age. Some of the many surveys conducted among children revealed a higher incidence of decay in white girls than in white boys, and others which included both white and Negro children disclosed that the former usually had more decayed teeth than the latter.

Findings from two large surveys conducted among adults suggest that the variation of DMF teeth by sex and race in children carries over into adulthood. In both of these studies, women consistently had slightly more decayed, missing, and filled teeth than men; and in one white men and women had sharply more DMF teeth than did comparable Negro adults.[4, 5]

It is surprising that comparatively little is known about the occurrence of a disease which unceasingly harasses so many people. Ironically, much more might have been learned had it not been for the exciting discovery more than a quarter of a century ago that an unknown ingredient contained in the drinking water of some communities increases man's immunity to tooth decay. From that moment on the imagination and resources of epidemiological research were largely engaged in studies which eventually revealed fluoride as the ingredient and established a safe and effective method of improving dental health. With better teeth at stake for millions of persons, it is no wonder that many other areas of dental epidemiology were relatively neglected until quite recently.

This report contains national estimates of the number of decayed, missing, and filled teeth by various demographic characteristics. Some of the estimates by age, sex, and race appeared in a previous report,[1] but others, including those by place of residence, family income, and educational attainment, are presented here for the first time. The estimates embrace some 91 million dentulous adults who, having at least one extant tooth, were still liable to tooth loss.

The estimates are based on findings obtained during 1960-62 from the examination of 6,672 men and women aged 18-79 years. By virtue of the statistical principles which determined their selection, the sample persons represented within a known range of probability the much larger population of which they were a part—approximately 111 million U.S. adults in the civilian, noninstitutional population. A description of the selection of sample persons, a description and an assessment of the dental examination, and an explanation of the procedure for deriving national estimates have previously been published.[1, 6, 7]

The mouth and teeth of each sample person were examined by one of five dentists who had been trained beforehand to perform the examination by a prescribed procedure. Radiographs of the teeth were not taken. The procedure also departed in other respects from the examination routinely given to many patients who seek dental care: teeth were not dried or isolated, oral debris

and calculus were not removed prior to observation, and tooth surfaces were not probed unless the examiner saw an indication of the presence of covert decay. To further increase agreement both within and between examiners, questionable or borderline conditions were purposefully not reported.

While these provisions heightened the comparability of findings as they were intended to do, they also lessened the sensitivity of the examination. As a result, many findings are conservative in comparison with what would be obtained by clinical evaluation. For example, defectively filled, nonfunctional, and especially decayed teeth are systematically underestimated from a clinical viewpoint while, conversely, complementary counts of normal and functional teeth are overestimated. Other estimates, however, such as the number of filled and missing teeth are derived from objective counts which are highly comparable by any standard.

In many places within this report the dental condition of particular groups of men and women is briefly described by citing the mean number of decayed, missing, and filled (DMF) teeth enumerated among them. This calculated value is called their DMF index. For anyone at any age, DMF teeth can be defined as the sum total of permanent teeth that are decayed, filled, and either missing or indicated for extraction. In younger adults who lose relatively few teeth from any cause other than decay, DMF teeth accurately measure the number of teeth that have been attacked by decay at least once. Thus, differences between DMF indexes of groups of young persons whose age is the same reflect relative variations in the rate at which their teeth have been attacked. If, for example, the DMF indexes of two groups of men and women aged 18-24 years are 8 and 16 teeth, respectively, it can reasonably be inferred that the caries attack rate has been twofold greater among women than among men even though the number of times each tooth had been attacked is not taken into account.

On the other hand, older adults often lose many teeth from severe periodontal disease which progressively destroys the structures supporting the teeth in the jaw. Among older men and women whose missing teeth may never have had decay, the DMF index merely provides a convenient summation of the lifetime toll of all dental disease.
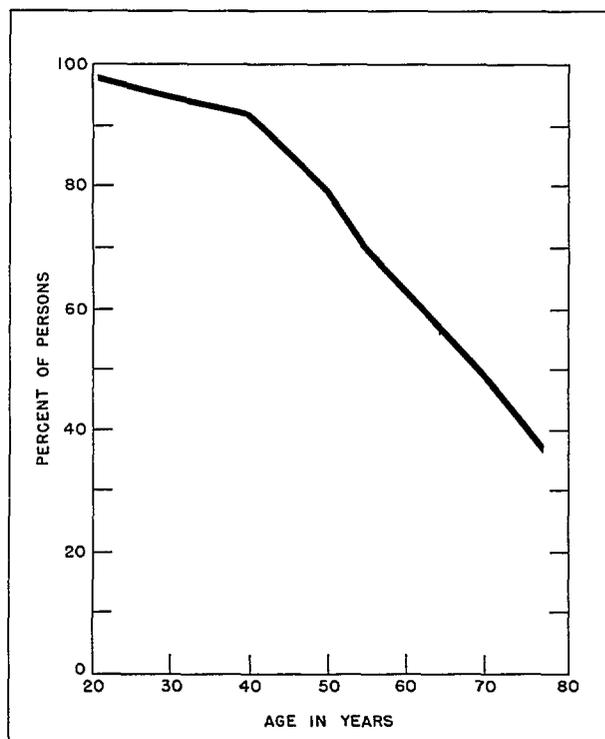
Figure 1. Percent of persons with at least one natural tooth, by age.

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

Based on examinations, approximately 20 million men and women had lost all of their natural teeth. Their exclusion from the estimates that follow resulted in a diminishing proportion of persons within each older age group (fig. 1) and, within specified age ranges, proportionately fewer white persons than Negroes and fewer women than men.

FINDINGS

A vast majority of the 91 million men and women who were still at risk to tooth loss showed abundant evidence of prior attack by dental disease. More than half of them had more than 18 decayed, missing, and filled teeth; and a quarter

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had as many as 24 or more (table 1). In sharp contrast, it was the exceptional person (about 1 in 160) who possessed a full complement of 32 teeth, none of which was either filled or decayed. Reflecting the exceedingly high rate of attack to which they had been subjected, men and women of all races averaged 17.9 DMF units per person—an aggregate comprising 1.4 decayed, 9.4 missing, and 7.0 filled teeth (table 5).

Each of the DMF components (decayed, missing, and filled teeth) was more or less concentrated in segments of the population which, although containing large numbers of men and women, were nonetheless proportionately small (tables 2-4). For instance, 1 in every 5 persons had 15 missing teeth or more, all of which accounted for nearly half of the total number of missing teeth. Similarly, every other man and woman had six or more filled teeth, so that fully 90 percent of all filled teeth were encountered in only half of the population. In marked contrast, a quarter of the population had no filled teeth. Finally, decayed teeth, which include those with faulty fillings as well as those with untreated cavities, were even more narrowly distributed. While 1 in every 2 men and women had no decayed teeth, the 1 in every 10 who had any at all had more than six. In other words, one-half of the total number of decayed teeth occurred in one-tenth of the population.

Age and Sex

DMF teeth amassed rapidly with lengthening exposure to the risk of disease. From a low of 13.4 and 14.1 for the youngest men and women,
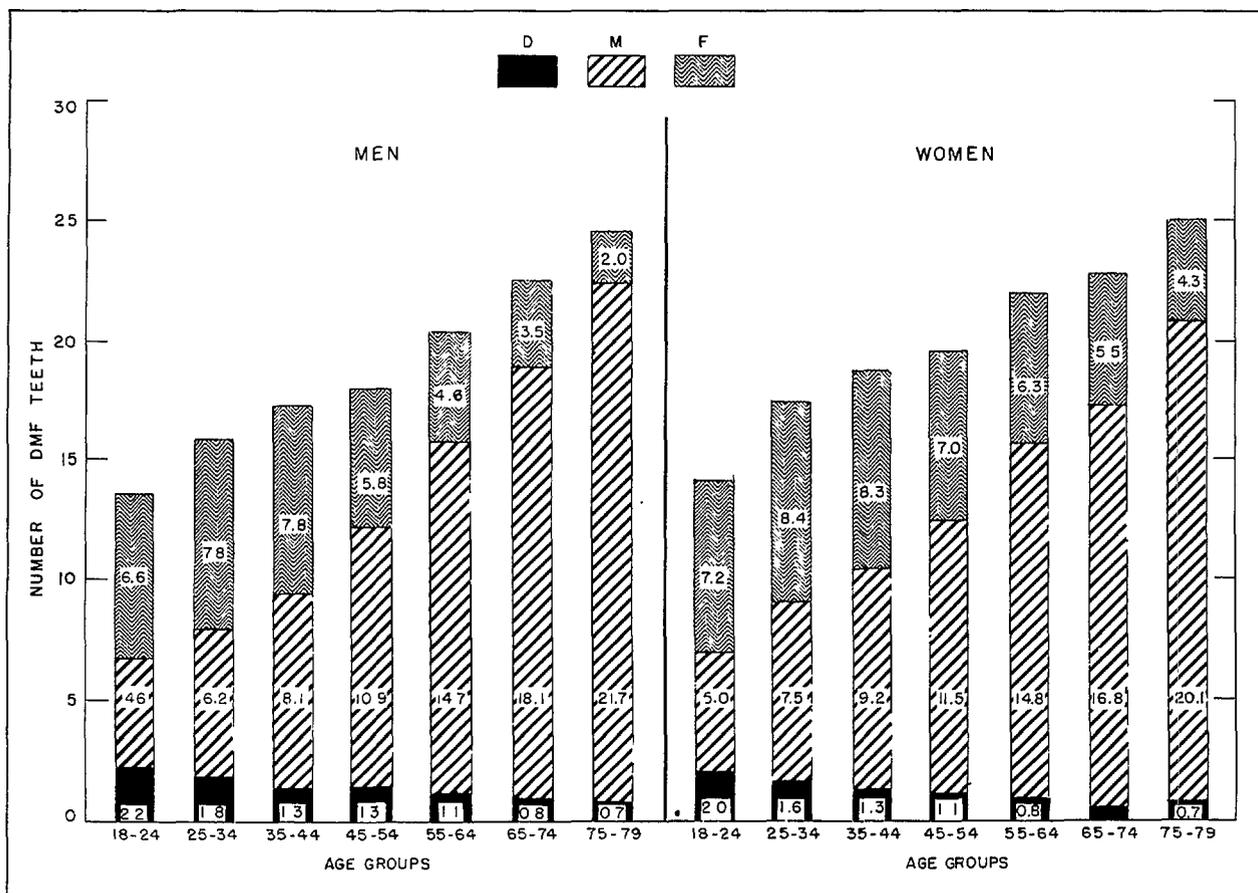
Figure 2. Mean number of decayed, missing, and filled teeth among dentulous men and women, by age.

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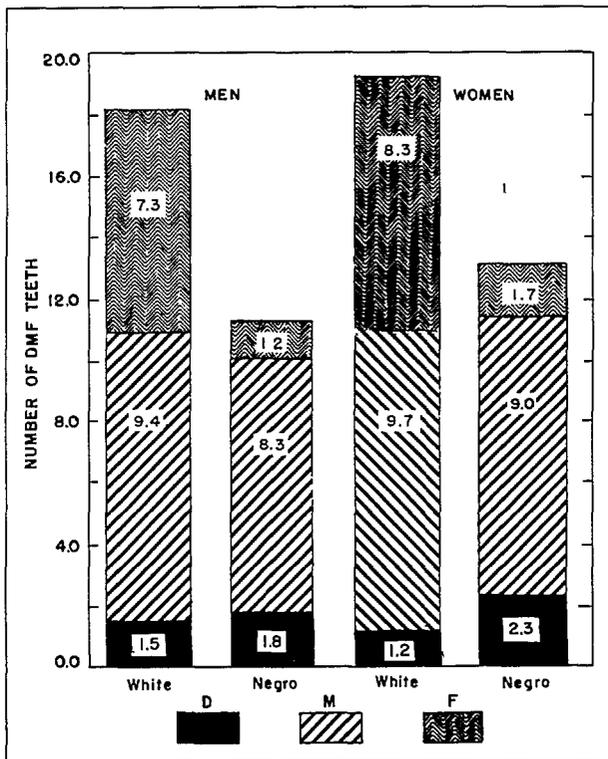
Figure 3. Mean number of decayed, missing, and filled teeth among dentulous white and Negro men and women.

respectively, mean counts climbed without falter to a high of about 25 per person among the oldest men and women (table 5). The uninterrupted rise resulted from the increasing tooth loss which accompanied aging. By contrast, the number of decayed teeth declined gradually, as did filled teeth after reaching a high of about 8 per person among men and women aged 25-44 years (fig. 2).

Comparative counts of decayed, missing, and filled teeth suggest that women are slightly more prone to dental disease than men. The mean number of DMF teeth per man and woman was 17.2 and 18.5, respectively. The difference by sex, although never large, recurred consistently. Within each of the various age groups, women usually had one or two more DMF teeth than men.

Race

The DMF index for white adults was half again as high as that for Negro adults, with an average per person of 18.7 and 12.2, respectively (tables

6 and 7). This sharp difference was the result of a much larger number of filled teeth among white adults than among Negro adults—7.8 as compared with only 1.5—and of a slight excess in the number of missing teeth among white adults—9.6 as compared with 8.7. On the other hand, Negro adults averaged somewhat higher quantities of decayed teeth (fig. 3).

Trends by both age and sex were remarkably consistent. Women without exception had higher DMF counts than men of the same race and age.

The mean number of DMF teeth for all white and Negro men and women appear in table 8. The inclusion of edentulous persons elevates index values by approximately one-eighth but entails little or no appreciable effect upon differentials existing by age, sex, and race.

OTHER DEMOGRAPHIC VARIABLES

Many of the more common dental conditions have frequently been found to vary significantly in prevalence and severity by levels of family income and education as well as by age, sex, and race. For example, the Health Examination Survey found that periodontal disease in adults was inversely related to rising levels of education and family income.[8] In the remainder of this report men and women whose dental conditions are being described have been classified by specified ranges of income and education; in addition, they have been classified by specified place of residence.

After the population was grouped, any differences which appeared in mean DMF teeth per person among the various groups were examined. For example, mean DMF counts for white and Negro adults whose family income was within one of five different income ranges were examined to determine whether the mean count within one range differed significantly from that within another. Allowance was made for differences in the age and sex distribution of persons composing the various groups since DMF teeth have already been shown to vary importantly by both of these characteristics.

Expected values were calculated by weighting age- and sex-specific mean DMF counts for the total U.S. population by the age-sex distribution of respective groups. Actual and expected values may occasionally be expected to differ by chance. But when the difference is not statistically signif-

icant, it can generally be assumed that differences between DMF indexes for component age-sex groups fluctuated randomly.

Because of the relatively limited number of sample persons, sampling variability for specific age and sex groupings was usually quite large. It is for this reason that summary comparisons of actual and expected mean counts were preferred to a comparison of mean age-specific counts.

Income and Education

The amount of yearly income earned by a family was directly associated with the number of DMF teeth its adult members had. Men and women in families whose annual incomes were high tended to have more DMF units than those in families with low incomes (tables 9-12). For example, men of all races whose yearly family income exceeded $9,999 had 19.0 DMF teeth per person, but those with incomes of less than $2,000 averaged only 15.3 (table 9).

Exactly the same trend in DMF teeth reoccurred with education (table 13). Women of all races with less than 5 years of schooling had 15.0 DMF teeth per person. By contrast, those who had completed 1 year or more of college had 19.3. The trend by education, like the one by income, is more pronounced among white adults than among Negro men and women; in fact, the only semblance of the trend among the Negro population was the one by income among women.

The rate of edentulous persons in the U.S. population has been found to decrease sharply with increasing income and education.[9] The inclusion of edentulous men and women in the above estimates significantly reduced but did not entirely eliminate the numerical differences in DMF teeth that were obtained. However, the DMF index among adults 18-79 years of age is not a reliable measure of dental caries activity nor an indicator of good or bad dental health but merely a concise description of dental findings.

Income and education were significantly associated not only with the number of DMF teeth but, to an even greater extent, with their proportionate composition (tables 10-12, 14-16). For example, the mean number of filled teeth in women rose abruptly from 1.4 among those with
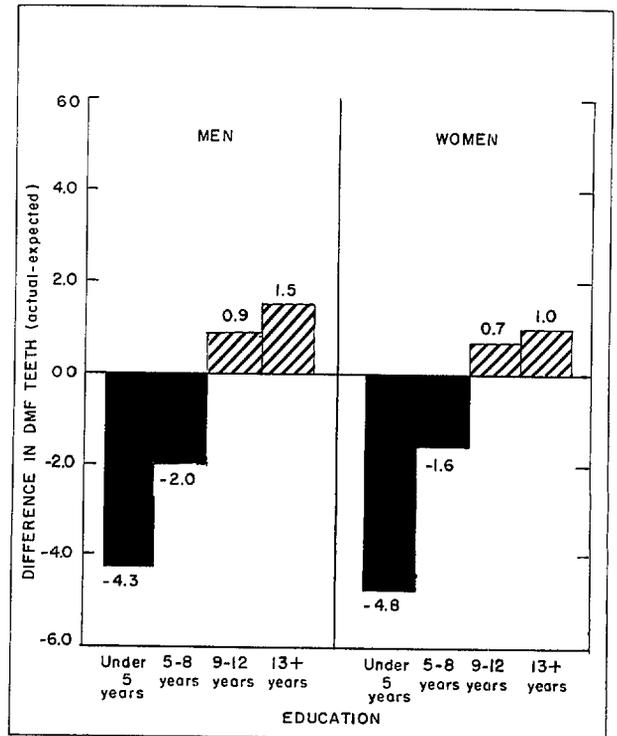
Figure 4. Differences between actual and expected mean number of decayed, missing, and filled (DMF) teeth among dentulous men and women, by education.

the least education to 11.2 among those with the most (table 16). Both decayed and missing teeth followed counter trends which, however, were too weak to offset the margin of difference resulting from filled teeth. Again, citing women by education as an example, those in the topmost group had 4.3 more DMF teeth than those in the lowest. Although the latter had many more decayed plus missing teeth than the former (13.6 as compared with 8.1), they also had many fewer filled teeth— only 1.4 as compared with 11.2. The outcome was a net increase in DMF teeth with rising income and education. Thus, adults with higher income or education had more DMF teeth than less advantaged men and women, but judging from the greater number of teeth they had and the smaller number of decayed ones, their dental condition was nonetheless the better.

Trends in DMF teeth did not arise because there were relatively more older persons within
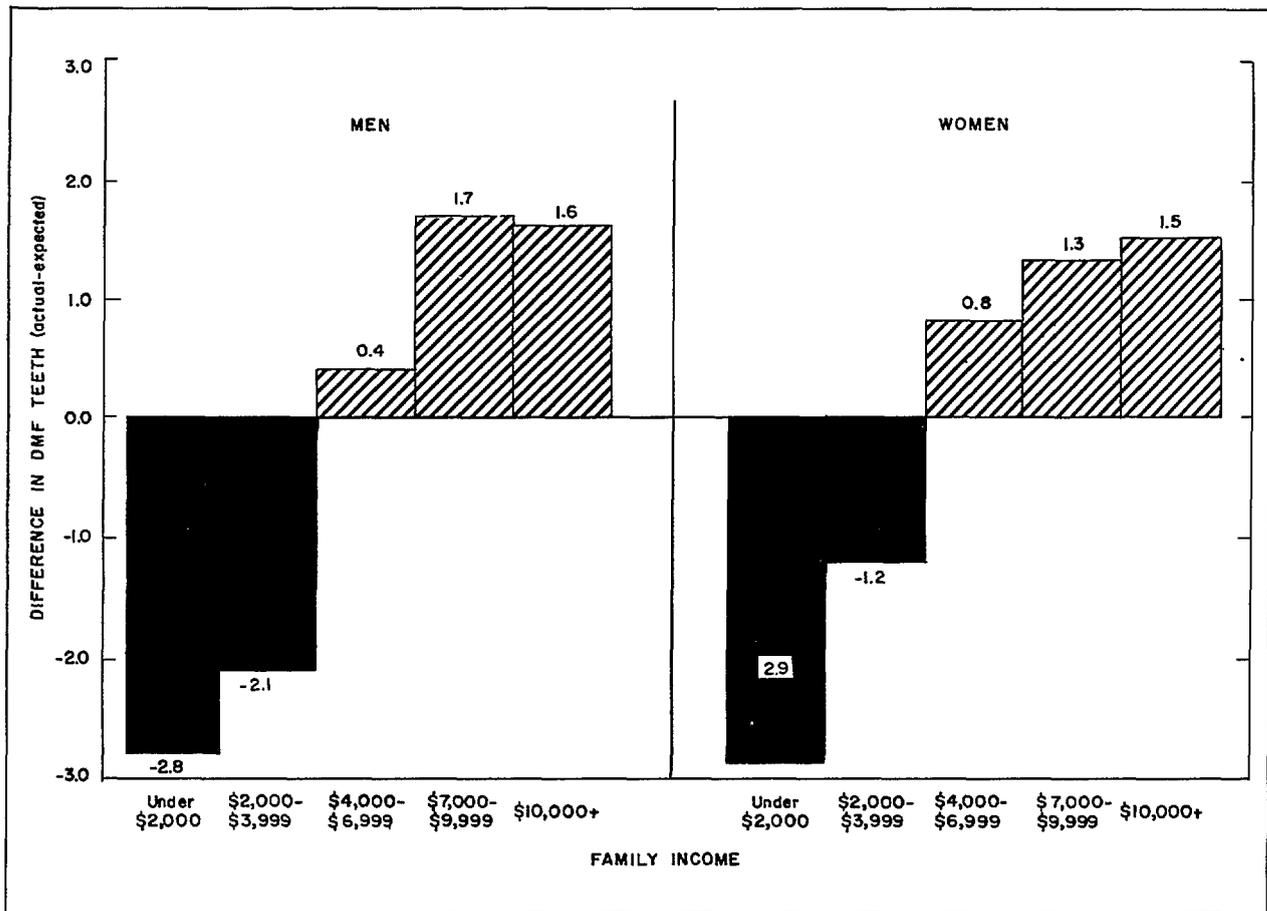
Figure 5. Differences between actual and expected mean number of decayed, missing, and filled (DMF) teeth among dentulous men and women, by family income.

each higher income and educational group. On the contrary, both trends are somewhat more apparent in the differences between actual and expected counts than they are in actual counts (figs. 4 and 5, tables 9-16).

DMF teeth continued to vary in number by sex. Throughout the various ranges of income and education, white and Negro women almost always had more DMF teeth than men of the same race.

In figure 6, differences between actual and expected numbers of DMF teeth by income, after adjustment for education, are shown. The trend in numbers, although reduced in magnitude, was unchanged in direction. Adjustment for education lowered the variance in mean counts attributable to income to approximately a third of its former value. In short, both income and education appear to be independently correlated with DMF teeth.

Race, Income, and Education

Variations in income and education fail to explain the wide difference in DMF teeth observed by race. Within any of the levels of income and education shown in table 17, white men continue to have a substantially higher index than Negro men as do white women in comparison with Negro women. Because proportionately few Negro adults had family incomes exceeding $6,999 per year or education beyond high school, mean values could not meaningfully be compared at these levels.

Place of Residence

Estimates of the mean number of DMF teeth in white and Negro men and women dwelling in three broad regions of the United States—the
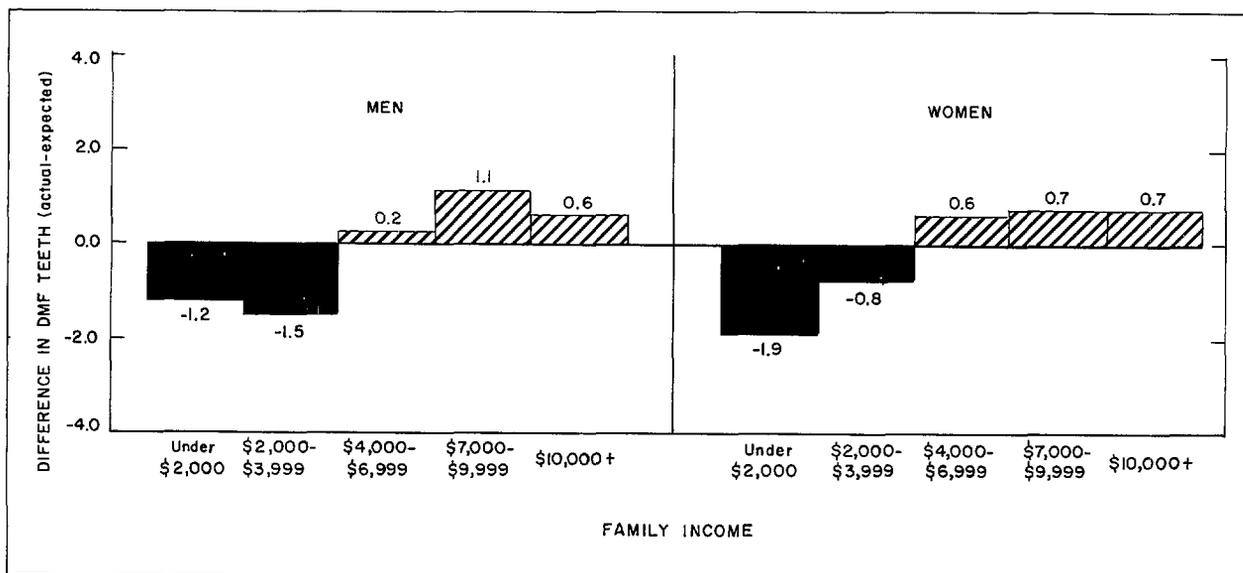
Figure 6. Differences between actual and expected mean number of decayed, missing.and filled (DMF) teeth among dentulous men and women, by family income adjusted for education.

Northeast, South, and West—appear in table 18. In the Northeast, it will be noted, adults had consistently higher estimates than were expected, whereas in the South they had consistently lower ones. Moreover, differences between the observed and expected means are statistically significant for every group except Negro women in the Northeast. Estimates for adults who lived in the West showed, by contrast, no significant regional variation.

Estimates of DMF teeth were also obtained by place description, population size, and urban-rural residence (tables 19-21). With remarkably few exceptions, white men and women from more densely inhabited areas had higher numbers of DMF teeth than persons from areas that are less densely peopled.

DMF Teeth in Young Adults
18-34 Years of Age

The trends in DMF teeth which have been described evolved with a consistency that was significant not only by age, sex, and race but also by income, education, and place of residence. Each demographic variable had an association

which was its own in the sense that it was not fully erased by controlling for others. It should again be stressed that variations in DMF teeth in the adult population do not necessarily imply the onset of more or less dental disease nor do they imply the presence of better or worse dental health. Moreover, any attempt to explain the factors underpinning the pattern that unfolded is forestalled because teeth extracted due to decay cannot be excluded from those lost because of severe periodontal disease. To illustrate the insurmountable problem this imposes, many men and women lose teeth previously neither filled nor decayed when periodontal disease reaches the stage of severity at which extraction is the most practical recourse. Many others with equally severe disease have fewer missing teeth simply because they have not sought the care which under the circumstances is appropriate. Thus, the exasperating but ineluctable question which arises is whether people obtain more care because they have more dental disease or whether they only ostensibly have more disease (higher DMF counts) because they have sought relatively more care.

The data on hand can perhaps provide some insight into the sources of the developing trends. In tables 22-24, estimates of DMF teeth in young

adults aged 18-34 years are singled out for closer attention. If the same pattern prevails here as in the population as a whole, it will suggest that DMF differentials arise at least in part from variations in susceptibility to dental decay.

In table 22 it will be noted that the trends by sex and race have gained an early but firm foothold. Young women already have slightly more DMF teeth than men of the same race, and white adults have many more than Negro adults. Also in effect in the white population (tables 23 and 24) are the trends by income and education, with DMF counts increasing generally with rising family income and strikingly with improving education. For example, white men who had completed less than 5 years of school averaged about 8 DMF units per person, but those who had completed 1 year or more of college had twice as many.

The differences in the number of DMF teeth by income and education occur largely because of the variation in numbers of filled teeth. On the other hand, comparatively little difference in the number of missing teeth is associated with any of the variables. Decayed teeth, which vary only slightly by sex, decline in number with increasing income and education. As in the entire white adult population, trends in the number of missing and decayed teeth are not sufficiently strong to overtake the opposing trend in filled teeth.

If trends in DMF teeth among adults do reflect variations in susceptibility to decay, and it appears that they indeed do, the question next in turn is why these variations follow certain lines of demographic distribution. It must not be overlooked that even the increments in DMF teeth which occur with age are less clear and simple than they might seem; they reflect, for example, not only length of exposure to disease but, in addition, whatever variation happens in the degree of relative immunity or susceptibility possessed by individuals. In short, the true source of the numerical variation in DMF teeth among younger adults must be sought among the bewilderingly numerous elements at interplay in the disease process that causes decay. These factors, intricately linked with diet, tooth susceptibility, and the action of oral bacteria, occur on a plane where the survey has little or no information to bring to bear in disclosing them.

SUMMARY

The widespread prevalence of dental disease in the U.S. population at large is nowhere more clearly revealed than in the number of decayed, missing, and filled teeth enumerated among adults. While nearly 20 million men and women no longer possessed any natural teeth, approximately 91 million others had an estimated 17.9 DMF teeth per person—a total consisting of 1.4 decayed, 9.4 missing, and 7.0 filled teeth.

National estimates of decayed, missing, and filled (DMF) teeth are based on the examination in 1960-62 of a probability sample comprising 6,672 persons from the civilian, noninstitutional U.S. population 18-79 years of age. The estimates presented here include only the 91 million men and women who, owing to the presence of at least one natural tooth, continued at risk to tooth loss.

DMF teeth accumulated rapidly with advancing age. From a low of 13.4 and 14.1 among the youngest men and women, respectively, mean counts increased within each successive age group until they reached approximately 25 per person for both men and women aged 75-79 years. The trend with age resulted from an unremitting loss of teeth. By contrast, decayed teeth slowly dwindled in number, as did filled teeth after they reached a maximum of about 8 per person among adults 25-44 years of age.

Proportionately half again as many DMF teeth were counted among white adults as among Negro adults, with an average per person of 18.7 and 12.2, respectively. White adults had, on the one hand, many more filled and slightly more missing teeth but, on the other, fewer decayed ones. Throughout the comparison by race, DMF counts were consistently higher for women than for men of the same race and for white men and women than for Negro men and women.

The number of DMF teeth was significantly related to family income and education. Men and women with greater means or higher schooling usually had more DMF teeth than poorer persons or persons with less education. The trends by income and education were more pronounced in the white than in the Negro population; and among persons whose income or education was the same, women had more DMF teeth than men and white adults had sharply more than Negroes.

DMF teeth also were found to vary in number by place of residence. For instance, white and Negro men and women living in the Northeast had more DMF teeth than those living elsewhere; by contrast, those in the South had fewer. Among the white population, residents of more densely populated areas usually had higher counts' than men and women residing in less dense areas.

Variations in the number of DMF teeth by sex, race, education, and income prevailed not only in the adult population as a whole but also in younger adults aged 18-34 years among whom such variation signifies a difference in the rate at which their teeth have been attacked by decay. Thus, it appears that women are slightly more prone to dental decay than men, persons with higher income or education more prone than poorer or less schooled persons, and white adults substantially more prone than Negro adults. In sum, a variance in the attack rate of dental decay appears to be at least partly responsible for demographic variations in the number of DMF teeth observed in the adult population of the United States.

REFERENCES

[1]National Center for Health Statistics: Selected dental findings in adults by age, race, and sex. *Vital and Health Statistics*. PHS Pub. No. 1000-Series 11-No. 7. Public Health Service. Washington. U.S. Government Printing Office, Feb. 1965.

[2]American Dental Association, Bureau of Economics and Statistics: Survey of needs for dental care, II, dental needs according to age and sex of patients. *J.Am.Dent.A.* 46:200, Feb. 1953.

[3]National Center for Health Statistics: Dental visits, time interval since last visit. *Vital and Health Statistics*. PHS Pub. No. 1000-Series 10-No. 29. Public Health Service. Washington. U.S. Government Printing Office, Apr. 1966.

[4]Hollander, F., and Dunning, J. M.: A study by age and sex of the incidence of dental caries in over 12,000 persons. *J.Dent.Res.* 18:43-60, Feb. 1939.

[5]Commission on Chronic Illness: *Chronic Illness in the United States*, Vol. IV, *Chronic Illness in a Large City*. Cambridge, Mass. Harvard University Press, 1957. ch. 5.

[6]National Center for Health Statistics: Plan and initial program of the Health Examination Survey. *Vital and Health Statistics*. PHS Pub. No. 1000-Series 1-No. 4. Public Health Service. Washington. U.S. Government Printing Office, July 1965.

[7]National Center for Health Statistics: Cycle I of the Health Examination Survey, sample and response. *Vital and Health Statistics*. PHS Pub. No. 1000-Series 11-No. 1. Public Health Service. Washington. U.S. Government Printing Office, Apr. 1964.

[8]National Center for Health Statistics. Periodontal disease in adults. *Vital and Health Statistics*. PHS Pub. No. 1000-Series 11-No. 12. Public Health Service. Washington. U.S. Government Printing Office, Nov. 1965.

[9]U.S. National Health Survey: Loss of teeth. *Health Statistics*. PHS Pub. No. 584-B22. Public Health Service. Washington. U.S. Government Printing Office, Sept. 1960.

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DETAILED TABLES

Table 1. Number of dentulous men and women, by number of decayed, missing, and filled (DMF) teeth: United States, 1960-62

Number of decayed, missing, and filled teeth	Men	Women	Number of decayed, missing, and filled teeth	Men	Women
	Number in thousands			Number in thousands	
Total---------------------------	43,933	46,763	16--------------------------	2,116	1,879
			17--------------------------	1,880	2,028
0------------------------------------	331	234	18--------------------------	1,836	2,148
1------------------------------------	380	333	19--------------------------	1,932	2,212
2------------------------------------	480	265	20--------------------------	1,769	2,344
3------------------------------------	949	434	21--------------------------	1,968	2,139
4------------------------------------	834	1,008	22--------------------------	1,897	1,859
5------------------------------------	838	732	23--------------------------	1,878	2,382
6------------------------------------	968	835	24--------------------------	2,227	2,675
7------------------------------------	1,093	842	25--------------------------	1,811	2,795
8------------------------------------	978	1,007	26--------------------------	1,714	2,604
9------------------------------------	1,320	1,203	27--------------------------	1,249	1,928
10-----------------------------------	1,652	1,237	28--------------------------	1,030	1,568
11-----------------------------------	1,508	1,207	29--------------------------	950	767
12-----------------------------------	1,504	1,372	30--------------------------	597	626
13-----------------------------------	1,741	1,358	31--------------------------	513	547
14-----------------------------------	1,552	1,500	32--------------------------	833	858
15-----------------------------------	1,625	1,840			

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 2. Number of dentulous men and women, by number of decayed teeth: United States, 1960-62

Number of decayed teeth	Men	Women	Number of decayed teeth	Men	Women
	Number in thousands			Number in thousands	
Total-----------------------	43,952	46,759	16------------------------	23	14
			17------------------------	10	11
0-------------------------------	22,046	24,984	18------------------------	-	-
1-------------------------------	7,963	8,020	19------------------------	-	-
2-------------------------------	4,421	4,913	20------------------------	-	31
3-------------------------------	3,118	2,788	21------------------------	-	-
4-------------------------------	1,897	1,833	22------------------------	-	15
5-------------------------------	1,460	1,348	23------------------------	-	-
6-------------------------------	893	899	24------------------------	-	-
7-------------------------------	699	626	25------------------------	-	-
8-------------------------------	548	493	26------------------------	-	-
9-------------------------------	388	268	27------------------------	-	-
10------------------------------	197	186	28------------------------	-	-
11------------------------------	115	95	29------------------------	-	-
12------------------------------	63	68	30------------------------	-	-
13------------------------------	41	75	31------------------------	-	-
14------------------------------	56	26	32------------------------	-	-
15------------------------------	14	66			

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 3. Number of dentulous men and women, by number of missing teeth: United States, 1960-62

Number of missing teeth	Men	Women	Number of missing teeth	Men	Women
	Number in thousands			Number in thousands	
Total--------------------------	43,954	46,760	16--------------------------	686	709
			17--------------------------	667	619
0--------------------------------	1,773	1,107	18--------------------------	413	646
1--------------------------------	1,869	1,189	19--------------------------	654	512
2--------------------------------	2,212	2,200	20--------------------------	457	507
3--------------------------------	3,563	2,760	21--------------------------	340	647
4--------------------------------	4,969	6,343	22--------------------------	599	797
5--------------------------------	3,694	4,498	23--------------------------	525	721
6--------------------------------	3,223	3,527	24--------------------------	748	1,208
7--------------------------------	2,797	3,208	25--------------------------	700	886
8--------------------------------	2,444	2,743	26--------------------------	463	1,008
9--------------------------------	2,040	2,030	27--------------------------	361	312
10-------------------------------	2,052	1,927	28--------------------------	266	292
11-------------------------------	1,379	1,444	29--------------------------	268	83
12-------------------------------	1,236	1,488	30--------------------------	229	177
13-------------------------------	1,213	1,178	31--------------------------	292	94
14-------------------------------	732	869	32--------------------------	373	188
15-------------------------------	717	843			

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 4. Number of dentulous men and women, by number of filled teeth: United States, 1960-62

Number of filled teeth	Men	Women	Number of filled teeth	Men	Women
	Number in thousands			Number in thousands	
Total-------------------------	43,950	46,760	16-----------------------	1,003	1,431
			17-----------------------	895	1,281
0-----------------------------	11,261	10,524	18-----------------------	716	1,267
1-----------------------------	2,806	2,993	19-----------------------	656	1,061
2-----------------------------	2,939	2,486	20-----------------------	514	679
3-----------------------------	2,205	2,119	21-----------------------	341	445
4-----------------------------	1,680	1,815	22-----------------------	145	362
5-----------------------------	2,066	1,446	23-----------------------	193	102
6-----------------------------	1,733	2,029	24-----------------------	78	113
7-----------------------------	1,999	1,674	25-----------------------	46	12
8-----------------------------	1,493	1,598	26-----------------------	59	-
9-----------------------------	1,632	1,817	27-----------------------	33	-
10----------------------------	1,877	1,665	28-----------------------	--	-
11----------------------------	1,673	1,921	29-----------------------	--	-
12----------------------------	1,520	2,411	30-----------------------	--	-
13----------------------------	1,577	1,770	31-----------------------	-	-
14----------------------------	1,451	1,948	32-----------------------	--	-
15----------------------------	1,359	1,791			

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 5. Mean number of decayed, missing, and filled teeth among dentulous adults, by sex and age: United States, 1960-62

Sex and age	Total DMF teeth	Decayed	Missing	Filled
Both sexes				
Total, 18-79 years---	17.9	1.4	9.4	7.0
Men				
Total, 18-79 years---	17.2	·1.5	9.2	6.5
18-24 years---	13.4	2.2	4.6	6.6
25-34 years---	15.8	1.8	6.2	7.8
35-44 years---	17.2	1.3	8.1	7.8
45-54 years---	18.0	1.3	10.9	5.8
55-64 years---	20.4	1.1	14.7	4.6
65-74 years---	22.3	0.8	18.1	3.5
75-79 years---	24.4	0.7	21.7	2.0
Women				
Total, 18-79 years---	18.5	1.4	9.6	7.5
18-24 years---	14.1	2.0	5.0	7.2
25-34 years---	17.5	1.6	7.5	8.4
35-44 years---	18.8	1.3	9.2	8.3
45-54 years---	19.6	1.1	11.5	7.0
55-64 years---	21.9	0.8	14.8	6.3
65-74 years---	22.8	0.5	16.8	5.5
75-79 years---	25.0	0.7	20.1	4.3

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. Mean number of decayed, missing, and filled teeth among dentulous white adults, by sex and age: United States, 1960-62

Sex and age	Total DMF teeth	Decayed	Missing	Filled
Both sexes				
Total, 18-79 years---	18.7	1.3	9.6	7.8
Men				
Total, 18-79 years---	18.1	1.5	9.4	7.3
18-24 years--	14.1	2.1	4.7	7.3
25-34 years--	16.8	1.8	6.5	8.5
35-44 years--	18.4	1.3	8.4	8.7
45-54 years--	18.8	1.3	11.0	6.5
55-64 years--	21.5	1.1	15.2	5.2
65-74 years--	22.7	0.7	18.2	3.8
75-79 years--	24.4	0.8	21.5	2.2
Women				
Total, 18-79 years---	19.2	1.2	9.7	8.3
18-24 years--	14.8	1.9	5.0	7.9
25-34 years--	18.4	1.4	7.5	9.5
35-44 years--	19.5	1.1	9.1	9.3
45-54 years--	20.4	1.1	11.5	7.9
55-64 years--	22.5	0.7	14.7	7.1
65-74 years--	23.4	0.6	16.9	6.0
75-79 years--	25.0	0.7	19.2	5.1

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. Mean number of decayed, missing, and filled teeth among dentulous Negro adults, by sex and age: United States, 1960-62

Sex and age	Total DMF teeth	Decayed	Missing	Filled
Both sexes				
Total, 18-79 years	12.2	2.1	8.7	1.5
Men				
Total, 18-79 years	11.3	1.8	8.3	1.2
18-24 years	8.1	2.6	4.7	0.8
25-34 years	8.4	1.9	4.8	1.8
35-44 years	9.2	1.7	6.2	1.3
45-54 years	13.6	1.6	10.8	1.2
55-64 years	15.1	1.6	12.6	1.0
65-74 years	19.0	1.8	16.8	0.3
Women				
Total, 18-79 years	13.0	2.3	9.0	1.7
18-24 years	9.2	3.0	4.6	1.7
25-34 years	12.3	3.2	7.1	2.0
35-44 years	13.8	2.0	9.7	2.2
45-54 years	13.7	1.6	10.5	1.6
55-64 years	16.8	1.3	14.7	0.8
65-74 years	14.6	0.4	13.9	0.2

NOTES: Where categories are not listed for a specific race-sex group, the sample size was too small for reliable estimates to be presented.

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. Mean number of decayed, missing, and filled (DMF) teeth among adults, including edentulous persons, by race, sex, and age: United States, 1960-62

Sex and age	All races	White	Negro
Both sexes			
Total, 18-79 years	20.4	21.2	14.5
Men			
Total, 18-79 years	19.6	20.6	12.9
18-24 years	13.6	14.4	8.3
25-34 years	16.2	17.3	8.4
35-44 years	18.1	19.3	9.4
45-54 years	20.8	21.6	14.9
55-64 years	24.5	25.4	18.4
65-74 years	26.7	26.9	23.7
75-79 years	28.6	28.8	*
Women			
Total, 18-79 years	21.1	21.9	15.7
18-24 years	14.4	15.1	9.2
25-34 years	18.4	19.2	13.6
35-44 years	20.1	20.8	15.1
45-54 years	22.1	22.8	15.8
55-64 years	25.7	26.2	21.2
65-74 years	27.7	27.9	25.2
75-79 years	29.6	29.8	*

NOTES: Where categories are not listed for a specific race-sex group, the sample size was too small for reliable estimates to be presented.

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 9. Actual and expected mean number of decayed, missing, and filled (DMF) teeth among dentulous men and women, by race and family income: United States, 1960-62

Race and family income	Men			Women		
	Actual	Ex-pected	Differ-ence	Actual	Ex-pected	Differ-ence
All races						
Under $2,000--	15.3	18.1	-2.8	15.9	18.8	-2.9
$2,000-$3,999---------------------------------------	15.2	17.3	-2.1	17.2	18.4	-1.2
$4,000-$6,999---------------------------------------	17.2	16.8	0.4	18.9	18.1	0.8
$7,000-$9,999---------------------------------------	18.6	16.9	1.7	19.7	18.4	1.3
$10,000 and over------------------------------------	19.0	17.4	1.6	20.3	18.8	1.5
Unknown---	17.2	17.3	-0.1	18.8	18.9	-0.1
White						
Under $2,000------------------------------------	18.0	19.3	-1.3	18.0	19.6	-1.6
$2,000-$3,999---------------------------------------	16.6	18.1	-1.5	18.0	19.2	-1.2
$4,000-$6,999---------------------------------------	17.8	17.8	0.0	19.3	18.9	0.4
$7,000-$9,999---------------------------------------	18.8	17.9	0.9	19.9	19.2	0.7
$10,000 and over------------------------------------	19.2	18.4	0.8	20.3	19.6	0.7
Unknown---	18.3	18.2	0.1	19.5	19.6	-0.1
Negro						
Under $2,000------------------------------------	12.2	12.2	0.0	12.7	13.4	-0.7
$2,000-$3,999---------------------------------------	10.2	11.2	-1.0	12.8	12.8	0.0
$4,000-$6,999---------------------------------------	10.2	10.3	-0.1	13.5	12.8	0.7

NOTES: Where categories are not listed for a specific race-sex group, the sample size was too small for reliable estimates to be presented.

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 10. Actual and expected mean number of decayed teeth among dentulous men and women, by race and family income: United States, 1960-62

Race and family income	Men			Women		
	Actual	Ex-pected	Differ-ence	Actual	Ex-pected	Differ-ence
All races						
Under $2,000-------------------------------------	1.8	1.4	0.4	1.8	1.3	0.5
$2,000-$3,999------------------------------------	1.9	1.5	0.4	2.0	1.4	0.6
$4,000-$6,999------------------------------------	1.6	1.5	0.1	1.2	1.4	-0.2
$7,000-$9,999------------------------------------	1.1	1.5	-0.4	1.0	1.4	-0.4
$10,000 and over---------------------------------	0.9	1.4	-0.5	0.7	1.3	-0.6
Unknown--	1.6	1.5	0.1	1.5	1.3	0.2
White						
Under $2,000-------------------------------------	1.8	1.3	0.5	1.3	1.2	0.1
$2,000-$3,999------------------------------------	2.0	1.5	0.5	2.0	1.2	0.8
$4,000-$6,999------------------------------------	1.6	1.5	0.1	1.2	1.3	-0.1
$7,000-$9,999------------------------------------	1.1	1.5	-0.4	1.0	1.2	-0.2
$10,000 and over---------------------------------	0.9	1.4	-0.5	0.7	1.2	-0.5
Unknown--	1.6	1.4	0.2	1.3	1.2	0.1
Negro						
Under $2,000-------------------------------------	1.8	1.8	0.0	2.4	2.2	0.2
$2,000-$3,999------------------------------------	1.6	1.8	-0.2	2.1	2.4	-0.3
$4,000-$6,999------------------------------------	1.8	1.9	-0.1	2.0	2.3	-0.3

NOTES: Where categories are not listed for a specific race-sex group, the sample size was too small for reliable estimates to be presented.

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 11. Actual and expected mean number of missing teeth among dentulous men and women, by race and family income: United States, 1960-62

Race and family income	Men			Women		
	Actual	Ex-pected	Differ-ence	Actual	Ex-pected	Differ-ence
All races						
Under $2,000---------------------------------------	11.3	11.0	0.3	10.7	10.4	0.3
$2,000-$3,999-----------------------------------	9.2	9.4	-0.2	10.2	9.7	0.5
$4,000-$6,999-----------------------------------	8.8	8.5	0.3	9.5	9.1	0.4
$7,000-$9,999-----------------------------------	8.7	8.5	0.2	9.3	9.3	0.0
$10,000 and over------- ----------------------	8.0	9.5	-1.5	8.2	10.0	-1.8
Unknown-------------------------------------	10.7	9.6	1.1	10.2	10.4	-0.2
White						
Under $2,000----------------------------------	13.1	12.0	1.1	11.7	10.9	0.8
$2,000-$3,999-----------------------------------	9.7	9.7	0.0	10.4	9.8	0.6
$4,000-$6,999-----------------------------------	9.0	8.8	0.2	9.6	9.1	0.5
$7,000-$9,999-----------------------------------	8.8	8.7	0.1	9.3	9.4	-0.1
$10,000 and over-----------------------------	8.1	9.8	-1.7	8.2	10.0	-1.8
Unknown-------------------------------------	11.0	9.8	1.2	10.1	10.4	-0.3
Negro						
Under $2,000----------------------------------	9.9	9.4	0.5	9.5	9.6	-0.1
$2,000-$3,999-----------------------------------	7.4	8.2	-0.8	9.0	8.6	0.4
$4,000-$6,999-----------------------------------	7.0	7.2	-0.2	8.8	8.7	0.1

NOTES: Where categories are not listed for a specific race-sex group, the sample size was too small for reliable estimates to be presented.

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 12. Actual and expected mean number of filled teeth among dentulous men and women, by race and family income: United States, 1960-62

Race and family income	Men			Women		
	Actual	Ex-pected	Differ-ence	Actual	Ex-pected	Differ-ence
All races						
Under $2,000--	2.3	5.8	-3.5	3.5	7.1	-3.6
$2,000-$3,999--	4.2	6.4	-2.2	5.0	7.4	-2.4
$4,000-$6,999--	6.8	6.8	0.0	8.1	7.6	0.5
$7,000-$9,999--	8.8	6.9	1.9	9.4	7.7	1.7
$10,000 and over-------------------------------------	10.1	6.5	3.6	11.3	7.6	3.7
Unknown--	4.9	6.3	-1.4	7.1	7.2	-0.1
White						
Under $2,000--	3.1	6.1	-3.0	5.0	7.6	-2.6
$2,000-$3,999--	5.0	7.0	-2.0	5.7	8.1	2.4
$4,000-$6,999--	7.2	7.5	-0.3	8.5	8.5	0.0
$7,000-$9,999--	9.0	7.7	1.3	9.6	8.5	1.1
$10,000 and over-------------------------------------	10.3	7.3	3.0	11.5	8.4	3.1
Unknown--	5.6	7.0	-1.4	8.2	8.0	0.2
Negro						
Under $2,000--	0.6	1.1	-0.5	0.8	1.6	-0.8
$2,000-$3,999--	1.3	1.2	0.1	1.8	1.8	0.0
$4,000-$6,999--	1.5	1.3	0.2	2.7	1.8	0.9

NOTES: Where categories are not listed for a specific race-sex group, the sample size was too small for reliable estimates to be presented.

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 13. Actual and expected mean number of decayed, missing, and filled (DMF) teeth among den-
tulous men and women, by race and education: United States, 1960-62

Race and education	Men			Women		
	Actual	Ex-pected	Differ-ence	Actual	Ex-pected	Differ-ence
All races						
Under 5 years--	14.5	18.8	-4.3	15.0	19.8	-4.8
5-8 years--	16.4	18.4	-2.0	17.9	19.5	-1.6
9-12 years--	17.4	16.5	0.9	18.7	18.0	0.7
13 years and over------------------------------	18.3	16.8	1.5	19.3	18.3	1.0
White						
Under 5 years--	16.6	20.0	-3.4	16.0	20.5	-4.5
5-8 years--	17.7	19.4	-1.7	19.1	20.4	-1.3
9-12 years--	18.2	17.5	0.7	19.3	18.8	0.5
13 years and over------------------------------	18.4	17.7	0.7	19.6	19.1	0.5
Negro						
Under 5 years--	13.9	13.8	0.1	13.2	14.7	-1.5
5-8 years--	11.5	11.6	-0.1	12.8	13.7	-0.9
9-12 years--	9.3	9.7	-0.4	12.8	12.1	0.7

NOTES: Where categories are not listed for a specific race-sex group, the sample size was too
small for reliable estimates to be presented.

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 14. Actual and expected mean number of decayed teeth among dentulous men and women, by race and education: United States, 1960-62

Race and education	Men			Women		
	Actual	Ex- pected	Differ- ence	Actual	Ex- pected	Differ- ence
All races						
Under 5 years	1.4	1.3	0.1	2.0	1.1	0.9
5-8 years	1.7	1.3	0.4	1.7	1.2	0.5
9-12 years	1.7	1.6	0.1	1.4	1.4	0.0
13 years and over	0.8	1.5	-0.7	0.7	1.4	-0.7
White						
Under 5 years	1.4	1.2	0.2	1.8	1.0	0.8
5-8 years	1.6	1.2	0.4	1.5	1.0	0.5
9-12 years	1.7	1.5	0.2	1.3	1.3	0.0
13 years and over	0.8	1.5	-0.7	0.6	1.2	-0.6
Negro						
Under 5 years	1.8	1.6	0.2	2.1	1.7	0.4
5-8 years	1.8	1.8	0.0	2.2	2.0	0.2
9-12 years	1.8	2.0	-0.2	2.4	2.6	-0.2

NOTES: Where categories are not listed for a specific race-sex group, the sample size was too small for reliable estimates to be presented.

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 15. Actual and expected mean number of missing teeth among dentulous men and women, by race and education: United States, 1960-62

Race and education	Men			Women		
	Actual	Ex-pected	Differ-ence	Actual	Ex-pected	Differ-ence
All races						
Under 5 years-------------------------------------	12.4	12.0	0.4	11.6	11.7	-0.1
5-8 years---	11.7	11.1	0.6	12.2	11.1	1:1
9-12 years--	8.7	8.1	0.6	9.2	8.9	0.3
13 years and over---------------------------------	6.5	8.4	-1.9	7.4	9.4	-2.0
White						
Under 5 years-------------------------------------	14.4	13.0	1.4	12.3	11.8	0.5
5-8 years---	12.5	11.6	0.9	12.8	11.4	1.4
9-12 years--	9.1	8.4	0.7	9.3	9.0	0.3
13 years and over---------------------------------	6.4	8.6	-2.2	7.4	9.5	-2.1
Negro						
Under 5 years-------------------------------------	11.9	11.1	0.8	10.5	11.6	-1.1
5-8 years---	8.9	8.7	0.2	9.9	10.1	-0.2
9-12 years--	5.7	6.5	-0.8	8.3	7.7	0.6

NOTES: Where categories are not listed for a specific race-sex group, the sample size was too small for reliable estimates to be presented.

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 16. Actual and expected mean number of filled teeth among dentulous men and women, by race and education: United States, 1960-62

Race and education	Men			Women		
	Actual	Ex-pected	Differ-ence	Actual	Ex-pected	Differ-ence
All races						
Under 5 years--------------------------------------	0.7	5.5	-4.8	1.4	7.0	-5.6
5-8 years---	3.1	5.9	-2.8	4.0	7.2	-3.2
9-12 years--	6.9	6.8	0.1	8.1	7.6	0.5
13 years and over---------------------------------	11.0	6.8	4.2	11.2	7.5	3.7
White						
Under 5 years--------------------------------------	0.9	5.8	-4.9	1.9	7.7	-5.8
5-8 years---	3.5	6.5	-3.0	4.7	7.9	-3.2
9-12 years--	7.4	7.6	-0.2	8.7	8.5	0.2
13 years and over---------------------------------	11.2	7.6	3.6	11.6	8.3	3.3
Negro						
Under 5 years--------------------------------------	0.2	1.0	-0.8	0.7	1.4	-0.7
5-8 years---	0.9	1.1	-0.2	0.7	1.6	-0.9
9-12 years--	1.7	1.3	0.4	2.1	1.9	0.2

NOTES: Where categories are not listed for a specific race-sex group, the sample size was too small for reliable estimates to be presented.

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 17. Mean number of decayed, missing, and filled (DMF) teeth among dentulous white and Negro men and women, by family income and education: United States, 1960-62

Family income and education	Men		Women	
	White[1]	Negro	White[1]	Negro
Family income				
Under $2,000	16.3	12.2	16.9	12.7
$2,000-$3,999	16.7	10.2	17.2	12.8
$4,000-$6,999	17.6	10.2	19.3	13.5
Education				
Under 5 years	16.0	13.9	15.9	13.2
5-8 years	16.7	11.5	18.2	12.8
9-12 years	17.7	9.3	18.6	12.8

[1]Value for white population adjusted to be comparable with value for Negro population computation explained in Appendix III.

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 18. Actual and expected mean number of decayed, missing, and filled (DMF) teeth among dentulous men and women, by race and region: United States, 1960-62

Race and region	Men			Women		
	Actual	Ex-pected	Differ-ence	Actual	Ex-pected	Differ-ence
All races						
Northeast---	19.5	17.2	2.3	20.5	18.6	1.9
South--	14.7	17.1	-2.4	15.6	18.2	-2.6
West---	16.7	17.2	-0.5	18.9	18.6	0.3
White						
Northeast---	20.0	18.1	1.9	20.9	19.3	1.6
South--	15.9	18.0	-2.1	16.6	19.0	-2.4
West---	17.6	18.2	-0.6	19.4	19.4	0.0
Negro						
Northeast---	13.4	11.0	2.4	15.1	13.3	1.8
South--	10.8	11.6	-0.8	11.7	13.0	-1.3
West---	10.6	10.9	-0.3	13.7	12.6	1.1

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 19. Actual and expected mean number of decayed, missing, and filled (DMF) teeth among dentulous men and women, by race and place description: United States, 1960-62

Race and place description	Men			Women		
	Actual	Ex-pected	Differ-ence	Actual	Ex-pected	Differ-ence
All races						
SMSA-in central city---------------------------	17.2	17.3	-0.1	18.6	18.6	0.0
SMSA-outside central city----------------------	18.7	17.1	1.6	20.3	18.6	1.7
Urban-not SMSA---------------------------------	16.5	17.0	-0.5	16.3	18.2	-1.9
Rural farm-------------------------------------	14.2	17.6	-3.4	15.6	18.5	-2.9
Rural nonfarm----------------------------------	15.8	17.1	-1.3	17.3	18.3	-1.0
White						
SMSA-in central city---------------------------	18.5	18.2	0.3	19.4	19.4	0.0
SMSA-outside central city----------------------	18.9	18.1	0.8	20.5	19.3	1.2
Urban-not SMSA---------------------------------	17.0	17.9	-0.9	17.3	19.0	-1.7
Rural farm-------------------------------------	15.8	18.7	-2.9	17.1	19.5	-2.4
Rural nonfarm----------------------------------	17.3	18.0	-0.7	18.0	19.0	-1.0
Negro						
SMSA-in central city---------------------------	11.4	11.1	0.3	14.3	13.1	1.2
SMSA-outside central city----------------------	12.7	10.2	2.5	13.1	13.1	0.0
Urban-not SMSA---------------------------------	11.6	12.3	-0.7	9.9	12.8	-2.9
Rural farm-------------------------------------	9.5	10.8	-1.3	10.9	12.1	-1.2
Rural nonfarm----------------------------------	11.1	11.8	-0.7	13.0	13.5	-0.5

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 20. Actual and expected mean number of decayed, missing, and filled (DMF) teeth among dentulous men and women, by race and population-size group: United States, 1960-62

Race and population-size group	Men			Women		
	Actual	Ex-pected	Differ-ence	Actual	Ex-pected	Differ-ence
All races						
Giant metropolitan areas---------------------	18.7	17.4	1.3	20.1	18.7	1.4
Other very large metropolitan areas-----------	18.1	17.2	0.9	19.8	18.5	1.3
Other standard metropolitan statistical areas-	17.2	17.1	0.1	18.5	18.5	0.0
Other urban areas----------------------------	16.0	17.0	-1.0	16.1	18.1	-2.0
Rural areas----------------------------------	15.5	17.2	-1.7	17.1	18.4	-1.3
White						
Giant metropolitan areas---------------------	19.6	18.3	1.3	20.8	19.5	1.3
Other very large metropolitan areas-----------	18.8	18.1	0.7	20.3	19.2	1.1
Other standard metropolitan statistical areas-	17.7	18.0	-0.3	18.9	19.2	-0.3
Other urban areas----------------------------	16.6	17.9	-1.3	17.3	18.9	-1.6
Rural areas----------------------------------	17.4	18.1	-0.7	18.0	19.2	-1.2
Negro						
Giant metropolitan areas---------------------	12.2	10.5	1.7	15.0	13.1	1.9
Other very large metropolitan areas-----------	10.6	10.5	0.1	14.2	13.0	1.2
Other standard metropolitan statistical areas-	11.6	11.9	-0.3	13.2	13.1	0.1
Other urban areas----------------------------	12.7	11.9	0.8	9.7	12.7	-3.0
Rural areas----------------------------------	9.5	11.4	-1.9	13.1	13.1	0.0

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 21. Actual and expected mean number of decayed, missing, and filled (DMF) teeth among dentulous men and women, by race and urban-rural residence: United States, 1960-62

Race and urban-rural residence	Men			Women		
	Actual	Ex-pected	Differ-ence	Actual	Ex-pected	Differ-ence
All races						
Urban--------------------------------------	17.6	17.2	0.4	18.7	18.5	0.2
Rural--------------------------------------	16.3	17.2	-0.9	18.0	18.4	-0.4
White						
Urban--------------------------------------	18.4	18.1	0.3	19.4	19.3	0.1
Rural--------------------------------------	17.4	18.1	-0.7	18.8	19.2	-0.4
Negro						
Urban--------------------------------------	11.6	11.2	0.4	13.3	13.0	0.3
Rural--------------------------------------	10.8	11.4	-0.6	12.4	13.0	-0.6

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 22. Mean number of decayed, missing, and filled (DMF) teeth among dentulous white and Negro men and women 18-34 years of age: United States, 1960-62

Race and sex	Total DMF teeth	Decayed	Missing	Filled
White				
Men--	15.7	1.9	5.7	8.0
Women---	16.8	1.6	6.4	8.8
Negro				
Men--	8.3	2.2	4.7	1.3
Women---	11.0	3.1	6.0	1.9

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 23. Mean number of decayed, missing, and filled teeth among dentulous white men and women 18-34 years of age, by family income: United States, 1960-62

Family income	Men				Women			
	Total DMF teeth	Decayed	Missing	Filled	Total DMF teeth	Decayed	Missing	Filled
Under $2,000-------------------	13.1	3.1	5.0	5.0	13.1	1.6	5.8	5.7
$2,000-$3,999-----------------	14.4	2.4	5.4	6.6	14.7	2.8	6.4	5.4
$4,000-$6,999-----------------	16.0	2.0	6.1	8.0	17.6	1.4	6.9	9.4
$7,000-$9,999-----------------	16.9	1.3	6.1	9.5	18.9	1.2	6.5	11.2
$10,000 and over--------------	16.5	1.4	4.6	10.5	18.5	0.7	6.1	11.7
Unknown----------------------	15.0	2.0	6.0	7.0	15.1	1.8	5.7	7.6

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 24. Mean number of decayed, missing, and filled teeth among dentulous white men and women 18-34 years of age, by education: United States, 1960-62

Education	Men				Women			
	Total DMF teeth	Decayed	Missing	Filled	Total DMF teeth	Decayed	Missing	Filled
Under 5 years------------------	7.6	3.4	3.6	0.6	10.1	2.9	5.2	2.0
5-8 years---------------------	13.6	2.5	7.3	3.8	14.2	2.7	8.3	3.3
9-12 years--------------------	16.2	2.4	6.2	7.6	17.3	1.7	6.7	9.0
13 years and over-------------	16.0	0.9	4.4	10.7	17.3	0.8	4.9	11.5
Unknown-----------------------	12.1	0.5	4.4	7.2	16.5	0.8	6.2	9.6

NOTES: Where categories are not listed for a specific race-sex group, the sample size was too small for reliable estimates to be presented.

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.

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 can obtain their findings on a uniform basis. The dental examination consists of determining the condition of the teeth—i.e., whether a tooth is decayed, missing, or 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.

"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).

Table I. Mean number of tooth status findings by specified categories among dentulous adults, by race: United States, 1960-62

Tooth status	All races	White	Negro
Total—decayed, missing, and filled teeth	17.9	18.7	12.2
Normal	14.1	13.3	19.8
Carious	1.1	0.9	1.9
Filled defective (or tooth both filled and carious)	0.4	0.4	0.1
Nonfunctional—carious	0.4	0.3	1.1
Nonfunctional—loss of supporting structure	0.1	0.1	0.1
Nonfunctional—other	0.0	0.0	0.0
Filled (including crown)	7.0	7.8	1.5
Missing	5.6	5.5	6.2
Missing—space closed	0.4	0.4	0.3
Replaced on fixed bridge or removable partial denture	2.8	3.1	1.0
Replaced defective	0.1	0.1	0.0

NOTE: DMF teeth include all teeth except normal ones.

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 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.

Table I shows the mean number of teeth classified according to the above criteria among dentulous adults in the U.S. population.

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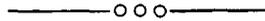
APPENDIX II.

DEMOGRAPHIC TERMS

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

Race—Race is recorded as "white," "Negro," or "other." "Other" includes American Indian, Chinese, Japanese, and so forth. Mexican persons are included with "white" unless definitely known to be Indian or of another nonwhite race.

Population size—The five classes comprising this characteristic 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.[7]

The definitions for each of the five population-size classes are as follows:

Giant metropolitan areas.—This class includes primary sampling units defined in the census as standard metropolitan statistical areas (SMSA's) having a population of 3,000,000 persons or more.

Other very large metropolitan areas.—Included in this class are standard metropolitan statistical areas with a population of 500,000 to 3,000,000 as defined by the 1950 census.

Other standard metropolitan statistical areas.—This class includes other SMSA's.

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

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

Region.—For the purpose of classifying the population by geographic area, the United States was divided into three major regions. This division was especially made for the design of the HES sample. The regions and the States included are 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

Urban and rural.—For the first six primary sampling units where examinations were conducted, the definition of urban and rural is the same as that used in the 1950 census. These locations are Philadelphia, Pa., Valdosta, Ga., Akron, Ohio, Muskegon, Mich., Chicago, Ill., and Butler, Mo. For the remainder of the sampling units the 1960 census definitions are used.

The change from 1950 to 1960 definitions is of small consequence in the survey since only six locations were affected. The major difference is the designation in 1960 of urban towns in New England and of urban townships in New Jersey and Pennsylvania.

According to the 1960 definition, the urban population comprises all persons living in (a) places of 2,500 inhabitants or more incorporated as cities, boroughs, villages, and towns (except towns in New England, New York, and Wisconsin); (b) the densely settled urban fringe, whether incorporated or unincorporated, of urbanized areas; (c) towns in New England and townships in New Jersey and Pennsylvania which contain no incorporated municipalities as subdivisions and have either 25,000 inhabitants or more or a population of 2,500-25,000 and a density of 1,500 persons or more per

square mile; (d) counties in States other than the New England States, New Jersey, and Pennsylvania that have no incorporated municipalities within their boundaries and have a density of 1,500 persons or more per square mile; and (e) unincorporated places of 2,500 inhabitants or more not included in any urban fringe. The remaining population is classified as rural.

Place description.—In this survey the urban population is classified as living "in the central city" or "outside the central city" of an SMSA. The remaining urban population is classified as "not in SMSA."

The definitions and titles of standard metropolitan statistical areas are established by the U.S. Bureau of the Budget with the advice of the Federal Committee on Standard Metropolitan Statistical Areas.

The definition of an individual standard metropolitan statistical area involves two considerations: first, a city or cities of specified population to constitute the central city and to identify the county in which it is located as the central county; and, second, economic and social relationships with contiguous counties which are metropolitan in character so that the periphery of the specific metropolitan area may be determined.

Persons "in the central city" of an SMSA are therefore defined as those whose residency is in the city appearing in the stand and metropolitan statistical area title. Persons residing in an SMSA but not in the city appearing in the SMSA title are considered to be residing "outside the central city."

The remaining population is allocated into rural-farm and rural-nonfarm groups. The farm population includes all persons living in rural territory on places of 10 acres or more from which sales of farm products amounted to $50 or more during the previous 12 months or on places of less than 10 acres from which sales of farm products amounted to $250 or more during the preceding 12 months. Other persons living in rural territory are classified as nonfarm. Persons are also classified as nonfarm if their household paid rent for the house but their rent did not include any land used for farming.

Education.—Each person is 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 is not counted in determining the highest grade of school completed.

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

The income recorded is 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 is included, e.g., wages, salaries, rents from properties, pensions, help from relatives, and so forth..

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APPENDIX III.

STATISTICAL NOTES

The Survey Design

The first cycle of the Health Examination Survey employed a highly stratified multistage probability design in which a sample of the civilian, noninstitutional population of the conterminous United States 18-79 years of age was selected. At the first stage, a sample of 42 primary sampling units (PSU's) was drawn from among the 1,900 geographic units into which the United States was divided. Random selection was controlled within regional and size-of-urban-place strata into which the units were classified. As used here a PSU is a standard metropolitan statistical area or one to three contiguous counties. Later stages result in the random selection of clusters of typically about four persons from a neighborhood within the PSU. The total sample included some 7,700 persons in 29 different States. The detailed structure of the design and the conduct of the survey have been described in previous reports.[6,7]

Reliability

The methodological strength of the survey derives especially from its use of scientific probability sampling techniques and highly standardized and closely con-trolled measurement processes. This does not imply that statistics from the survey are exact or without error. Data from the survey are imperfect for three major 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 processes themselves are inexact even though standardized and controlled.

The first-stage evaluation of the survey was reported in reference 7, which dealt principally with an analysis of the faithfulness with which the sampling design was carried out. This study notes that out of the 7,700 sample persons the 6,672 who were examined—a response rate of over 86 percent—gave evidence that they were a highly representative sample of the civilian, noninstitutional population of the United States. Imputation of nonrespondents was accomplished by attributing to nonexamined persons the characteristics of comparable examined persons as described in reference 7. The specific procedure used amounted to inflating the sampling weight for each examined person in order to compensate for sample persons at that stand of the same age-sex group who were not examined.

There were 6,672 persons who came in for examination. Of these, 19 did not receive a dental examination; and 1,170 did not receive a periodontal score because

Table II. Number of persons examined and number for whom DMF scores were available, by age and sex: Health Examination Survey, 1960-62

Age	Number examined		Number with DMF teeth	
	Men	Women	Men	Women
Total, 18-79 years-----------------------------------	3,091	3,581	2,587	2,896
18-24 years---	411	534	403	524
25-34 years---	675	746	662	697
35-44 years---	703	784	656	702
45-54 years---	547	705	431	552
55-64 years---	418	443	262	267
65-74 years---	265	299	139	132
75-79 years---	72	70	34	22

Table III. Standard errors in mean score of DMF teeth in adults, by race, sex, and age: United States, 1960-62

Sex and age	Total DMF teeth		Decayed		Missing		Filled	
	White	Negro	White	Negro	White	Negro	White	Negro
Both sexes								
Total, 18-79 years--------	0.30	0.31	0.05	0.14	0.23	0.26	0.21	0.16
Men								
Total, 18-79 years--------	0.34	0.45	0.07	0.20	0.26	0.54	0.23	0.25
18-24 years--------------------	0.43	1.05	0.17	0.64	0.24	0.59	0.40	0.46
25-34 years--------------------	0.38	0.92	0.08	0.25	0.31	0.58	0.34	0.54
35-44 years--------------------	0.36	0.85	0.10	0.25	0.39	0.73	0.31	0.33
45-54 years--------------------	0.51	0.99	0.13	0.41	0.42	0.74	0.56	0.53
55-64 years--------------------	0.58	1.51	0.15	0.42	0.73	0.96	0.42	0.49
65-74 years--------------------	0.50	1.90	0.10	0.47	1.10	1.53	0.75	0.19
75-79 years--------------------	1.44	7.59	0.22	0.50	1.85	7.42	1.09	0.17
Women								
Total 18-79 years---------	0.33	0.50	0.06	0.16	0.24	0.54	0.25	0.19
18-24 years--------------------	0.44	1.01	0.14	0.21	0.25	0.56	0.40	0.66
25-34 years--------------------	0.41	1.11	0.12	0.21	0.35	0.82	0.37	0.33
35-44 years--------------------	0.38	0.94	0.11	0.24	0.26	0.95	0.33	0.34
45-54 years--------------------	0.52	0.97	0.10	0.26	0.44	0.79	0.31	0.41
55-64 years--------------------	0.53	1.79	0.09	0.40	0.58	2.31	0.48	0.45
65-74 years--------------------	0.52	2.94	0.09	0.28	0.76	3.02	0.54	0.18
75-79 years--------------------	1.91	8.46	0.23	1.29	1.92	7.66	1.51	-

they were edentulous. Thus a total of 5,483 persons received a DMF score. The distribution of these persons by age and sex is given in table II.

Sampling and Measurement Error

In the present report, reference has been made to efforts to minimize 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 the measurement of all elements in the universe.

The estimation of sampling errors for a study of the type of the Health Examination Survey is difficult for at least three reasons: (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

Table IV. Standard errors in mean scores of DMF teeth in adults by selected characteristics, sex, and race: United States, 1960-62

	Characteristic	Total DMF teeth			
		Men		Women	
		White	Negro	White	Negro
	Family income				
1	Under $2,000	0.89	1.29	0.68	0.67
2	$2,000-$3,999	0.53	1.21	0.54	0.90
3	$4,000-$6,999	0.34	1.25	0.32	1.20
4	$7,000-$9,999	0.56	2.10	0.37	1.12
5	$10,000 or more	0.53	3.74	0.64	3.81
6	Unknown	0.77	1.17	0.69	1.19
	Education				
7	None or under 5 years	1.68	1.49	1.11	1.51
8	5-8 years	0.43	0.83	0.50	0.72
9	9-12 years	0.34	0.75	0.31	0.86
10	13 years or more	0.44	2.10	0.46	1.57
11	Unknown	1.67	1.58	1.74	3.86
	Region				
12	Northeast	0.30	1.15	0.26	1.03
13	South	0.86	0.59	0.89	0.60
14	West	0.42	0.90	0.45	1.04
	Population-size group				
15	Giant metropolitan areas	0.42	1.05	0.28	1.20
16	Other very large metropolitan areas	0.84	1.79	0.60	0.62
17	Other standard metropolitan statistical areas	0.86	1.82	0.80	1.91
18	Other urban areas	1.39	1.06	1.34	1.21
19	Rural areas	1.14	0.76	0.97	1.08
	Place description				
20	SMSA-in central city	0.51	0.43	0.50	0.51
21	SMSA-outside central city	0.40	1.51	0.28	0.82
22	Urban, not SMSA	1.12	2.13	0.77	1.87
23	Rural, farm	1.59	1.65	1.00	1.58
24	Rural, nonfarm	0.89	0.52	0.57	0.68
	Urban-rural residence				
25	Urban	0.45	0.60	0.46	0.62
26	Rural	0.44	0.63	0.46	0.69

Table IV. Standard errors in mean scores of DMF teeth in adults by selected characteristics, sex, and race: United States, 1960-62—Con.

Decayed				Missing				Filled				
Men		Women		Men		Women		Men		Women		
White	Negro	White	Negro	White	Negro	White	Negro	White	Negro	White	Negro	
0.18	0.38	0.15	0.31	0.81	0.98	0.66	0.62	0.52	0.21	0.54	0.15	1
0.19	0.21	0.14	0.29	0.52	0.86	0.45	0.95	0.35	0.48	0.32	0.32	2
0.08	0.38	0.05	0.31	0.30	0.85	0.28	0.93	0.26	0.53	0.26	0.82	3
0.08	0.52	0.10	0.46	0.43	1.98	0.42	1.27	0.42	1.07	0.33	1.03	4
0.11	2.59	0.09	2.33	0.42	3.72	0.41	2.77	0.42	0.52	0.51	0.64	5
0.32	0.38	0.15	0.55	0.70	1.09	0.70	1.13	0.48	0.63	0.38	0.49	6
0.32	0.39	0.22	0.57	1.72	1.57	1.06	1.48	0.32	0.16	0.59	0.25	7
0.12	0.39	0.12	0.28	0.56	0.77	0.52	0.83	0.33	0.22	0.34	0.17	8
0.10	0.39	0.07	0.18	0.31	0.63	0.23	0.82	0.21	0.38	0.23	0.27	9
0.08	0.54	0.09	0.53	0.30	3.27	0.44	1.33	0.37	1.57	0.50	1.06	10
0.21	0.63	0.28	0.81	1.73	1.65	1.95	3.61	1.06	0.24	0.85	0.44	11
*	*	*	*	*	*	*	*	*	*	*	*	12
*	*	*	*	*	*	*	*	*	*	*	*	13
*	*	*	*	*	*	*	*	*	*	*	*	14
*	*	*	*	*	*	*	*	*	*	*	*	15
*	*	*	*	*	*	*	*	*	*	*	*	16
*	*	*	*	*	*	*	*	*	*	*	*	17
*	*	*	*	*	*	*	*	*	*	*	*	18
*	*	*	*	*	*	*	*	*	*	*	*	19
*	*	*	*	*	*	*	*	*	*	*	*	20
*	*	*	*	*	*	*	*	*	*	*	*	21
*	*	*	*	*	*	*	*	*	*	*	*	22
*	*	*	*	*	*	*	*	*	*	*	*	23
*	*	*	*	*	*	*	*	*	*	*	*	24
*	*	*	*	*	*	*	*	*	*	*	*	25
*	*	*	*	*	*	*	*	*	*	*	*	26

complex and, accordingly, require computationally involved techniques for the calculation of variances, and (3) from the survey are coming thousands of statistics, many for subclasses of the population for which there are a small number of sample cases. Estimates of sampling error are obtained from the sample data and are themselves subject to sampling error when the number of cases in a cell is small, or even occasionally, when the number of cases is substantial.

Estimates of approximate sampling variability for selected statistics used in this report are presented in tables III and IV. 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 the measurement variance.

In accordance with usual practice, the interval estimate for any statistic may be considered the range within one standard error of the tabulated statistic, with 68 percent confidence; or the range within two standard errors of the tabulated statistic, with 95 percent confidence.

Expected Values

In tables 8-15 and 17-20 the actual mean DMF teeth and their components for the various demographic variables are compared with the expected. The computation of expected means was done as follows:

Suppose that in an area (say, the Northeast) the Health Examination Survey estimates that there are N_i persons of a particular race in the ith age group $(i = 1, 2 \ldots 7$, sum of $N_i = N)$.

Suppose the Health Examination Survey estimates that the mean DMF level for persons of this particular race for the United States in the ith age group is X_i. Then the expected mean DMF score for this specific race for the area is

$$\frac{1}{N} \sum_i N_i X_i$$

Comparison of an actual value for, say, a region with the expected value for that region is undertaken on the assumption that a meaningful statement can be made which holds in some average way for all persons in the region. This may or may not be true. The specified region may have higher values for younger persons and lower values for older persons than are found in other regions.

In that case an average comparison will obliterate one or both of these differentials. In arriving at the general conclusions expressed in the text, an effort was made to consider all the specific data, including data not included in this report; but it must be recognized that balancing such evidence is a qualitative rather than a quantitative exercise. The standard error of the difference between an actual and an expected value may be approximated by the standard error of the actual table (table III).

In addition to tables 8-15 and 17-20, expected values are computed for figure 5. The computation of D_k, the mean deviation adjusted for education of the mean DMF teeth for sex-income group k, was done as follows:

Let X_{ijk} be the estimated mean DMF teeth for persons in sex-income group k who are in the ith age group and the jth education group. Let n_{ijk} be the estimated number of people in that group.

Let
$$X_{ij} = \frac{\sum_k n_{ijk} X_{ijk}}{\sum_k n_{ijk}}$$

Let
$$n_{jk} = \sum_i n_{ijk}$$

The
$$D_k = \frac{\sum_i n_{jk} d_{jk}}{\sum_i n_{jk}} \quad \text{where}$$

$$d_{jk} = \frac{\sum_i n_{ijk} (X_{ijk} - X_{ij})}{n_{jk}}$$

Adjusted Values

In table 17 the mean DMF teeth for white persons in a specified income or educational group were adjusted to the distribution of the Negroes in the same group. The adjusted mean number for white persons in the kth sex-income or educational group was computed as follows:

Let X_{ik} be the estimated mean DMF teeth for white persons in the sex-income group or sex-education group k who are in the age group i.
Let n_{ik} be the number of Negro persons in that group.
Then
$$X_k = \frac{X_{ik} n_{ik}}{n_k} \quad \text{where} \quad \sum_i n_{ik} = n_k$$

Tests of Significance

Tests of significance for the demographic variables were performed in two ways. The first was to divide the difference between the actual and expected values by the standard error of the actual value. For example, for white men with annual incomes of $2,000-$3,999 the actual number of teeth given a DMF score was 1.5 less than expected, and the standard error was 0.53. Since the difference was approximately three times its standard error, it may be deemed statistically significant.

The second method was to examine the age-specific differences (not published) between the prevalence for the specified and the prevalence for all persons. Thus, for women from rural areas, the mean DMF score for all seven age groups was less than the overall means

Table V. Average number of missing second and third molars per adult, by single years of age from 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

for these age groups. The probability of such an occurrence is 0.01, and the difference between the actual and expected values (which is really a weighted average of the age-specific differences) is 1.22 times its standard error which is not statistically significant.

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 aged 18-34 years by single years of age are shown in table V 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.
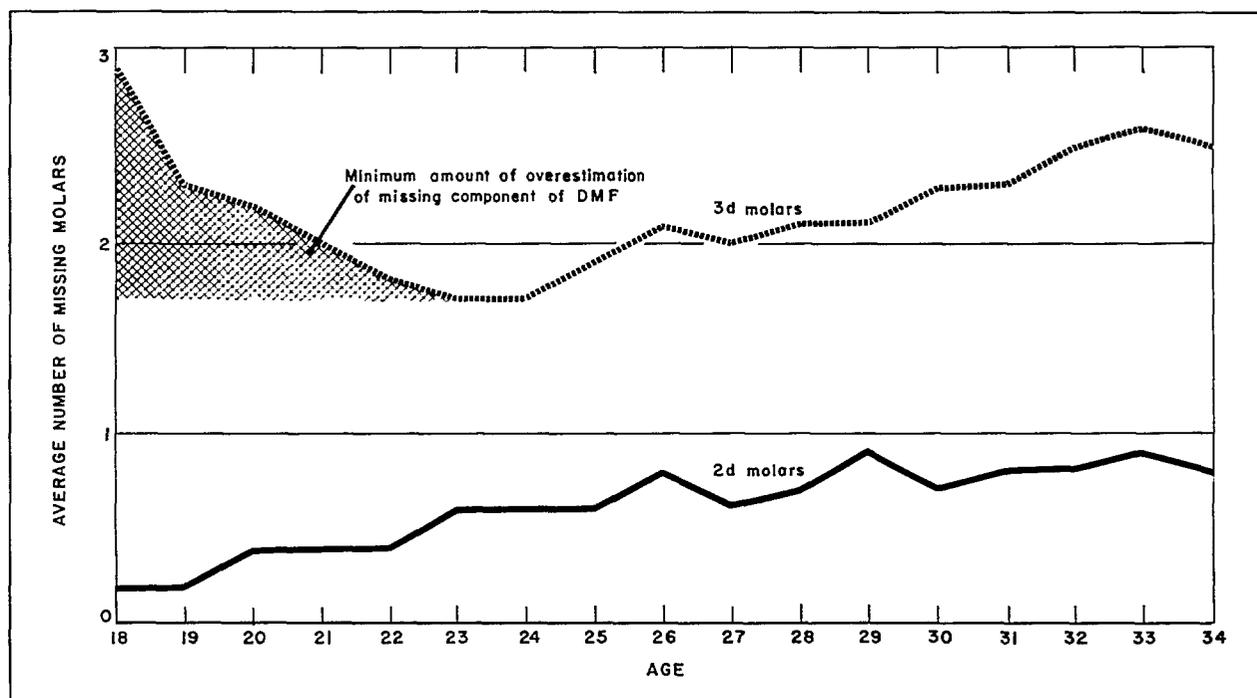

Figure I. Average number of missing second and third molars per adult, by single years of age from ages 18-34 years.

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