Data from the
NATIONAL HEALTH SURVEY

Series 11
Number 162

An Assessment of the Occlusion

of the Teeth of Youths

12–17 Years

United States

Estimates of the distribution of selected major components of occlusion among youths; the prevalence of degrees of malocclusion; the average Treatment Priority Index per youth by age, sex, race, family income, education of head of household, and region of residence; and a brief analysis of the relation of occlusal status with a reported need for orthodontic care.

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DIVISION OF HEALTH EXAMINATION STATISTICS

COOPERATION OF THE BUREAU OF THE CENSUS

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

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CONTENTS

	Page
Acknowledgement	iii
Introduction	1
Findings	2
Components of Occlusion	2
Vertical Overbite or Openbite	2
Overjet of Upper or Lower Incisors	3
Posterior Crossbite	3
Tooth Displacement Score	3
Buccal Segment Relation	5
Treatment Priority Index	5
Distribution of TPI Scores	5
Severity of Malocclusion	5
Malocclusion Syndromes	6
Average TPI Score Associated With Selected Demographic Characteristics	7
Age, Sex, and Race	7
Other Demographic Characteristics	7
Additional Findings	8
Discussion	12
Summary	16
References	18
List of Detailed Tables	19
Appendix I. Assessment of Occlusion and Training of Examiners	49
Procedures for Assessment of Occlusion	49
Calculation of Treatment Priority Index	51
Training Examiners	51
FORTRAN Program for Computing TPI Scores	53
Appendix II. Demographic and Socioeconomic Terms	56
Appendix III. Statistical Notes	57
The Survey Design	57
Reliability	58
Sampling and Measurement Error	59

Page

Expected Values 59
Small Numbers 60
Tests of Significance 60

Appendix IV. The Relation Between TPI Scores and Orthodontists' Ratings of the Severity of Malocclusion 61

SYMBOLS

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

AN ASSESSMENT OF THE OCCLUSION OF THE TEETH OF YOUTHS 12–17 YEARS

James E. Kelly, D.D.S., and Clair R. Harvey, *Division of Health Examination Statistics*

INTRODUCTION

During 1966-70, the Division of Health Examination Statistics conducted a survey that collected information about the health of the U.S. population aged 12-17 years.[1] The survey was the third of a series of Health Examination Survey programs which obtain statistical information about the health of selected segments of the U.S. population. The conduct and operation of the survey of youths were practically the same as those of the two earlier surveys, one of adults aged 18-79[2] and the other of children aged 6-11.[2,3] Physicians, dentists, psychologists, and technicians conducted examinations in mobile examination centers which visited 40 scientifically selected locations in 25 states.

The universe, or target population, from which the sample of youths was drawn totaled approximately 22.7 million (table III, appendix III). It was defined as all noninstitutionalized, civilian youths aged 12-17 years living in the United States (including Alaska and Hawaii) except those on lands reserved for the use of American Indians. A probability sample of approximately 7,500 was selected by a complex scientific procedure so that statistically valid estimates about the health of the Nation's youth could be made.

Each sample youth that participated in the survey received the same examination. As in the earlier survey of children's health, most of the tests and measurements in the survey of youths focused on factors related to biological and psychological aspects of growth and development. A pediatrician examined the nose, eyes, throat, ears, heart, and neuromuscular system of each youth. The teeth and their supporting structures were examined by a dentist, and tests of intellectual development, school achievement, and personality development were administered by a psychologist. The examination also included tests of vision, hearing, exercise tolerance, grip strength, and breathing capacity. Blood pressure levels and electrocardiograms were recorded as well as height, weight, and several other body measurements.

The dental examination was given by seven dentists who were employed at various times during the survey. Teeth were classified as sound, filled, decayed, filled-defective, and nonfunctional-carious. The absence of permanent teeth and the presence of artificial teeth and exposed root remnants were recorded. X-rays of the teeth were not taken. An adjustable examining chair, a standard light source, and a mouth mirror and explorer were used during the examination which usually lasted about 10 minutes.

During the dental examination selected components of the occlusion of the teeth, including their alignment, were either noted or measured and recorded. The procedure for assessing occlusion and the training received by the examining dentists are described in appendix I. Among the recorded variables were the following:

Vertical overbite or openbite
Overjet of the upper or lower incisors
Posterior crossbite
Tooth displacement
Buccal segment relation

At the close of the survey 90.0 percent of the 7,514 sample youths had been examined. With respect to age, sex, race, geographic region, population density, and population growth in area of residence, the examined sample may be regarded as closely representative of the population it was drawn from. It seems quite unlikely, therefore, that nonresponse would appreciably bias estimates based on the findings of the survey.

This report contains estimates of the occurrence and distribution of selected components of the occlusion of the teeth. It includes national estimates of the number of youths with normal occlusion and of the number with various degrees of malocclusion. The relation of occlusal status with age, sex, race, and other selected demographic characteristics is examined, and the relation of occlusal status with a reported need for orthodontic treatment is briefly analyzed.

The Treatment Priority Index (TPI) was used to assess the occlusion of the teeth. Selected major components of occlusion are combined in the TPI to give a single, weighted score indicating the severity of malocclusion present in each youth. As measured by the index, occlusal status may range from virtually ideal occlusion (a score of 0) to very severe malocclusion (a score of 10 or more).

The TPI is an important outgrowth of the research conducted by the Burlington Orthodontic Research Project of the University of Toronto. It was developed to find out whether preventive orthodontic treatment could reduce the prevalence and the severity of malocclusion in children. The proposed TPI was first described in the 1960 annual report of the Burlington Orthodontic Research Centre.[4] Its later development is described in a publication of the National Center for Health Statistics.[5]

All five measurements needed for calculating a TPI score could not be taken on every sample youth's teeth. Sometimes the teeth involved in a measurement, and sometimes those involved in more than one, were missing. At other times none of the measurements could be taken, usually because fixed orthodontic appliances were in the way. If only one TPI component was missing, a value for it was imputed by using the procedure described in appendix III.

The estimated population represented by the sample youths is shown in table III, appendix III, by age, race, and sex. The estimated population is shown in each detailed table when it is less than 22.7 million, which at the midpoint of the survey was the total population of noninstitutionalized, civilian youths aged 12-17.

In the following text the findings for youths are often compared with similar findings for U.S. children aged 6-11. The estimates of the occlusal status of the younger children were based on measurements collected during the sample survey conducted from 1963 through 1965. A report on the assessment of the occlusion of children's teeth was published in 1973.[6]

FINDINGS

Components of Occlusion

Vertical Overbite or Openbite

"Overbite" and "openbite" are terms that describe the vertical relation of the upper incisors with the lower incisors (appendix I). With the upper and lower teeth resting together, vertical overbite is present when the leading, or incisal, edges of the upper anterior teeth overlap those of the opposing lower ones. When that relation is reversed so that the incisal edges of the upper teeth lie above those of the lower ones, openbite is present. The estimates in tables 1 and 2 apply to those youths with fully erupted upper and lower incisors whose vertical relation could be measured.

Only 5.2 percent of the youths have anterior teeth in the openbite relation. An estimated 45.9 percent have overbite measurements of 0-3 mm., which is considered the normal range, and 38.6 percent have measurements of 4-5 mm. Overbites of 6 mm. or more, which may be clinically significant, are present in 10.3 percent of the youths. The numbers of male and female youths with specified overbite and openbite measurements are about the same.

Both the prevalence and the severity of vertical overbite are associated with race. The upper and lower incisors of about 96 percent of the white youths, but of only about 84 percent

of the black youths, are in the overbite relation. Severe overbites (figure 1), those measuring 6 mm. or more, are much more common in white youths (11.7 percent) than in black youths (1.4 percent).

The openbite relation on the other hand is more common in black youths than in white ones—16.2 percent compared with 3.5 percent. Proportionately more black than white youths also have severe openbites (figure 2), which often impair the function of the teeth and adversely affect the youths' appearances. For example, about 10 percent of the black youths, but only about 1 percent of the white youths, have openbites that measure 2 mm. or more.

A small number of youths have upper and lower incisors that meet in an edge-to-edge relation. The anterior vertical relation of their teeth was recorded as being an openbite of 0 and a lower overjet of 0.

Overjet of Upper or Lower Incisors

"Upper overjet" and "lower overjet" are terms that describe the horizontal relation of the upper incisors with the lower incisors (appendix I). With the upper and lower teeth resting together, upper overjet is present when the upper anterior teeth lie in front of the opposing lower ones. When that relation is reversed so that the lower teeth lie in front of the upper teeth, lower overjet is present. Overjet of the upper incisors ranging from 0 to 5 mm. is generally regarded as the normal horizontal relation of the incisors. The estimates in tables 3 and 4 apply to youths with fully erupted upper and lower incisors whose horizontal relation could be measured.

An estimated 82.5 percent of the youths have upper overjets that measure from 0 through 5 mm. About 15 percent have severe upper overjets that measure more than 5 mm. Overjet of the lower incisors is a rare condition occurring in only 2.5 percent of the youths. It is more common in black youths (4.8 percent) than in white youths (2.1 percent), but only about 1 percent of the youths of both races have severe lower overjets—those greater than 1 mm. Both severe upper and lower overjets may impair biting and chewing and seriously affect the appearance of children and adults (figures 3 and 4).

Posterior Crossbite

Approximately 12 percent of the youths have at least one premolar or molar in crossbite to the lingual (toward the tongue) of the opposing lower teeth, and approximately 5 percent have one or more in crossbite to the buccal (toward the cheek). (See tables 5 and 6 and appendix I.) Figure 5 illustrates the lingual crossbite relation.

Tooth Displacement Score

Crooked or malaligned teeth are perhaps the most common sign of malocclusion; when present, they may impair both biting and chewing. Extremely crowded front teeth are usually shoved forward or backward from the normal position and are always unsightly, often disfiguring. Hard to clean and to keep clean, displaced and rotated teeth may be conducive to the onset of gingivitis and periodontal disease.

Because both the degree of malalignment and the number of malaligned teeth may adversely affect one's facial appearance and ability to bite and chew food properly, the estimates in table 7 are not counts of displaced and malaligned teeth but displacement scores. The displacement score is the total number of teeth in minor malalignment plus twice the sum of those in major malalignment (appendix I). A tooth that is in major malalignment is displaced 2 mm. or more, or rotated 45° or more; a tooth in minor malalignment is obviously either displaced or rotated, but it is displaced less than 2 mm. or rotated less than 45°. In the development of the Treatment Priority Index, a tooth displacement score of 4 was assumed to be of critical severity. Figure 6 illustrates the appearance of someone with several badly malaligned teeth.

Approximately 13 percent of the youths have no obviously displaced or rotated teeth (table 7); about 37 percent have tooth displacement scores of 3 or less, and the remaining youths have scores of 4 or more. The scores for white youths are generally higher than those for black youths of the same sex.

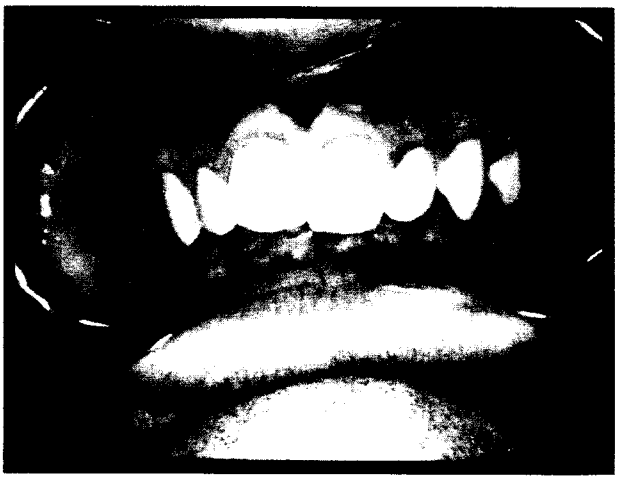

Figure 1. Illustration of vertical overbite.

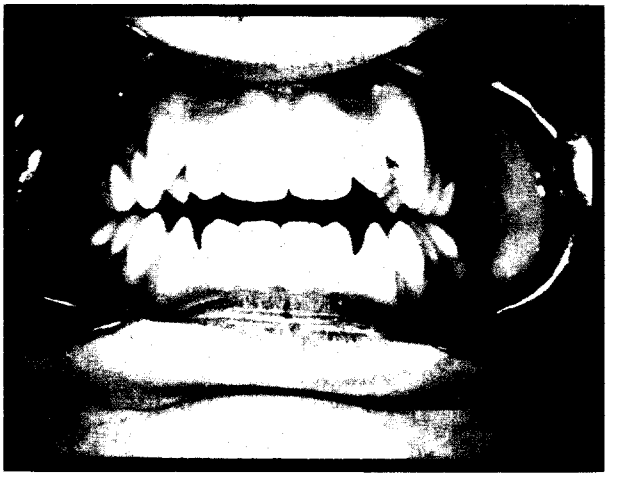

Figure 2. Illustration of anterior openbite.

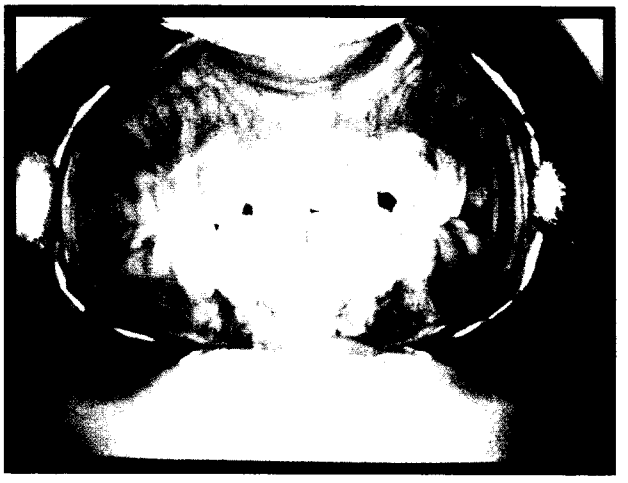

Figure 3. Illustration of overjet of lower front teeth.

Figure 4. Illustration of overjet of upper front teeth.

Figure 5. Illustration of upper posterior teeth in lingual crossbite relationship.

Figure 6. Illustration of malaligned teeth and anterior openbite.

Buccal Segment Relation

Neutroclusion is the normal anteroposterior relation of the upper teeth with the lower. When the lower molars interdigitate with the upper molars in front of the normal position, the relation is called mesioclusion and when they interdigitate behind the normal position, it is called distoclusion (appendix I).

Approximately 53 percent of the youths have neutroclusion, 32 percent distoclusion, 14 percent mesioclusion, and 1 percent an asymmetrical relation (table 8). The buccal segment relation was determined largely by observing the interdigitation of opposing 6-year molars on both the right and left sides of the mouth (appendix I).

The prevalence of the types of buccal segment relation, except the mixed (asymmetrical), varies according to race. About 62 percent of the black youths have neutroclusion as compared with about 52 percent of the white youths. More black youths than white youths are classified as having mesioclusion—18.6 percent as against 13.0 percent. On the other hand, the percentage of white youths (33.6 percent) with distoclusion is significantly larger than the percentage of black youths (18.0 percent) with that relation.

During the present survey as little as a cusp-to-cusp deviation in the relation of the lower buccal segment with the upper one was classified as either mesioclusion or distoclusion, even though the deviation occurred on one side only. If the occlusion of the sample youths had been classified by orthodontists, the results would no doubt have been quite different from those described above. The proportion of youths classified as having mesioclusion seems especially high; for, although 14 percent are classified as having mesioclusion, only 2.5 percent have overjet of the lower incisors.

Treatment Priority Index

Distribution of TPI Scores

Only 11 percent of the estimated 22.3 million youths with TPI scores have zero scores (figure 7, table 9). About 54 percent have scores less than 5, and 16 percent have scores of 10 or more.

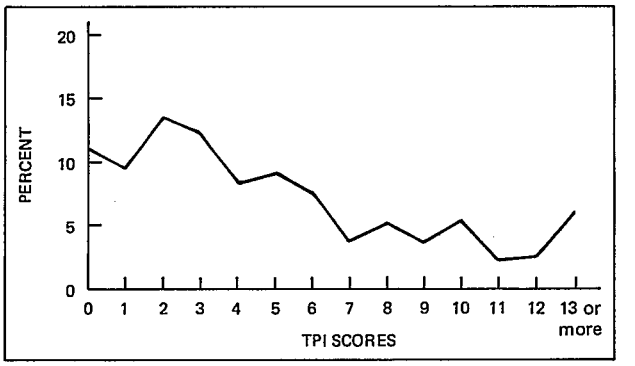

Figure 7. Percent of youths with specified TPI scores: United States, 1966-70.

More black youths (14.7 percent) than white youths (10.5 percent) have zero scores. Differences between the percentages of youths with specified scores are not consistently associated with either race or sex.

The percentages of youths with specified TPI scores are distributed in table 10 according to age and sex. There are no consistent differences in the percentage distribution associated with either age or sex.

Severity of Malocclusion

During the development of the Treatment Priority Index, a scale ranging from 0 (virtually classic normal occlusion) to 10 (very severe malocclusion with treatment mandatory) was arbitrarily selected to express the relative severity of malocclusion occurring in children and youths.[5] The scale was constructed with the assumption that no score, or cutoff point, would unerringly distinguish between children and youths who need orthodontic care and those who do not.

It should be noted that a given TPI score, like the judgment rating of an orthodontist, does not always reflect the same degree of clinical severity, because the weights and constants used to calculate the scores for each major type, or syndrome, of malocclusion are the same. But the clinical interpretation indicated by ranges of the index is much more reliable than individual scores. Furthermore, since the TPI is highly reproducible in the hands of trained examiners, significant differences between the average

scores for large groups of people undoubtedly reflect real differences in their occlusal status.[7]

To establish the scale for classifying children or youths according to their relative need for orthodontic treatment (case severity), six conditions or factors that may be associated with malocclusion, including unacceptable appearance, impaired biting or chewing, and speech defects, were taken into consideration.[5] The clinical interpretation of TPI scores suggested by Grainger is as follows:

Malocclusion severity scale	Interpretation
0	Virtually classic normal occlusion
1-3	Minor manifestations and treatment need is slight
4-6	Definite malocclusion but treatment elective
7-9	Severe handicap, treatment highly desirable
10	Very severe handicap with treatment mandatory

National estimates of the percentage of youths according to case severity are shown by sex and race in table 11. An estimated 11.0 percent are classified as having normal occlusion, and 34.8 percent are classified as having only minor manifestations of malocclusion. An estimated 25.2 percent have definite malocclusion for which treatment is elective. The scores for the remaining youths range from 7 through 10 or higher, with treatment "highly desirable" for 13.0 percent and "mandatory" for an additional 16.0 percent.

Significantly more black youths than white youths have zero scores, as was previously noted. The percentages of black and white youths in the four other ranges of case severity are about the same. The percentage distribution of youths by case severity does not differ consistently according to sex.

In the preceding nationwide survey of the health of U.S. children aged 6-11 years, a higher percentage of the black children (8.2) than of the white children (5.0) were found to have TPI scores of 10 or more. Although the difference was not great, it was statistically significant. Other differences, which have not been mentioned, between the occlusal findings on children and those on youths will be noted later, and what is believed to cause most of them (namely the teeth that erupt at about the age of 12) will be discussed.

Malocclusion Syndromes

Youths are distributed in table 12 according to specified malocclusion syndromes and TPI scores. The syndrome under which each youth's malocclusion is classified is determined by the occlusal component that contributes the greatest weight to his TPI score. When the weighted tooth displacement score is the largest contributor, the youth's malocclusion is classified under one of two syndromes: maxillary expansion if either distoclusion or buccal crossbite is present or maxillary "collapse" if neither distoclusion nor buccal crossbite is present (figure I, appendix I). It is worth noting that this classification by type of syndrome is not a diagnosis of a youth's malocclusion but a rather crude description of the defect involved. The occlusal defects of only those youths with TPI scores of 4.5 or more are classified by type of syndrome.

Maxillary "collapse" is the most prevalent syndrome, occurring in an estimated 4 million youths, and lower overjet is the least prevalent, occurring in only 34,000. The estimated 285,000 youths whose TPI scores have two or more equally high weights are classified as having a "mixed" syndrome.

TPI scores of 10 or more are most highly associated with the lower overjet syndrome and least highly with the maxillary expansion and the upper overjet syndromes. About 91 percent of the youths with the lower overjet syndrome, but only about 24 percent with the maxillary expansion syndrome and 18 percent with the upper overjet syndrome, have scores of 10 or more.

In children 6-11 years old the upper overjet and the overbite types, not the tooth displacement types (maxillary "collapse" and maxillary expansion), were the most common syndromes.

It is believed that this difference between the findings of the two surveys is due to the increased number of teeth that have erupted in the older children.

Fewer youths (34,000) than children (76,000) were found to have malocclusions classified under the lower overjet syndrome. The lower prevalence of that syndrome in youths than in children may perhaps be explained by the fact that children whose lower anterior teeth overjet their upper teeth often seek orthodontic care as early as possible.

Average TPI Score Associated With Selected Demographic Characteristics

Age, Sex, and Race

The average TPI score per person for U.S. youths of all races and both sexes is 5.0 (table 13). The mean scores do not rise with increasing age, nor are there large, consistent differences in the scores associated with either sex or race. The average scores for youths are generally about two points higher than the comparable ones for children 6-11 years old.

Other Demographic Characteristics

Because teeth continue to erupt after age 12, there is reason to believe that tooth displacement scores, and therefore TPI scores, increase as youths grow older. In consequence, actual and expected (age-adjusted) estimates of the average TPI per youth are shown in the remainder of this section. The U.S. population 12-17 years has been classified by family income, education of head of household, and geographic region, and any differences that appeared in the mean TPI per child among various groups were examined. For example, the estimates for white males in families whose income was within one of six income ranges were examined to determine whether the mean TPI score for a given income range differed significantly from those for other ranges. In addition, mean scores per youth for all income ranges were compared to determine whether the TPI trended higher or lower with increasing income. The comparisons were made among youths of the same race and sex, and adjustment was made for differences in the age distribution of the youths within each income and education group and within each geographic region by calculating age-adjusted values.

Expected (age-adjusted) values were calculated by weighting the age-sex-race specific mean TPI per youth for the total U.S. population of youths 12-17 years by the number of youths in that age-sex-race group within specified ranges of income or education. Actual and expected values may differ by chance. But, when the difference between them is statistically significant, one may conclude that the mean TPI of a given sex-race-income group or a sex-race-education group is excessively larger or smaller than the mean of that sex-race group for the United States and that this excess is independent of age.

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

Family income and education of head of household.—The average TPI per person is shown by specified levels of family income in table 14 and by specified levels of the educational attainment of the head of household in table 15. There is no trend in the mean scores associated with levels of either family income or education of the head of household. It will be noticed, however, that the scores for white females from families with yearly incomes of $15,000 or more and for those whose parents or guardians have 17 years of formal education or more are significantly low. The low scores for those two groups are probably due to the relatively large number of persons in them who have had orthodontic treatment, as is reported in the following section "Additional Findings."

Geographic region of residence.—There are no important differences between the average TPI scores for youths associated with geographic region of residence (table 16). The largest difference between comparable scores occurs for black females, with those in the South having a

score of 4.6 and those in the Midwest having a score of 6.0. In the previous survey black girls in the South also had the smallest average score, but those in the Northeast had the largest.

At this point it may be well to comment about the findings just described, because the high percentage of U.S. youths with TPI scores of 7 or more will probably raise questions about the clinical interpretation of the scores. This is especially so in view of the percentage of youths (10.7) who, as is reported in the section "Additional Findings," had been or were under orthodontic treatment at the time of the survey. A study by the New York State Department of Health and another by the National Center for Health Statistics provide information that may help answer many of the questions that arise (appendix IV).

After examining 1,379 casts of the teeth of a broadly representative sample of high school students in upstate New York, 30 orthodontists found that 4.4 percent of the casts were examples of a "very severe handicap for which treatment is mandatory" and that an additional 26.1 percent were examples of a "severe handicap for which treatment is highly desirable." TPI scores for the same 1,379 casts placed 11.3 percent in the highest treatment priority group and 10.2 percent in the next highest group. In the earlier New York study, two orthodontists, who had much more time to arrive at their judgments than the 30 orthodontists in the later study, found that 14.4 percent of the casts, an estimate that was believed to be "cautious," represented severe "handicapping" malocclusion. The study casts included none that were taken after a child's teeth had been straightened.[8]

Diagnostic standards for dental as well as for medical conditions are based on the best judgment of experts selected from the relevant fields or specialties of those professions. At least to a certain extent, the standards that are adopted are often arbitrary. Only too often the eventual effects of not treating a condition, unless its signs and symptoms are quite obvious, are not well known; here, too, the experience and insight of experts must be relied upon in establishing norms for clinical practice.

The TPI was designed to reflect the clinical judgment of qualified practitioners of orthodontics, a specialty of dental practice. The data cited above and in appendix IV bear witness that the index does by and large what it is meant to do and that, all considered, it provides a practical, economical, and acceptably accurate means of *screening* large populations for severe cases of malocclusion. Anyone, who for reasons of his own finds it desirable to choose a higher or lower cutoff score than 7 to decide whose teeth may need to be straightened and whose may not, can of course do so. The provision of that option is another valuable feature of the TPI.

Finally, it is worthwhile to note that classification by the TPI should never be considered an adequate substitute for an orthodontic diagnosis. For one thing, the TPI takes into account only the relation of the teeth with one another. An orthodontic diagnosis, however, also takes into account facial proportions and the relation of the teeth with the underlying bone, both of which are important in arriving at an accurate diagnosis and in deciding what treatment, if any, is indicated for particular cases. In short, the appropriate use of the TPI is in epidemiological studies, whereas that of the orthodontic diagnosis is in clinical practice.

ADDITIONAL FINDINGS

Additional information about the health of the sample youths was collected by self-administered questionnaires, including one that was filled out by the youths' parents and another by the youths themselves. The questionnaire for the parents, Medical History of Youth, was left in each household that contained a sample youth. The questionnaire for the youths, Health Habits and History, was answered while the youths were in the examination center. Members of the survey staff reviewed the answers on each questionnaire, making certain that all applicable questions had been fully answered and that the responses on it were consistent with one another.

Information from the parents.—The following

questions were included on the questionnaire answered by the parents:

Have his (her) teeth been straightened or have bands been put on them?

☐ Yes ☐ No

If no:

a. Do you think they need straightening?
☐ Yes ☐ No

b. Has a dentist said they need straightening?
☐ Yes ☐ No ☐ Don't know

On the basis of the parents' responses, it is estimated that 10.7 percent of the youths, 2.4 million in all, have had orthodontic treatment (table 17). The percentage that have ever had their teeth straightened increases steadily with advancing age, rising from 7.4 percent of those 12 years old to 13.3 percent of those 17 years old. More girls (11.8 percent) than boys (9.6 percent) have been under orthodontic treatment at one time or other.

About 12 percent of the youths that have not had orthodontic treatment were reported by their parents to need it (table 18). More white females (13.3 percent) than white males (10.9 percent), black females (9.7 percent), or black males (9.3 percent) were reported to need their teeth straightened.

The percentages of youths reported to need orthodontic treatment are shown by race and family income in table 19. The estimates show no trend associated with increasing family income for either white or black youths.

The parents of only 7.0 percent of the youths reported that dentists have said their children's teeth need to be straightened. But more than half of the parents who think their children's teeth need to be straightened reported that dentists have said so (table A). The percentages of youths whose teeth need to be straightened, according to their parents, and whose parents answered "yes" when asked "Has a dentist said they need straightening?" do not differ significantly according to the sex of the youths.

Only about 1 percent of the youths whose teeth according to their parents do not need to be straightened have been told otherwise by dentists. The percentages of youths so reported do not differ according to sex (table B).

Table 20 shows the average TPI score per person for youths whose teeth have not been straightened according to whether or not their parents reported that they need to be straightened and by sex and race. The average TPI for youths of all races and both sexes with a reported need for straightening (8.2) is significantly higher than that (4.7) for other youths of comparable sex and race. The differences between the average TPI scores for those reportedly needing straightening and those reportedly not needing it are about the same for all other comparable sex-race groups.

Table 21 shows the average TPI scores per person for youths whose teeth have not been straightened according to whether or not dentists have ever said they need to be straightened and by sex and race. The estimates are about the

Table A. Percent distribution of youths aged 12-17 years whose teeth need straightening (according to parents), by whether or not dentists said so, according to sex

Sex	Yes	No	Not reported	Yes	No	Not reported
	Percent distribution			Standard errors		
Both sexes	54.5	44.4	1.1	2.55	2.64	0.39
Male	55.8	42.5	1.7	3.73	3.76	0.69
Female	53.5	46.0	0.5	2.70	2.73	0.36

Table B. Percent distribution of youths aged 12-17 years whose teeth do not need straightening (according to parents), by whether or not dentists have said so, according to sex

Sex	Yes	No	Not reported	Yes	No	Not reported
	Percent distribution			Standard errors		
Both sexes	0.7	99.2	0.1	0.10	0.11	0.05
Male	0.8	99.1	0.1	0.16	0.19	0.06
Female	0.6	99.2	0.2	0.17	0.18	0.07

same as the corresponding ones in table 20. The average scores for white girls reported by their parents to need their teeth straightened (7.6) and for those who have been told by dentists that their teeth need to be straightened (7.8) are lower than the corresponding scores for white boys—8.9 and 9.5, respectively. This suggests that, when deciding whether or not children and youths need orthodontic treatment, the parents and dentists of white youths have one set of standards in mind for girls and another, a slightly lower one, for boys. On the other hand, apparently neither the parents nor the dentists of black youths make such a distinction.

The average TPI per person for youths whose teeth have been straightened is lower than that for all other youths—4.1 compared with 5.1 (table 22). The same difference occurs for all sex-race groups except black females, where the sampling variability is especially large. If, as would seem likely, the TPI scores of youths who have had orthodontic treatment were about the same before they were treated as those of the youths who have not had treatment but are thought to need it, the average decrease in TPI scores following treatment (about 4 points) is convincing evidence of the effectiveness of orthodontic correction.

Information from the youths.—The following question was included on the questionnaire answered by the sample youths:

Do you think your teeth need straightening?
☐ Yes ☐ No ☐ Don't know

The estimates based on the answers to it are shown in table 23. About 18 percent of the youths whose teeth have not been straightened answered "yes." This is a fairly large increase over the percentage that parents think need orthodontic treatment. The percentages of both boys and girls that think so are about the same. The estimates show no consistent differences associated with age, nor is there a significant difference between the percentages of white and black youths that think their own teeth need to be straightened (table C).

As shown in table D, the scores for the youths who answered "yes" are lower than the ones for the youths whose parents or dentists reported a need for straightening but, like the other scores, they are within the 7-9 range, which is interpreted as "Severe handicap, treatment highly desirable." This indicates that, speaking generally, youths and their parents are not bad judges of whether or not someone needs orthodontic treatment.

The relation of a reported need for orthodontic treatment with ranges of TPI scores.—The estimates in table E are the percentages of youths of all races whose teeth were reported to need straightening by parents, dentists, or the youths themselves, according to ranges of TPI scores. The ranges of scores are those which Grainger found agreed well with the clinical interpretation of TPI scores described earlier in the section "Severity of Malocclusion."

Most youths whose teeth are thought to need straightening by all three groups of respondents are in the two highest treatment priority classifications, 7-9 and 10 or more. An estimated 54.0 percent of those who think their own teeth need to be straightened and 59.0 percent of those reported by their parents to need their teeth

Table C. Percent distribution of youths aged 12-17 by whether or not their teeth need to be straightened (self-reported need), according to race and sex, with standard errors: United States, 1966-70

Race and sex	Self-reported need for tooth straightening					
	Yes	No	Don't know	Yes	No	Don't know
	Percent distribution			Standard errors		
White						
Both sexes	18.0	74.5	7.5	0.47	0.73	0.42
Male	17.6	75.3	7.1	0.55	0.90	0.53
Female	18.3	73.6	8.1	0.90	1.05	0.62
Black						
Both sexes	20.9	7.02	8.9	1.44	2.07	1.48
Male	20.3	71.0	8.7	1.48	1.94	1.19
Female	21.5	69.5	9.0	2.24	2.74	2.17

Table D. Average Treatment Priority Index (TPI) per person for youths aged 12-17, by whether or not their teeth need to be straightened (self-reported need), race, and sex, with standard errors: United States, 1966-70

Race and sex	Do you think your teeth need straightening?					
	Yes	No	Don't know	Yes	No	Don't know
	Average TPI scores			Standard errors		
All races						
Both sexes	7.7	4.4	6.0	0.24	0.15	0.31
White						
Both sexes	7.7	4.5	6.2	0.30	0.18	0.36
Male	8.1	4.6	5.9	0.34	0.17	0.36
Female	7.3	4.4	6.4	0.33	0.21	0.52
Black						
Both sexes	7.6	4.0	5.3	0.43	0.16	0.62
Male	7.6	3.8	4.5	0.71	0.25	0.60
Female	7.6	4.2	6.0	0.44	0.24	0.84

Table E. Percent distribution of youths aged 12-17 years by Treatment Priority Index (TPI), according to who reported need for youths' teeth to be straightened, with standard errors: United States, 1966-70

Need for straightening reported by:	Total	Treatment Priority Index Range									
		0	1-3	4-6	7-9	10 or more	0	1-3	4-6	7-9	10 or more
		Percent distribution					Standard errors				
Parents	100.0	1.8	16.4	22.8	22.9	36.1	0.44	1.77	2.26	1.63	3.11
Dentists	100.0	1.6	13.4	21.5	23.8	39.7	0.51	2.26	1.85	2.03	3.40
Youths	100.0	2.4	20.1	23.5	20.1	33.9	0.49	1.35	1.68	1.13	2.35

straightened have scores of 7 or more. The best agreement between high scores and a reported need for orthodontic treatment is, as would be expected, for youths whose teeth dentists have said need to be straightened. In that group 63.5 percent have scores of 7 or more (table E).

A high percentage of the youths reported by either their parents or themselves as not needing orthodontic treatment are in the lower treatment priority groups—0, 1-3, and 4-6. Of the youths who according to their parents do not need orthodontic treatment, 74.1 percent have scores ranging from 0 through 6, and of those who think their own teeth do not need to be straightened 76.7 percent have scores in the same range.

DISCUSSION

The conditions generally classified as malocclusion occur when various relations of the teeth either deviate from the norms or are in disharmony with one another. The occlusion and alignment of teeth range from what is considered optimal to very severe dislocations or disharmonies that anyone would confidently classify as malocclusion. But between those extremes there is a broad, ill-defined area of occlusal variations where arbitrary judgments must be made in deciding how severe an occlusal defect may be before it ought to be corrected.

Table F contains estimates of the number and percentage of youths with occlusal defects that were singled out because their nature or severity probably indicates a need for treatment. It seems reasonable to believe that the 10.2 million youths (about 1 in every 2) with the listed defects need at the least further orthodontic evaluation and that a substantial number would be considered by orthodontists as well as by the youths themselves to need treatment. The same youths may be included in more than one category.

Some of the estimated 201,000 that have impinging bites urgently need attention. This condition occurs when the lower incisors make contact with or bite into the soft tissue of the palate. Impinging bites in youths 12-17 years can be corrected only by orthodontic treatment. Like the other conditions in the list, they may interfere with biting or chewing. (NOTE.—The number of youths with impinging bites is probably underestimated. Because the front part of the palate is hard to see when the teeth are closed together, it is often hard to determine whether the lower teeth actually touch the palate or only seem to touch it, and, when in doubt, the examining dentist was instructed not to record an impinging bite as being present. Many of the estimated 201,000 youths for whom impinging bites were recorded had indentations on their palates caused by the lower teeth and some had either inflamed or bleeding palatal mucosa.)

Several differences between the estimates in this report and those in the earlier one about the occlusion of children aged 6-11 have already

Table F. Number and percent of youths aged 12-17 and children aged 6-11 with high priority for orthodontic treatment, by specified malocclusion findings and race: United States, 1966-70 and 1963-65

Finding and race	Youths 12-17 years		Children 6-11 years	
	Number in thousands	Percent of those measured	Number in thousands	Percent of those measured
Tissue impingement				
Total[1]	201	0.9	711	4.0
White	192	1.0	697	4.6
Black	9	0.3	31	1.2
Posterior crossbite 4 teeth or more to lingual				
Total[1]	334	1.5	261	1.1
White	268	1.4	224	1.1
Black	54	1.8	55	1.7
Posterior crossbite 4 teeth or more to buccal				
Total[1]	22	0.1	24	0.1
White	19	0.1	20	0.1
Black	3	0.1	–	–
Tooth displacement scores of 7 or more				
Total[1]	7,368	32.5	665	2.8
White	6,544	33.5	571	2.8
Black	776	25.7	52	1.6
TPI scores				
7-9 (severe handicap with treatment highly desirable)				
Total[1]	2,896	13.0	1,542	8.7
White	2,492	13.0	1,314	8.7
Black	365	12.2	221	8.7
TPI scores				
10 or more (very severe handicap with treatment mandatory)				
Total[1]	3,564	16.0	975	5.5
White	3,106	16.2	755	5.0
Black	454	15.2	208	8.2
Overbite 6 mm. or more				
Total[1]	2,281	10.3	1,169	6.6
White	2,230	11.7	1,147	7.6
Black	42	1.4	20	0.8
Openbite 2 mm. or more				
Total[1]	509	2.3	443	2.5
White	229	1.2	211	1.4
Black	300	10.1	244	9.6
Upper overjet 7 mm. or more				
Total[1]	1,783	8.0	1,672	9.4
White	1,611	8.4	1,471	9.7
Black	165	5.5	201	7.9
Lower overjet 1 mm. or more				
Total[1]	201	0.9	142	0.8
White	153	0.8	121	0.8
Black	36	1.2	15	0.6

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

been mentioned. At this point it seems appropriate to pursue the matter further and to suggest what may have caused some of the differences.

The number and percent of youths and of children with specified malocclusion findings are compared in table F. It will be noticed that only one condition, "tissue impingement," is not as common in youths as in children. The lower estimate for youths suggests that many children with impinging bites have orthodontic treatment before age 12.

Many more youths (32.5 percent) than children (2.8 percent) have tooth displacement scores of 7 or more, an increase undoubtedly due in large part to the teeth that erupt as children grow older. For example, 12-year-old boys and girls average 4.0 and 2.8 more teeth, respectively, than 11-year-old children of the same sex; and 13-year-olds average 5.7 and 3.8 more, respectively. Since, in general, the higher the displacement score, the higher the TPI, a greater percentage of youths (29.0) than children (14.2) also have high TPI scores.

Estimates of the prevalence of the remaining occlusal defects differ either not at all or only slightly with age, which indicates that the eruption of teeth after age 11 has little or no effect on them. Then, too, it should be borne in mind that youths who, when younger, had occlusal defects may no longer have them owing to orthodontic treatment.

It is worth additional comment that the percentages of children and youths with openbites of 2 mm. or more are about the same. Longitudinal studies have indicated that openbites in some children tend to improve spontaneously with advancing age. But the nearly equal percentages of children and youths with severe openbites suggest that spontaneous improvement of this defect may not occur as often as some studies have indicated.

In view of the high prevalence of crowded teeth in U.S. children and youths, it might be well to call attention to certain trends that have taken place in the type of dental service children receive and in the number and frequency of dental visits they make. For it seems quite likely that these trends have resulted in an increase in the prevalence of malocclusion due to crowded teeth.

There has been since 1958 only a small increase in the average number of dental visits by children aged 5-14 years—from 1.8 visits per child to 2.0 per child in 1973.[9,10] But of all dental visits by children 5-14 years old, the percentage for fillings declined from 50 in 1958 to 41 in 1964 and to 27 in 1971.[9-11] Over the same period the percentage of visits for extractions showed a smaller decline—from 12 to 9 percent.

As for the trend in the volume and frequency of visits, proportionately more children are visiting their dentists now than before, and proportionately more are visiting them oftener. From 1958 to 1969 the percentage of children 5-14 years old that had never visited a dentist fell from 28 to 18, while the percentage with visits during the past year rose from 48 to 59.[12-13] By 1973 only 15 percent had never visited a dentist, and 63 percent had visited one within the past year.[10]

In short, the trends in dental services and visits strongly suggest that the incidence of tooth decay in children has been steadily falling for the past decade or so, no doubt largely because of the increase in the number of communities that have added fluoride to their water supplies. They further suggest that increasingly more children with decayed teeth have them filled rather than extracted. If this is true, increasingly more have had less room to accommodate the teeth that erupt as they grow older, a result that would increase the prevalence of malocclusion due to crowded teeth.

Whereas the percentage of visits for fillings and extractions has decreased, the percentage for tooth straightening has more than doubled—from 9 percent of all visits in 1958 by children aged 5-14 years to 24 percent of all visits in 1971.[9,10] Thus it seems quite likely that increasingly more children have had their teeth extracted not as a result of decay but as a part of orthodontic treatment—that is, to provide more room for the remaining teeth. Based on the present survey findings, the estimated number of youths 12-17 years that have had "orthodontic extractions" is about 500,000. Comparable estimates for earlier years are not available.

The estimates in this report indicate that there is a high prevalence of malocclusion in

U.S. youths aged 12-17 years. They further indicate that the need for orthodontic treatment is widespread and not exclusively associated with any of the major demographic characteristics used to class the population. It is true for youths as it was for children 6-11 years that severe deviations of some occlusal components such as overbites and openbites are associated with race. But, perhaps more important, the average TPI per person, excepting only that for white girls whose families earn $15,000 or more yearly, does not differ greatly according to age, sex, race, family income, education of head of household, or region of residence. The exception noted for white girls in high-income families is probably due to the large number of them who have had orthodontic treatment.

Previous findings on U.S. adults aged 18-79, U.S. children aged 6-11, and U.S. youths aged 12-17 have shown that the status of dental health is closely associated with certain demographic characteristics, especially family income and educational attainment. For instance, the average number of filled teeth per person increased from a low of 1.6 for youths whose families have yearly incomes of $2,999 or less to a high of 5.4 for those whose families have incomes of $15,000 or more.[14] By contrast, the average number of decayed and missing teeth per person declined from 3.9 for youths in families with the lowest incomes to 1.0 for those in families with the highest. The same trends also prevailed in both adults and children.[15,16]

The estimates in table 24 and figure 8 show the close association that exists between the receipt of orthodontic care and family income. An estimated 107 per 1,000 youths of all income groups were reported to have had their teeth straightened. The number that have had orthodontic treatment increases steadily with rising family income from a low of about 20 per 1,000 of those whose families earn less than $3,000 yearly to a high of about 290 per 1,000 of those whose families earn $15,000 or more. Oddly enough, in families with the highest incomes, the percentage of youths that have had orthodontic treatment is the same as the percentage of all youths classified according to the TPI as having either a "severe handicap, treatment highly desirable" or a "very severe handicap with treatment mandatory."

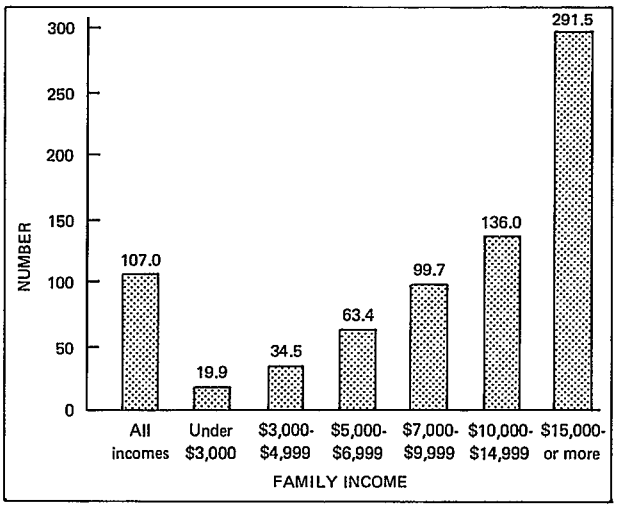

Figure 8. Number per 1,000 youths reported to have had their teeth straightened, by annual family income: United States, 1966-70.

Whether or not the teeth of children 6-11 years old had been straightened was also closely associated with the yearly income of their families.[6]

The cost of orthodontic treatment, compared with that of other dental services, is high because most cases require many visits spread over a period of months or sometimes years. But compared with the lifetime cost of all dental services received by most Americans, orthodontic treatment is not as expensive as it otherwise seems to be. This statement is true because orthodontic services, unlike those for other dental conditions (examinations and X-rays, cleanings, fillings, extractions and the like), are rarely needed more than once during a person's lifetime.

To ease the burden of paying a substantial fee for services all at one time, most orthodontists require only a part of their fees when they begin to treat new patients and the balance in monthly installments during the expected period of treatment. Nevertheless, poor families still cannot afford orthodontic treatment for those of their children who need it, and many middle-income families either cannot, or feel that they cannot, afford it for theirs.

The cost of orthodontic services received by the children of low-income families has undoubtedly been paid largely or wholly by

third-party programs. Most fees for orthodontic treatment, however, are out-of-pocket expenses borne entirely by patients or their families. For example, 1 in 2 of the orthodontists responding to a questionnaire mailed in 1974 by the American Association of Orthodontists (AAO) to its active and associate members indicated that less than 10 percent of his practice was funded by third-party programs, and only 1 in 100 indicated that his practice was funded more than 50 percent by such programs.[17] If significantly more children from poor families are to have the orthodontic treatment they need, funds from third-party programs for orthodontists' fees will have to be greatly increased.

It seems obvious that the cost of orthodontic treatment is not the sole reason why many youths who could benefit from having their teeth straightened do not. Estimates shown earlier indicate that about 1 in 3 youths has a severe malocclusion and that an additional 1 in 5 has an occlusal defect, such as deep anterior overbite, that should be clinically evaluated by an orthodontist to determine whether it ought to be corrected. Yet the parents of only about 1 in 10 think their children's teeth need to be straightened, and only about 1 in 5 youths thinks his own teeth need to be straightened. Many parents and youths are apparently either unaware of the manifestations of malocclusion or else of the benefit of having orthodontic treatment when it is needed. It also seems apparent that many dentists in general practice do not recommend orthodontic consultations for their patients as often as they should.

Are there enough orthodontists in the country to treat all those whose teeth need to be straightened? Not if everyone with malocclusion should seek treatment within a fairly short period—an event that is, of course, not very likely to happen. But the fact of the matter is that recent demand for orthodontic treatment has fallen far short not only of the need for treatment but of the capacity of orthodontists to provide treatment. In response to a question asked during the AAO's 1974 survey of its membership, 39 percent of those responding reported that they "need more work," 56 percent that they were "moderately busy," and only 3 percent that they were "overloaded."

In 1976 approximately 6,450 members of the AAO were living in the United States and practicing orthodontics.[18] An unknown number of other orthodontists, who do not belong to the AAO, also treat orthodontic patients. In addition, some general practitioners and pedodontists provide orthodontic services for their patients, treating perhaps as many as 1 in every 4 orthodontic patients, according to the AAO, in certain sections of the country.[19]

The AAO is deeply concerned about what may well be a growing oversupply of orthodontic specialists. The number entering practice each year ranges between 320 and 350, an increment that far exceeds the number of orthodontists dying or retiring each year. Contributing to the AAO's unfavorable manpower projection is the declining U.S. birth rate, which resulted in an estimated 3.1 million births in 1975 compared with 3.6 million in 1966.[19,20] And unless the demand for orthodontic treatment increases rapidly over the next few years, the AAO's projections on patient load indicate that in 1982 most orthodontists will be working at much less than their full capacity.[17]

SUMMARY

The estimates in this report are based on findings of dental examinations conducted during 1966-70 on 6,768 youths, 90 percent of a probability sample of 7,514 youths representative of approximately 22.7 million noninstitutionalized U.S. youths aged 12-17.

The distribution among youths of several major components of occlusion was presented. The components were:

Vertical overbite or overbite
Overjet of the upper or lower incisors
Posterior crossbite
Tooth displacement
Buccal segment relation

The prevalence and severity of malocclusion, as they are measured by the Treatment Priority Index (TPI), were also estimated. In addition, the average TPI per person was examined to determine whether occlusal status is associated with various demographic characteristics such as age, sex, race, and family income. Finally, the relation of the occlusion of the youths' teeth with a reported need for orthodontic treatment was briefly analyzed.

Among the principal findings are the following:

1. Many more youths have vertical overbites than openbites—94.8 percent as against 5.2. An estimated 10.3 percent have severe overbites measuring 6 mm. or more, and 3.4 percent have severe openbites measuring 1 mm. or more.
2. Most youths, about 98 percent of them, have upper overjets, and about 15 percent have severe overjets measuring 6 mm. or more. The remaining youths have lower overjets, but only about half of them or 0.9 percent of all youths, have severe overjets measuring 1 mm. or more.
3. About 12 percent of the youths have at least one premolar or molar in crossbite to the lingual (toward the tongue) of the opposing lower teeth, and about 5 percent have at least one in crossbite to the buccal (toward the cheek). About 13 percent of the youths have no obviously displaced or rotated teeth; about 38 percent have tooth displacement scores of 3 or less, and the remaining youths have scores of 4 or more.
4. About 54 percent of the youths have neutroclusion, the anteroposterior relation of the upper with the lower back teeth characteristic of normal occlusion. About 32 percent have distoclusion, 14 percent mesioclusion, and 1 percent an asymmetrical relation. Proportionately more black (62 percent) than white youths (52 percent) have neutroclusion and proportionately more (19 percent compared with 13 percent) have mesioclusion. On the other hand, more white (34 percent) than black youths (18 percent) have distoclusion.
5. Consistent differences in the average TPI per youth are not associated with age, sex, race, family income, education of the head of household, or geographic region. But the average scores for white females from families with yearly incomes of $15,000 or more, and for those whose parents or guardians have 17 years of formal education or more, are significantly low.
6. According to classification by the TPI, 11 percent of the youths have normal occlusion, and 35 percent have only minor manifestations of malocclusion. About 25 percent have definite malocclusion for which treatment is considered to be elective. Scores for the remaining youths range from 7 to 10 or more, with treatment "highly desirable" for 13 percent (2.9 million) and "mandatory" for an additional 16 percent (3.6 million). Included among those who urgently need further orthodontic evaluation are 201,000 whose lower front teeth either contact the palate or bite into it.
7. An estimated 10.2 million youths have specified occlusal defects, such as large anterior overbites or openbites, that should be evaluated by orthodontists to determine whether or not treatment is needed. The youths include 201,000 whose lower front teeth contact the palate or bite into it.
8. An estimated 107 per 1,000 youths, 2.4 million in all, have had their teeth straightened. The percentage that have ever had orthodontic treatment increases steadily with age, rising from 7.4 percent of those 12 years old to 13.3 percent of those 17 years old. More girls (11.8 percent) than boys (9.6 percent) have had treatment. The number ever treated is strongly associated with family income, ranging from a low of about 20 per 1,000 of those whose families earn less than $3,000 yearly to a high of about 290 per 1,000 of those whose families earn $15,000 or more.
9. About 12 percent of the youths whose teeth have not been straightened are thought by their parents to need orthodontic treatment. More white females (13.3 percent) than white males (10.9 percent) or black females (9.7 percent) or black males (9.3 percent) are reported to need their teeth straightened. The average TPI per person for youths reported to need their teeth straightened (8.2) is about twice as high as that for comparable youths reported not to need their teeth straightened (4.7). When asked whether they thought their own teeth need to be straightened, an estimated 18 percent of the youths answered "yes."

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LIST OF DETAILED TABLES

Page

Table 1. Number and percent distribution of youths aged 12-17 by specified vertical overbite measurements, according to race and sex, with standard errors of the estimates: United States, 1966-70 21

2. Number and percent distribution of youths aged 12-17 by specified openbite measurements, according to race and sex, with standard errors of the estimates: United States, 1966-70 22

3. Number and percent distribution of youths aged 12-17 by specified upper anterior overjet measurements, according to race and sex, with standard errors of the estimates: United States, 1966-70 23

4. Number and percent distribution of youths aged 12-17 by specified lower anterior overjet measurements, according to race and sex, with standard errors of the estimates: United States, 1966-70 24

5. Number and percent distribution of youths ages 12-17 by specified number of upper posterior teeth in buccal crossbite relation, according to race and sex, with standard errors of the estimates: United States, 1966-70 25

6. Number and percent distribution of youths aged 12-17 by specified number of upper posterior teeth in lingual crossbite relation, according to race and sex, with standard errors of the estimates: United States, 1966-70 26

7. Number and percent distribution of youths aged 12-17 by specified tooth displacement scores, according to race and sex, with standard errors of the estimates: United States, 1966-70 27

8. Number and percent distribution of youths aged 12-17 by specified buccal segment relation, according to race and sex, with standard errors of the estimates: United States, 1966-70 28

9. Number and percent distribution of youths aged 12-17 by specified Treatment Priority Index (TPI), according to race and sex, with standard errors of the estimates: United States, 1966-70 29

10. Number and percent distribution of youths aged 12-17 by specified Treatment Priority Index (TPI), according to age and sex, with standard errors of the estimates: United States, 1966-70 30

11. Number and percent distribution of youths aged 12-17 by specified case severity, according to race and sex, with standard errors of the estimates: United States, 1966-70 32

12. Number and percent distribution of youths aged 12-17 by specified Treatment Priority Index (TPI), according to type of malocclusion syndrome, with standard errors of the estimates: United States, 1966-70 33

13. Average Treatment Priority Index (TPI) per youth, by race, sex, and age, with standard errors of the estimates: United States, 1966-70 34

14. Differences between actual and expected average Treatment Priority Index (TPI) per youth for youths aged 12-17, by sex, race, and annual family income, with standard errors of the estimates: United States, 1966-70 35

15. Differences between actual and expected average Treatment Priority Index (TPI) per youth for youths aged 12-17, by sex, race, and education of the head of household, with standard errors of the estimates: United States, 1966-70 . . . 36

16. Differences between actual and expected average Treatment Priority Index (TPI) per youth for youths aged 12-17, by sex, race, and geographic region, with standard errors of the estimates: United States, 1966-70 37

17. Number and percent distribution of youths aged 12-17 by whether or not it was reported that their teeth have been straightened, according to sex and age, with standard errors of the estimates: United States, 1966-70 38

18. Number and percent distribution of youths aged 12-17 whose teeth have not been straightened by whether or not parents thought the youths' teeth need to be straightened, according to race, sex, and age: United States, 1966-70 39

Page

Table 19. Number and percent distribution of youths aged 12-17 whose teeth have not been straightened by whether or not parents thought the youths' teeth need to be straightened, according to race and annual family income, with standard errors of the estimates: United States, 1966-70 42

20. Number of youths aged 12-17 whose teeth have not been straightened and the average Treatment Priority Index (TPI) per youth, by race, sex, and whether or not parents thought the youths' teeth need to be straightened, with standard errors of the estimates: United States, 1966-70 44

21. Number of youths aged 12-17 whose teeth have not been straightened and the average Treatment Priority Index (TPI) per youth, by race, sex, and whether or not youths have been told by dentists that their teeth need to be straightened, with standard errors of the estimates: United States, 1966-70 45

22. Number of youths aged 12-17 and average Treatment Priority Index (TPI) per youth, by race, sex, and whether or not youths' teeth have been straightened, with standard errors of the estimates: United States, 1966-70 46

23. Number and percent distribution of youths aged 12-17 whose teeth have not been straightened, by whether or not they thought their own teeth need to be straightened, according to sex and age, with standard errors of the estimates: United States, 1966-70 47

24. Number of youths per 1,000 youths aged 12-17 whose teeth have been straightened, by sex and annual family income, with standard errors of the estimates: United States, 1966-70 48

Table 1. Number and percent distribution of youths aged 12-17 by specified vertical overbite measurements, according to race and sex, with standard errors of the estimates: United States, 1966-70

Vertical overbite in mm.	Total[1]			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	22,144	11,175	10,969	19,063	9,648	9,415	2,972	1,467	1,505
	Percent distribution								
All measurements	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Negative	5.2	5.0	5.5	3.5	3.5	3.5	16.3	14.5	18.0
0	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.5	0.6
1	10.8	9.5	12.1	9.5	8.1	10.9	18.7	18.3	19.1
2	14.5	13.6	15.4	13.4	12.4	14.4	22.0	21.8	22.1
3	20.4	20.1	20.8	20.2	19.8	20.7	21.2	21.9	20.5
4	21.6	21.1	22.0	22.9	22.2	23.5	13.2	13.6	12.8
5	17.0	18.3	15.6	18.6	20.0	17.2	6.7	7.2	6.2
6 mm. or more	10.3	12.2	8.4	11.7	13.8	9.6	1.4	2.2	0.7
	Standard errors								
Negative	0.35	0.40	0.51	0.23	0.34	0.42	2.15	2.14	2.68
0	0.08	0.11	0.08	0.07	0.10	0.05	0.35	0.39	0.44
1	0.60	0.69	0.76	0.62	0.68	0.87	1.56	1.70	2.21
2	0.59	0.72	0.78	0.64	0.79	0.82	1.04	1.81	1.94
3	0.56	0.63	0.69	0.63	0.67	0.79	0.97	1.88	1.23
4	0.64	0.77	1.06	0.63	0.78	1.15	1.83	2.65	2.13
5	0.71	0.63	1.01	0.83	0.77	1.21	1.13	1.76	1.16
6 or more	0.65	0.73	0.71	0.77	0.86	0.83	0.34	0.53	0.38

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

NOTE: This table does not include an estimated 149,000 youths with a lower overjet and a lower overbite.

Table 2. Number and percent distribution of youths aged 12-17 by specified openbite measurements, according to race and sex, with standard errors of the estimates: United States, 1966-70

Openbite in mm.	Total[1]			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	22,144	11,175	10,969	19,063	9,648	9,415	2,972	1,467	1,505
	Percent distribution								
All measurements	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Negative	94.8	95.0	94.5	96.5	96.5	96.5	83.8	85.5	82.0
0	1.8	1.7	1.9	1.4	1.3	1.4	3.9	3.4	4.3
1	1.1	1.1	1.1	0.9	1.1	0.8	2.2	1.4	3.0
2	1.2	1.2	1.2	0.7	0.7	0.8	4.4	4.7	4.2
3	0.5	0.4	0.6	0.2	0.2	0.3	2.3	1.9	2.6
4	0.2	0.2	0.3	0.1	0.0	0.1	1.2	1.2	1.3
5	0.2	0.2	0.2	0.1	0.1	0.1	1.1	1.2	1.0
6 or more	0.2	0.2	0.2	0.1	0.1	0.0	1.1	0.7	1.6
	Standard errors								
Negative	0.35	0.40	0.51	0.23	0.34	0.42	2.15	2.14	2.68
0	0.19	0.26	0.23	0.19	0.26	0.29	0.92	1.00	0.98
1	0.11	0.17	0.17	0.12	0.19	0.15	0.41	0.49	0.71
2	0.14	0.18	0.20	0.09	0.12	0.15	0.86	1.17	0.94
3	0.11	0.12	0.16	0.07	0.09	0.10	0.77	0.76	1.00
4	0.04	0.04	0.09	0.03	0.02	0.05	0.34	0.31	0.65
5	0.06	0.09	0.06	0.05	0.05	0.05	0.35	0.55	0.35
6 or more	0.05	0.07	0.08	0.03	0.05	0.03	0.29	0.36	0.58

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

NOTE: This table does not include an estimated 149,000 youths with a lower overjet and a lower overbite.

Table 3. Number and percent distribution of youths aged 12-17 by specified upper anterior overjet measurements, according to race and sex, with standard errors of the estimates: United States, 1966-70

Upper anterior overjet in mm.	Total[1]			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	22,293	11,267	11,026	19,183	9,727	9,456	2,996	1,479	1,517
	Percent distribution								
All measurements	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Negative	2.5	2.7	2.3	2.1	2.3	1.8	4.8	4.7	5.0
0	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.4	0.2
1	3.9	3.4	4.5	3.6	3.0	4.3	5.9	6.0	5.8
2	17.6	16.0	19.3	17.5	15.8	19.2	18.3	16.8	19.8
3	28.6	27.7	29.5	28.9	28.1	29.8	26.2	25.5	7.0
4	20.1	20.6	19.6	20.0	20.1	19.8	20.8	23.3	18.2
5	12.3	13.4	11.1	12.5	13.7	11.2	11.1	11.5	10.8
6	6.9	7.4	6.3	6.9	7.5	6.2	7.1	7.0	7.2
7	3.5	3.7	3.3	3.7	4.1	3.4	2.2	1.6	2.9
8	1.8	1.9	1.8	1.9	2.1	1.8	1.2	0.8	1.5
9	1.1	1.1	1.0	1.1	1.1	1.1	0.9	1.1	0.6
10 or more	1.6	2.0	1.2	1.7	2.1	1.3	1.2	1.3	1.0
	Standard errors								
Negative	0.18	0.28	0.23	0.17	0.25	0.31	1.09	1.39	1.03
0	0.04	0.06	0.05	0.03	0.04	0.05	0.22	0.42	0.17
1	0.31	0.26	0.61	0.31	0.29	0.66	0.91	0.92	1.22
2	0.67	0.61	0.94	0.73	0.73	1.04	0.99	1.59	1.42
3	0.54	0.71	0.55	0.57	0.75	0.59	1.34	1.63	2.20
4	0.50	0.59	0.77	0.49	0.55	0.79	1.47	1.70	2.30
5	0.37	0.59	0.54	0.38	0.63	0.57	0.89	1.22	1.36
6	0.25	0.34	0.45	0.27	0.37	0.51	1.34	1.42	1.46
7	0.22	0.26	0.35	0.26	0.30	0.39	0.43	0.68	0.79
8	0.15	0.18	0.24	0.15	0.20	0.25	0.30	0.37	0.50
9	0.12	0.19	0.18	0.12	0.19	0.20	0.37	0.64	0.38
10 or more	0.10	0.18	0.15	0.11	0.23	0.17	0.27	0.57	0.23

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

NOTE: This table includes an estimated 149,000 youths with a lower overjet and a lower overbite. Lower overbite was not measured (appendix I).

Table 4. Number and percent distribution of youths aged 12-17 by specified lower anterior overjet measurements, according to race and sex, with standard errors of the estimates: United States, 1966-70

Lower anterior overjet in mm.	Total[1]			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	22,293	11,267	11,026	19,183	9,727	9,456	2,996	1,479	1,517
	Percent distribution								
All measurements	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Negative	97.5	97.3	97.7	97.9	97.7	98.2	95.2	95.3	95.0
0	1.6	1.6	1.7	1.3	1.2	1.4	3.5	3.4	3.7
1	0.3	0.3	0.3	0.2	0.3	0.2	0.8	0.5	1.1
2	0.3	0.4	0.2	0.3	0.4	0.1	0.2	0.5	-
3 or more	0.3	0.4	0.1	0.3	0.4	0.1	0.3	0.3	0.2
	Standard errors								
Negative	0.18	0.28	0.23	0.17	0.25	0.31	1.09	1.39	1.03
0	0.18	0.23	0.24	0.18	0.21	0.29	0.90	0.99	0.97
1	0.05	0.07	0.09	0.04	0.06	0.07	0.33	0.29	0.47
2	0.07	0.13	0.08	0.08	0.14	0.08	0.23	0.47	-
3 or more	0.04	0.05	0.07	0.04	0.05	0.07	0.20	0.24	0.18

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

NOTE: This table includes an estimated 149,000 youths with a lower overjet and a lower overbite. Lower overbite was not measured (appendix I).

Table 5. Number and percent distribution of youths aged 12-17 by specified number of upper posterior teeth in buccal crossbite relation, according to race and sex, with standard errors of the estimates: United States, 1966-70

Number of upper posterior teeth in buccal crossbite	Total[1]			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	22,284	11,264	11,020	19,180	9,727	9,453	2,990	1,476	1,514
	Percent distribution								
All measurements	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0	94.9	93.7	96.2	94.7	93.4	96.1	96.1	95.1	97.0
1	3.6	4.1	3.0	3.7	4.2	3.1	2.9	3.1	2.8
2	1.2	1.7	0.6	1.2	1.8	0.6	0.8	1.4	0.2
3	0.2	0.3	0.2	0.2	0.3	0.2	0.1	0.2	-
4	0.1	0.2	0.0	0.2	0.2	0.0	0.1	0.2	-
5	-	-	-	-	-	-	-	-	-
6	0.0	0.0	-	0.0	0.0	-	-	-	-
7 or more	-	0.0	-	0.0	0.0	-	-	-	-
	Standard errors								
0	0.29	0.51	0.31	0.33	0.55	0.38	0.66	1.06	0.44
1	0.30	0.45	0.29	0.32	0.45	0.34	0.55	0.78	0.51
2	0.14	0.29	0.11	0.17	0.33	0.13	0.24	0.50	0.16
3	0.05	0.07	0.08	0.06	0.08	0.10	0.10	0.22	-
4	0.04	0.09	0.03	0.05	0.09	0.04	0.09	0.19	-
5	-	-	-	-	-	-	-	-	-
6	0.01	0.02	-	0.01	0.02	-	-	-	-
7 or more	-	0.01	-	0.01	0.02	-	-	-	-

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

Table 6. Number and percent distribution of youths aged 12-17 by specified number of upper posterior teeth in lingual crossbite relation, according to race and sex, with standard errors of the estimates: United States, 1966-70

Number of upper posterior teeth in lingual crossbite	Total[1]			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	22,284	11,264	11,020	19,180	9,727	9,453	2,991	1,476	1,514
	Percent distribution								
All measurements	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0	88.0	89.1	86.8	88.3	89.3	87.4	85.3	87.7	83.0
1	5.8	6.1	5.7	5.8	6.0	5.5	6.7	6.6	6.7
2	3.2	2.5	4.0	3.1	2.4	3.7	4.4	3.2	5.6
3	1.5	1.1	1.8	1.4	1.1	1.8	1.7	1.1	2.3
4	1.0	0.8	1.3	1.0	0.7	1.2	1.5	1.2	1.7
5	0.2	0.2	0.2	0.2	0.3	0.2	0.1	-	0.2
6	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.2
7 or more	0.1	0.0	0.1	0.0	0.0	0.1	0.1	-	0.3
	Standard errors								
0	0.57	0.67	0.69	0.59	0.71	0.80	1.18	1.82	1.67
1	0.29	0.50	0.32	0.30	0.48	0.39	0.75	1.65	1.21
2	0.23	0.25	0.38	0.26	0.29	0.41	0.51	0.75	0.68
3	0.15	0.17	0.29	0.17	0.22	0.33	0.39	0.32	0.57
4	0.16	0.18	0.21	0.17	0.18	0.25	0.34	0.43	0.52
5	0.07	0.08	0.09	0.08	0.10	0.10	0.09	-	0.18
6	0.06	0.09	0.06	0.06	0.10	0.06	0.14	0.17	0.22
7 or more	0.03	0.02	0.06	0.03	0.02	0.05	0.14	-	0.28

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

Table 7. Number and percent distribution of youths aged 12-17 by specified tooth displacement scores, according to race and sex, with standard errors of the estimates: United States, 1966-70

Tooth displacement scores	Total[1]			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	22,670	11,470	11,200	19,534	9,914	9,620	3,020	1,493	1,527
	Percent distribution								
All measurements	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0	13.4	13.6	13.2	13.0	13.2	12.8	16.0	16.3	15.8
1	5.2	5.2	5.2	5.1	5.1	5.1	5.8	5.9	5.6
2	11.7	12.0	11.3	11.1	11.5	10.8	15.2	15.5	14.9
3	7.2	7.1	7.3	7.1	7.1	7.1	8.0	7.2	8.7
4	11.8	11.9	11.7	11.7	12.0	11.3	12.5	11.0	13.9
5	8.5	9.0	8.1	8.6	8.9	8.4	8.0	9.8	6.3
6	9.7	9.7	9.7	9.8	9.9	9.8	8.7	8.5	8.9
7	6.3	6.4	6.2	6.5	6.5	6.5	4.9	5.5	4.4
8	6.7	6.5	6.9	6.8	6.4	7.2	6.1	6.9	5.2
9	5.1	4.5	5.7	5.3	4.8	5.8	3.2	2.1	4.4
10	4.2	4.3	4.0	4.2	4.3	4.0	4.2	3.7	4.7
11	2.8	2.7	3.0	2.9	2.9	3.0	2.2	2.1	2.4
12 or more	7.4	7.1	7.7	7.8	7.4	8.2	5.1	5.5	4.8
	Standard errors								
0	1.32	1.44	1.39	1.42	1.65	1.52	2.17	3.00	2.23
1	0.36	0.51	0.46	0.40	0.58	0.51	0.81	0.88	1.05
2	0.51	0.65	0.53	0.54	0.70	0.60	0.95	1.83	0.87
3	0.42	0.44	0.60	0.44	0.46	0.67	1.11	1.51	1.00
4	0.49	0.88	0.54	0.51	0.99	0.51	1.10	1.64	1.72
5	0.40	0.53	0.55	0.39	0.49	0.59	1.43	2.33	1.15
6	0.50	0.63	0.53	0.57	0.70	0.61	0.89	1.09	1.50
7	0.37	0.46	0.50	0.38	0.48	0.53	1.10	1.07	1.27
8	0.32	0.44	0.56	0.39	0.50	0.61	0.95	1.80	1.29
9	0.43	0.33	0.69	0.48	0.38	0.76	0.40	0.61	1.01
10	0.30	0.35	0.40	0.32	0.38	0.42	0.67	1.05	0.80
11	0.24	0.32	0.33	0.23	0.36	0.28	0.45	0.51	0.78
12 or more	0.65	0.53	0.94	0.75	0.57	1.10	0.67	0.83	0.91

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

Table 8. Number and percent distribution of youths aged 12-17 by specified buccal segment relation, according to race and sex, with standard errors of the estimates: United States, 1966-70

Buccal segment relation	Total[1]			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	22,284	11,260	11,024	19,180	9,723	9,457	2,990	1,476	1,514
	Percent distribution								
All relations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Neutroclusion[2]	53.5	53.4	53.8	52.2	52.2	52.4	62.4	60.7	64.2
Mesioclusion									
Unilateral	7.5	7.5	7.6	7.0	6.8	7.2	10.9	12.3	9.5
Bilateral	6.3	6.4	6.1	6.0	6.2	5.8	7.7	7.9	7.5
Distoclusion									
Unilateral	17.0	16.8	17.1	17.8	17.3	18.2	12.0	13.6	10.5
Bilateral	14.5	14.6	14.4	15.8	16.2	15.4	6.0	4.1	7.7
Mixed	1.2	1.3	1.0	1.2	1.3	1.0	1.0	1.4	0.6
	Standard errors								
Neutroclusion[2]	0.94	1.33	0.88	0.94	1.28	0.88	2.67	4.25	2.14
Mesioclusion									
Unilateral	0.58	0.52	0.82	0.67	0.61	0.93	0.72	0.97	1.07
Bilateral	0.52	0.55	0.63	0.58	0.63	0.68	1.12	1.47	1.22
Distoclusion									
Unilateral	0.66	0.90	0.63	0.67	0.88	0.70	1.80	2.73	1.25
Bilateral	0.73	0.58	1.11	0.84	0.62	1.25	0.74	1.10	1.20
Mixed	0.15	0.24	0.21	0.17	0.28	0.25	0.13	0.30	0.26

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

[2] Only youths with both right and left buccal segments scored normal are classified as having neutroclusion.

Table 9. Number and percent distribution of youths aged 12-17 by specified Treatment Priority Index (TPI), according to race and sex, with standard errors of the estimates: United States, 1966-70

Treatment Priority Index	Total[1]			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	22,777	11,260	11,017	19,173	9,723	9,450	2,990	1,476	1,514
	Percent distribution								
All TPI	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0	11.0	10.9	11.2	10.5	10.2	10.7	14.7	15.0	14.3
1	9.5	8.8	10.2	9.5	8.7	10.2	9.6	8.9	10.3
2	13.2	13.4	12.9	12.8	13.1	12.5	15.7	15.5	15.8
3	12.2	11.7	12.6	12.3	11.7	12.9	11.6	12.0	11.2
4	8.4	8.8	8.1	8.6	8.9	8.4	7.2	8.6	5.9
5	9.0	8.9	9.2	9.4	9.0	9.8	6.8	8.4	5.2
6	7.7	7.9	7.4	7.7	8.1	7.3	7.0	6.3	7.7
7	3.9	4.1	3.7	3.9	4.0	3.8	3.5	4.0	3.1
8	5.2	4.9	5.5	5.2	4.9	5.4	5.2	5.4	5.0
9	3.9	3.9	3.9	3.9	3.8	4.0	3.5	4.2	2.8
10	5.3	5.4	5.3	5.6	6.0	5.4	3.5	1.9	5.1
11	2.2	2.5	1.9	2.4	2.7	2.0	1.6	1.5	1.6
12	2.4	2.6	2.2	2.3	2.6	2.1	2.8	2.3	3.4
13 or more	6.1	6.2	5.9	5.9	6.3	5.5	7.3	6.0	8.6
	Standard errors								
0	0.64	0.72	0.74	0.69	0.77	0.84	1.21	2.06	0.85
1	0.63	0.69	0.76	0.72	0.82	0.83	0.98	1.11	1.38
2	0.45	0.44	0.74	0.43	0.58	0.78	0.99	1.56	1.73
3	0.49	0.62	0.83	0.54	0.64	0.93	0.73	1.40	1.75
4	0.37	0.45	0.52	0.41	0.50	0.54	0.64	1.01	1.04
5	0.42	0.63	0.48	0.48	0.72	0.53	0.82	1.42	0.73
6	0.37	0.45	0.50	0.40	0.49	0.57	0.55	0.64	0.92
7	0.24	0.28	0.36	0.27	0.31	0.39	0.77	0.80	0.97
8	0.28	0.38	0.53	0.32	0.42	0.63	0.59	0.83	0.97
9	0.25	0.44	0.33	0.29	0.45	0.45	0.52	0.71	0.51
10	0.50	0.59	0.62	0.52	0.65	0.65	0.63	0.52	1.07
11	0.22	0.35	0.31	0.26	0.36	0.36	0.42	0.69	0.51
12	0.17	0.31	0.29	0.17	0.29	0.29	0.62	0.86	0.83
13 or more	0.58	0.64	0.59	0.64	0.73	0.64	0.70	0.83	0.96

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

Table 10. Number and percent distribution of youths aged 12-17 by specified Treatment Priority Index (TPI), according to age and sex, with standard errors of the estimates: United States, 1966-70

Treatment Priority Index	12-17 years			12 years			13 years		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	22,276	11,260	11,016	3,928	2,002	1,926	3,885	1,969	1,916
	Percent distribution								
All TPI	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0	11.0	10.8	11.2	10.6	11.5	9.6	12.1	11.0	13.2
1	9.5	8.8	10.2	7.1	8.2	6.0	10.0	10.1	9.9
2	13.2	13.4	12.9	13.0	14.2	11.9	12.2	12.7	11.7
3	12.2	11.7	12.6	12.3	11.0	13.7	12.3	12.2	12.4
4	8.4	8.8	8.1	7.4	8.7	6.6	9.5	9.6	9.4
5	9.0	8.9	9.2	10.4	10.2	10.7	8.5	8.8	8.2
6	7.7	7.9	7.4	9.3	9.3	9.4	6.4	6.5	6.4
7	3.9	4.0	3.7	4.3	4.3	4.4	4.1	4.8	3.3
8	5.2	4.9	5.4	4.2	3.0	5.5	5.2	4.9	5.6
9	3.9	3.8	3.9	4.1	4.2	4.0	3.7	4.4	2.9
10	5.3	5.4	5.3	6.1	5.3	6.9	4.4	3.8	5.0
11	2.2	2.5	1.9	2.1	2.6	1.6	2.1	2.1	2.0
12	2.4	2.6	2.2	2.4	3.2	1.6	1.7	0.8	2.6
13 or more	6.1	6.2	5.9	6.4	4.8	8.0	7.8	8.1	7.5
	Standard errors								
0	0.64	0.72	0.74	1.17	1.40	1.56	1.10	1.39	1.81
1	0.63	0.69	0.76	0.81	1.08	1.18	1.05	1.70	1.27
2	0.45	0.44	0.74	0.90	1.31	1.18	0.95	1.08	1.55
3	0.49	0.62	0.83	1.21	1.34	1.86	0.92	0.86	1.72
4	0.37	0.45	0.52	0.99	1.02	1.43	0.62	0.84	1.17
5	0.42	0.63	0.48	0.81	1.12	1.32	1.08	1.43	1.52
6	0.37	0.45	0.50	1.15	1.42	1.52	0.90	0.83	1.36
7	0.24	0.28	0.36	0.55	0.63	0.93	0.53	0.89	0.61
8	0.28	0.38	0.53	0.67	0.77	1.06	0.65	0.76	1.22
9	0.25	0.44	0.33	0.82	0.91	1.32	0.49	0.79	0.47
10	0.50	0.59	0.62	0.74	1.00	1.11	0.65	0.94	0.80
11	0.22	0.35	0.31	0.38	0.64	0.50	0.29	0.62	0.41
12	0.17	0.31	0.29	0.44	0.58	0.59	0.35	0.44	0.75
13 or more	0.58	0.64	0.59	1.14	1.21	1.24	1.16	1.60	1.23

Table 10. Number and percent distribution of youths aged 12-17 by specified Treatment Priority Index (TPI), according to age and sex, with standard errors of the estimates: United States, 1966-70—Con.

14 years			15 years			16 years			17 years		
Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
3,772	1,897	1,874	3,679	1,869	1,809	3,583	1,811	1,772	3,427	1,709	1,718
Percent distribution											
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
10.4	11.3	9.5	10.0	10.0	9.9	12.4	11.7	13.1	10.7	9.4	12.0
9.9	7.7	12.2	10.0	9.4	10.7	9.1	7.5	10.7	10.9	9.8	11.9
12.7	13.4	11.9	12.8	11.5	14.1	13.3	13.3	13.4	15.4	15.7	15.1
13.3	12.5	14.1	10.6	11.2	10.1	13.0	12.7	13.2	11.4	10.9	12.0
7.8	8.6	7.1	9.7	9.1	10.4	9.4	10.4	8.3	6.8	6.9	6.7
10.0	10.7	9.3	8.0	7.2	8.8	9.2	9.4	9.0	8.0	6.9	9.0
7.4	7.0	7.7	8.8	9.1	8.5	6.7	7.4	6.0	7.2	8.1	6.2
3.4	3.6	3.3	3.9	4.1	3.7	2.0	3.0	3.0	4.4	4.5	4.4
5.0	4.4	5.6	5.6	6.2	4.8	5.1	5.8	4.3	6.2	5.4	6.9
4.2	4.4	4.1	4.0	3.3	4.7	3.2	2.5	3.9	4.0	4.3	3.6
5.9	5.1	6.7	5.4	4.4	6.4	5.4	6.3	4.4	4.8	7.7	2.0
1.6	2.2	1.0	2.7	3.7	1.7	3.0	2.1	3.8	2.0	2.3	1.6
2.1	2.1	2.1	3.6	4.2	2.9	2.4	3.1	1.7	2.2	1.9	2.5
6.2	7.0	5.4	5.0	6.6	3.3	4.8	4.6	5.1	6.0	6.1	6.0
Standard errors											
0.78	1.16	1.00	1.46	2.03	1.65	1.25	1.43	2.14	1.06	1.34	1.46
1.11	1.34	1.73	1.41	1.69	1.69	0.77	0.92	1.18	1.25	1.45	2.13
1.03	1.70	1.41	1.04	1.23	1.79	1.15	1.62	1.37	1.00	1.52	1.43
1.45	1.59	2.53	1.30	1.87	1.68	0.76	1.11	1.04	0.70	1.22	1.42
0.65	1.06	0.99	1.08	1.19	1.52	1.02	1.51	1.08	0.88	1.18	1.22
1.15	1.25	1.81	0.96	1.27	1.21	0.87	0.99	1.44	0.97	1.04	1.57
0.65	1.10	1.02	0.64	1.32	0.95	0.94	1.40	1.34	1.01	1.50	1.05
0.56	0.65	0.71	0.69	0.83	0.82	0.52	0.66	0.72	0.59	0.77	1.03
0.80	1.05	1.04	1.00	0.94	1.46	0.70	1.25	1.18	0.73	1.15	1.03
0.79	1.13	1.14	0.37	0.68	0.68	0.48	0.66	0.62	0.57	0.81	0.96
0.94	1.45	1.38	0.98	0.96	1.62	0.89	1.12	1.02	0.67	1.37	0.49
0.35	0.64	0.33	0.74	1.09	0.60	0.50	0.44	0.94	0.55	0.97	0.60
0.36	0.55	0.59	0.45	0.92	0.58	0.62	0.99	0.59	0.45	0.66	0.71
0.77	1.17	0.84	0.91	1.14	0.82	0.76	1.09	0.82	0.56	1.09	0.70

Table 11. Number and percent distribution of youths aged 12-17 by specified case severity, according to race and sex, with standard errors of the estimates: United States, 1966-70

Specified case severity	Total[1]			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	22,277	11,260	11,017	19,173	9,723	9,450	2,990	1,476	1,514
	Percent distribution								
All cases	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0 (Normal occlusion)	11.0	10.8	11.2	10.5	10.2	10.7	14.7	15.0	14.3
1-3 (Minor malocclusion)	34.8	34.0	35.8	34.5	33.6	35.7	36.9	36.4	37.3
4-6 (Definite malocclusion)	25.2	25.7	24.6	25.8	26.0	25.5	21.0	23.3	18.8
7-9 (Severe malocclusion)	13.0	12.8	13.0	13.0	12.7	13.2	12.2	13.5	11.0
10 or more (Very severe malocclusion)	16.0	16.7	15.4	16.2	17.5	14.9	15.2	11.8	18.6
	Standard errors								
0 (Normal occlusion)	0.64	0.72	0.74	0.69	0.77	0.84	1.21	2.06	0.85
1-3 (Minor malocclusion)	0.99	0.95	1.50	1.08	1.04	1.66	1.37	1.68	2.13
4-6 (Definite malocclusion)	0.75	0.81	1.13	0.82	0.89	1.23	1.15	1.83	1.23
7-9 (Severe malocclusion)	0.39	0.53	0.65	0.45	0.60	0.76	0.81	1.16	1.06
10 or more (Very severe malocclusion)	1.13	1.01	1.42	1.24	1.10	1.57	1.15	1.50	1.95

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

Table 12. Number and percent distribution of youths aged 12-17 by specified Treatment Priority Index (TPI), according to type of malocclusion syndrome, with standard errors of the estimates: United States, 1966-70

Treatment Priority Index	Type of malocclusion syndrome							
	Normal	Tooth displacement		Anterior				
		Maxillary expansion	Maxillary collapse	Over-bite	Open-bite	Lower overjet	Upper overjet	Mixed[1]
Estimated number of youths in thousands	12,099	2,657	4,017	1,167	860	34	1,154	285
	Percent distribution							
All TPI	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0	20.3	-	-	-	-	-	-	-
1	17.4	-	-	-	-	-	-	-
2	24.3	-	-	-	-	-	-	-
3	22.4	-	-	-	-	-	-	-
4	15.6	-	-	-	-	-	-	-
5	-	22.7	21.0	7.3	7.1	-	26.7	39.8
6	-	18.7	14.8	11.3	20.0	-	25.5	5.8
7	-	9.7	4.7	3.0	16.4	-	18.4	9.6
8	-	13.3	11.5	8.5	19.4	-	6.1	1.2
9	-	11.5	6.7	12.6	7.6	9.1	5.1	4.2
10 or more	-	24.1	41.3	57.3	29.5	90.9	18.2	39.4
	Standard errors							
0	.92	-	-	-	-	-	-	-
1	0.91	-	-	-	-	-	-	-
2	0.73	-	-	-	-	-	-	-
3	0.88	-	-	-	-	-	-	-
4	0.77	-	-	-	-	-	-	-
5	-	1.66	1.08	1.71	1.72	-	1.83	5.81
6	-	1.35	1.09	2.51	3.08	-	3.24	2.32
7	-	0.87	0.57	1.03	3.36	-	1.89	4.57
8	-	1.14	1.01	1.62	1.53	-	1.12	1.24
9	-	1.41	0.88	2.04	0.95	9.97	0.93	2.78
10 or more	-	2.19	1.67	3.22	2.46	9.97	3.75	6.60

[1]Two or more TPI components of equally high weight.

Table 13. Average Treatment Priority Index (TPI) per youth, by race, sex, and age, with standard errors of the estimates: United States, 1966-70

Sex and age	Total[1]	White	Black	Total[1]	White	Black
	Average TPI			Standard errors		
Both sexes 12-17 years	5.0	5.1	4.9	0.14	0.16	0.13
12 years	5.2	5.4	4.5	0.23	0.26	0.26
13 years	5.1	5.1	4.9	0.16	0.16	0.30
14 years	5.0	4.9	5.5	0.18	0.19	0.37
15 years	5.1	5.1	5.0	0.24	0.27	0.33
16 years	4.8	4.8	5.1	0.18	0.20	0.35
17 years	4.9	5.1	4.2	0.15	0.14	0.55
Male 12-17 years	5.1	5.2	4.6	0.14	0.15	0.22
12 Years	5.0	5.2	4.1	0.23	0.27	0.36
13 years	5.1	5.2	4.2	0.19	0.18	0.54
14 years	5.1	5.1	4.8	0.19	0.21	0.60
15 years	5.4	5.5	5.0	0.30	0.31	0.63
16 years	4.9	4.9	5.3	0.19	0.23	0.49
17 years	5.2	5.4	4.5	0.19	0.20	0.62
Female 12-17 years	4.9	4.9	5.1	0.16	0.18	0.21
12 years	5.5	5.6	4.9	0.27	0.30	0.30
13 years	5.1	5.0	5.6	0.23	0.27	0.42
14 years	4.9	4.7	6.1	0.23	0.25	0.73
15 years	4.8	4.8	4.9	0.28	0.30	0.63
16 years	4.6	4.6	5.0	0.22	0.26	0.60
17 years	4.6	4.8	3.9•	0.20	0.19	0.71

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

Table 14. Differences between actual and expected average Treatment Priority Index (TPI) per youth for youths aged 12-17, by sex, race, and annual family income, with standard errors of the estimates: United States, 1966-70

Race and annual family income	Both sexes			Males			Females			Both sexes	Male	Female
	Actual	Expected	Difference	Actual	Expected	Difference	Actual	Expected	Difference			
	Average TPI			Average TPI			Average TPI			Standard errors		
All races[1]	5.0	...	...	5.1	...	...	4.9	...	...	0.14	0.14	0.16
Less than $3,000	5.3	5.0	0.3	5.2	5.1	0.1	5.4	4.9	0.5	0.19	0.33	0.21
$3,000-$4,999	5.1	5.0	0.1	5.0	5.1	-0.1	5.2	5.0	0.2	0.22	0.23	0.32
$5,000-$6,999	4.9	5.0	-0.1	5.0	5.1	-0.1	4.8	4.9	-0.1	0.17	0.26	0.20
$7,000-$9,999	5.2	5.0	0.2	5.2	5.1	0.1	5.3	4.9	0.4	0.22	0.22	0.30
$10,000-$14,999	5.0	5.0	0.0	5.3	5.1	0.2	4.6	4.9	-0.3	0.23	0.22	0.30
$15,000 or more	4.4	5.0	-0.6	4.8	5.1	-0.3	4.0	4.9	-0.9	0.22	0.35	0.20
Unknown	5.2	5.0	0.2	5.2	5.1	0.1	5.1	4.9	0.2	0.25	0.44	0.35
White	5.1	...	...	5.2	...	...	4.9	...	...	0.16	0.15	0.18
Less than $3,000	5.7	5.1	0.6	5.7	5.2	0.5	5.7	4.9	0.8	0.27	0.45	0.27
$3,000-$4,999	5.3	5.1	0.2	5.2	5.2	0.0	5.4	4.9	0.5	0.25	0.28	0.37
$5,000-$6,999	4.9	5.0	-0.1	5.1	5.2	-0.1	4.7	4.9	-0.2	0.20	0.30	0.26
$7,000-$9,999	5.3	3.1	0.2	5.2	5.2	0.1	5.3	4.9	0.4	0.22	0.21	0.31
$10,000-$14,999	4.9	5.1	-0.2	5.3	5.2	0.1	4.6	4.9	-0.3	0.24	0.23	0.31
$15,000 or more	4.4	5.0	-0.6	4.8	5.2	-0.4	4.0	4.9	-0.9	0.22	0.34	0.19
Unknown	4.9	5.1	-0.2	5.0	5.2	-0.2	4.8	4.9	-0.1	0.24	0.35	0.29
Black	4.9	...	...	4.6	...	...	5.1	...	...	0.13	0.22	0.21
Less than $3,000	4.7	4.9	-0.2	4.5	4.7	-0.2	4.9	5.1	-0.2	0.18	0.31	0.31
$3,000-$4,999	4.6	4.9	-0.3	4.3	4.6	-0.3	5.0	5.2	-0.2	0.26	0.29	0.41
$5,000-$6,999	4.8	4.8	0.0	4.7	4.6	0.1	4.9	5.0	-0.1	0.30	0.58	0.51
$7,000-$9,999	4.8	4.8	0.0	4.6	4.6	0.0	5.1	5.1	0.0	0.68	0.92	0.83
$10,000-$14,999	5.2	4.8	0.4	5.0	4.6	0.4	5.2	4.8	0.4	0.72	0.52	1.25
$15,000 or more	4.3	4.9	-0.6	5.0	4.6	0.4	3.4	5.2	-1.6	1.91	3.65	2.96
Unknown	6.6	4.9	0.7	6.3	4.7	1.6	6.9	5.1	1.8	1.34	1.91	1.72

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

Table 15. Differences between actual and expected average Treatment Priority Index (TPI) per youth for youths aged 12-17, by sex, race, and education of the head of household, with standard errors of the estimates: United States, 1966-70

Race and education of head of household	Both sexes			Male			Female			Both sexes	Male	Female
	Actual	Expected	Difference	Actual	Expected	Difference	Actual	Expected	Difference			
	Average TPI			Average TPI			Average TPI			Standard errors		
All races[1]	4.9	...	...	5.0	...	...	4.8	...	...	0.14	0.13	0.16
None or less than 5 years	5.3	5.0	0.3	5.1	5.0	0.1	5.6	4.9	0.7	0.47	0.52	0.55
5-7 years	5.2	5.0	0.2	5.1	5.0	0.1	5.2	4.9	0.3	0.23	0.34	0.34
8 years	5.0	4.9	0.1	4.7	5.0	-0.3	5.2	4.8	0.4	0.24	0.20	0.38
9-11 years	5.2	4.9	0.3	5.0	5.0	0.0	5.3	4.8	0.5	0.17	0.15	0.22
12 years	4.9	4.9	0.0	5.2	5.0	0.2	4.5	4.9	-0.4	0.18	0.21	0.19
13-15 years	4.6	4.9	-0.3	4.8	5.0	-0.2	4.4	4.8	-0.4	0.34	0.39	0.49
16 years	4.6	4.9	-0.3	4.7	5.0	-0.3	4.4	4.8	-0.4	0.22	0.29	0.36
17 years or more	4.3	5.0	-0.7	4.6	5.0	-0.4	3.9	4.9	-1.0	0.30	0.24	0.43
Unknown	5.6	4.9	0.7	6.0	5.0	1.0	5.2	4.8	0.4	0.38	0.82	0.56
White	5.0	...	...	5.1	...	...	4.8	...	...	0.15	0.15	0.18
None or less than 5 years	5.7	5.0	0.7	5.4	5.1	0.3	6.0	4.8	1.2	0.57	0.59	0.72
5-7 years	5.5	5.0	0.5	5.5	5.1	0.4	5.6	4.8	0.8	0.26	0.40	0.40
8 years	5.0	5.0	0.0	4.8	5.1	-0.3	5.1	4.8	0.3	0.24	0.21	0.38
9-11 years	5.2	5.0	0.2	5.1	5.1	0.0	5.4	4.8	0.6	0.20	0.19	0.26
12 years	4.8	5.0	-0.2	5.2	5.1	0.1	4.4	4.8	-0.4	0.19	0.23	0.21
13-15 years	4.6	5.0	-0.4	4.9	5.1	-0.2	4.4	4.8	-0.4	0.34	0.39	0.49
16 years	4.6	5.0	-0.4	4.7	5.1	-0.4	4.4	4.8	-0.4	0.23	0.29	0.37
17 years or more	4.3	5.0	-0.7	4.7	5.1	-0.4	3.8	4.8	-1.0	0.31	0.28	0.39
Unknown	5.8	5.0	0.8	6.3	5.1	1.2	5.3	4.8	0.5	0.37	0.92	0.75
Black	4.8	...	...	4.6	...	...	5.0	...	...	0.13	0.22	0.22
None or less than 5 years	4.6	4.8	-0.2	4.4	4.5	-0.1	4.6	5.1	-0.5	0.37	0.58	0.42
5-7 years	4.3	4.8	-0.5	4.3	4.5	-0.2	4.3	5.0	-0.7	0.28	0.43	0.47
8 years	5.2	4.8	0.4	4.1	4.5	-0.4	6.5	5.0	1.5	0.54	0.38	0.96
9-11 years	4.8	4.8	0.0	4.5	4.6	-0.1	5.0	5.0	0.0	0.25	0.36	0.25
12 years	5.7	4.8	0.9	5.6	4.6	1.0	5.7	5.1	0.6	0.42	0.73	0.47
13-15 years	4.1	4.7	-0.6	4.1	4.6	-0.5	4.1	4.8	-0.7	0.90	1.11	1.67
16 years	3.8	4.6	-0.8	4.5	4.5	0.0	2.5	5.0	-2.5	1.13	1.68	0.33
17 years or more	4.9	4.8	0.1	2.7	4.6	-1.9	10.7	5.3	5.4	2.25	0.90	5.65
Unknown	4.9	5.0	-0.1	4.7	4.8	-0.1	5.0	5.1	-0.1	0.82	1.21	1.34

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

Table 16. Differences between actual and expected average Treatment Priority Index (TPI) per youth for youths aged 12-17, by sex, race, and geographic region, with standard errors of the estimates: United States, 1966-70

Race and region	Both sexes			Male			Female			Both sexes	Male	Female
	Actual	Expected	Difference	Actual	Expected	Difference	Actual	Expected	Difference			
	Average TPI			Average TPI			Average TPI			Standard errors		
All races[1]	5.0	...	...	5.1	...	...	4.9	...	...	...	...	...
Northeast	4.8	5.0	-0.1	4.8	5.1	-0.3	4.8	4.9	-0.1	0.19	0.21	0.18
Midwest	5.3	5.0	0.5	5.5	5.1	0.4	5.1	4.9	0.2	0.46	0.44	0.49
South	5.2	5.0	0.2	5.3	5.1	0.2	5.2	4.9	0.3	0.16	0.27	0.13
West	4.7	5.0	0.2	4.8	5.1	-0.3	4.6	4.9	-0.3	0.47	0.46	0.52
White	5.1	...	...	5.2	...	...	4.9	...	...	0.16	0.15	0.18
Northeast	4.8	5.1	-0.3	4.8	5.2	-0.4	4.8	4.9	-0.1	0.18	0.19	0.19
Midwest	5.3	5.1	0.2	5.5	5.2	0.3	5.0	4.9	0.1	0.50	0.49	0.52
South	5.5	5.1	0.4	5.6	5.2	0.4	5.4	4.9	0.5	0.18	0.30	0.13
West	4.7	5.1	-0.4	4.8	5.2	-0.4	4.6	4.9	-0.3	0.49	0.49	0.53
Black	4.9	...	...	4.6	...	...	5.1	...	...	0.13	0.22	0.21
Northeast	5.0	4.9	0.1	4.5	4.6	-0.1	5.3	5.1	0.2	0.45	0.62	0.41
Midwest	5.8	4.9	0.9	5.6	4.7	0.9	6.0	5.1	0.9	0.40	0.66	0.41
South	4.5	4.9	-0.4	4.3	4.6	-0.3	4.6	5.1	-0.5	0.16	0.32	0.35
West	4.9	4.8	-0.1	4.7	4.6	0.1	5.2	5.0	0.2	0.79	0.38	1.49

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

Table 17. Number and percent distribution of youths aged 12-17 by whether or not it was reported that their teeth have been straightened, according to sex and age, with standard errors of the estimates: United States, 1966-70

Sex and age	Total	Teeth straightened	Teeth not straightened	Not reported
Estimated number of youths in thousands	22,578	2,415	20,151	12
		Percent distribution		
Both sexes 12-17 years	100.0	10.7	89.2	0.1
12 years	100.0	7.4	92.5	0.1
13 years	100.0	9.5	90.5	0.0
14 years	100.0	10.4	89.4	0.2
15 years	100.0	10.6	89.4	0.0
16 years	100.0	13.5	86.5	0.0
17 years	100.0	13.3	86.7	0.0
Male 12-17 years	100.0	9.6	90.3	0.1
12 years	100.0	6.0	93.8	0.2
13 years	100.0	9.7	90.3	0.0
14 years	100.0	10.2	89.4	0.4
15 years	100.0	9.4	90.6	0.0
16 years	100.0	12.8	87.2	0.0
17 years	100.0	10.0	90.0	0.0
Female 12-17 years	100.0	11.8	88.2	0.0
12 years	100.0	8.7	91.3	0.0
13 years	100.0	9.3	90.7	0.0
14 years	100.0	10.6	89.4	0.0
15 years	100.0	11.9	88.1	0.0
16 years	100.0	14.1	85.9	0.0
17 years	100.0	16.7	83.3	0.0
		Standard errors		
Both sexes 12-17 years	...	0.68	0.69	0.03
12 years	...	1.37	1.41	0.12
13 years	...	0.61	0.61	0.00
14 years	...	1.41	1.42	0.15
15 years	...	0.89	0.89	0.0
16 years	...	1.17	1.17	0.0
17 years	...	1.58	1.58	0.0
Male 12-17 years	...	0.71	0.72	0.06
12 years	...	1.32	1.43	0.24
13 years	...	1.26	1.26	0.00
14 years	...	1.41	1.41	0.31
15 years	...	0.88	0.88	0.00
16 years	...	1.37	1.37	0.00
17 years	...	1.91	1.91	0.00
Female 12-17 years	...	0.83	0.83	0.00
12 years	...	1.94	1.94	0.00
13 years	...	1.15	1.15	0.00
14 years	...	1.82	1.82	0.00
15 years	...	1.57	1.57	0.00
16 years	...	1.65	1.65	0.00
17 years	...	2.24	2.24	0.00

Table 18. Number and percent distribution of youths aged 12-17 whose teeth have not been straightened by whether or not parents thought the youths' teeth need to be straightened, according to race, sex, and age: United States, 1966-70

Race, sex, and age	Total	Parents reported need for tooth straightening			
		Yes	No	Don't know	Not reported
Estimated number of youths in thousands	20,151	2,344	17,601	59	145
Total[1]	Percent distribution				
Both sexes 12-17 years	100.0	11.6	87.4	0.3	0.7
12 years	100.0	14.6	84.4	0.2	0.8
13 years	100.0	11.6	87.1	0.2	1.1
14 years	100.0	12.6	86.8	0.0	0.6
15 years	100.0	11.8	86.8	0.6	0.8
16 years	100.0	10.6	88.7	0.3	0.4
17 years	100.0	7.7	91.1	0.6	0.6
Male 12-17 years	100.0	10.6	88.1	0.4	0.9
12 years	100.0	13.0	85.9	0.2	0.9
13 years	100.0	12.2	86.8	0.2	0.8
14 years	100.0	10.4	88.9	0.0	0.7
15 years	100.0	10.6	86.8	1.1	1.4
16 years	100.0	10.5	88.9	0.2	0.4
17 years	100.0	5.9	92.0	0.9	1.2
Female 12-17 years	100.0	12.8	86.5	0.2	0.6
12 years	100.0	16.4	82.8	0.1	0.7
13 years	100.0	11.1	87.3	0.2	1.4
14 years	100.0	14.8	84.7	0.0	0.5
15 years	100.0	13.1	86.7	0.0	0.2
16 years	100.0	10.7	88.5	0.4	0.4
17 years	100.0	9.6	90.0	0.4	0.0
Total[1]	Standard errors				
Both sexes 12-17 years	...	0.45	0.47	0.13	0.16
12 years	...	1.17	1.28	0.11	0.31
13 years	...	0.87	1.02	0.11	0.35
14 years	...	0.78	0.81	0.00	0.19
15 years	...	1.03	1.10	0.34	0.48
16 years		0.81	0.75	0.16	0.18
17 years	...	0.67	0.69	0.48	0.32
Male 12-17 years	...	0.47	0.55	0.26	0.24
12 years	...	1.64	1.90	0.17	0.43
13 years	...	1.48	1.54	0.16	0.35
14 years	...	1.18	1.23	0.00	0.22
15 years	...	1.69	1.64	0.67	0.92
16 years	...	1.18	1.16	0.17	0.25
17 years	...	1.13	1.14	0.86	0.61
Female 12-17 years	...	0.67	0.68	0.05	0.12
12 years	...	1.75	1.64	0.15	0.38
13 years	...	1.23	1.48	0.17	0.60
14 years	...	1.48	1.48	0.00	0.28
15 years	...	1.32	1.25	0.00	0.16
16 years	...	1.38	1.30	0.26	0.27
17 years	...	1.19	1.32	0.37	0.00

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

Table 18. Number and percent distribution of youths aged 12-17 whose teeth have not been straightened by whether or not parents thought the youths' teeth need to be straightened, according to race, sex, and age: United States, 1966-70—Con.

Race, sex, and age	Total	Parents reported need for tooth straightening			
		Yes	No	Don't know	Not reported
Estimated number of youths in thousands	17,091	2,059	14,844	59	128
White	Percent distribution				
Both sexes 12-17 years	100.0	12.0	86.9	0.3	0.8
12 years	100.0	15.7	83.2	0.2	0.8
13 years	100.0	12.7	85.9	0.2	1.2
14 years	100.0	12.7	86.8	0.0	0.4
15 years	100.0	11.6	86.8	0.7	1.0
16 years	100.0	10.7	88.7	0.3	0.3
17 years	100.0	7.8	90.7	0.7	0.7
Male 12-17 years	100.0	10.9	87.7	0.5	0.9
12 years	100.0	13.4	85.5	0.2	0.9
13 years	100.0	12.9	86.0	0.2	0.9
14 years	100.0	9.5	90.1	0.0	0.4
15 years	100.0	11.2	85.8	1.3	1.7
16 years	100.0	10.9	88.7	0.2	0.2
17 years	100.0	6.7	90.9	1.0	1.4
Female 12-17 years	100.0	13.3	85.9	0.2	0.6
12 years	100.0	18.2	80.8	0.2	0.8
13 years	100.0	12.6	85.7	0.2	1.5
14 years	100.0	16.1	83.5	0.0	0.4
15 years	100.0	12.1	87.7	0.0	0.2
16 years	100.0	10.5	88.6	0.4	0.4
17 years	100.0	9.1	90.4	0.4	0.0
White	Standard errors				
Both sexes 12-17 years	...	0.53	0.59	0.16	0.17
12 years	...	1.25	1.38	0.13	0.36
13 years	...	0.96	1.15	0.14	0.39
14 years	...	0.93	0.93	0.00	0.11
15 years	...	1.15	1.25	0.40	0.56
16 years	...	0.79	0.68	0.19	0.17
17 years	...	0.72	0.74	0.56	0.38
Male 12-17 years	...	0.55	0.72	0.31	0.26
12 years	...	1.47	1.73	0.20	0.48
13 years	...	1.70	1.78	0.19	0.41
14 years	...	1.37	1.40	0.00	0.11
15 years	...	1.81	1.83	0.78	1.08
16 years	...	1.48	1.47	0.21	0.17
17 years	...	1.31	1.46	1.00	0.72
Female 12-17 years	...	0.78	0.78	0.06	0.13
12 years	...	2.02	1.89	0.18	0.46
13 years	...	1.51	1.79	0.21	0.64
14 years	...	1.66	1.64	0.00	0.27
15 years	...	1.52	1.44	0.00	0.19
16 years	...	1.35	1.24	0.31	0.32
17 years	...	1.18	1.32	0.45	0.00

Table 18. Number and percent distribution of youths aged 12-17 whose teeth have not been straightened by whether or not parents thought the youths' teeth need to be straightened, according to race, sex, and age: United States, 1966-70—Con.

Race, sex, and age	Total	Parents reported need for tooth straightening			
		Yes	No	Don't know	Not reported
Estimated number of youths in thousands	2,958	280	2,661		16
Black	Percent distribution				
Both sexes 12-17 years	100.0	9.5	89.9	0.0	0.6
12 years	100.0	8.7	90.8	0.0	0.5
13 years	100.0	6.0	93.5	0.0	0.5
14 years	100.0	12.2	86.3	0.0	1.5
15 years	100.0	13.0	87.0	0.0	0.0
16 years	100.0	10.5	88.8	0.0	0.8
17 years	100.0	6.9	93.1	0.0	0.0
Male 12-17 years	100.0	9.3	90.0	0.0	0.7
12 years	100.0	10.7	88.4	0.0	1.0
13 years	100.0	9.0	91.0	0.0	0.0
14 years	100.0	16.5	81.6	0.0	1.9
15 years	100.0	7.8	92.2	0.0	0.0
16 years	100.0	8.7	89.7	0.0	1.6
17 years	100.0	1.2	98.7	0.0	0.0
Female 12-17 years	100.0	9.7	89.9	0.0	0.4
12 years	100.0	6.7	93.3	0.0	0.0
13 years	100.0	3.0	96.0	0.0	1.0
14 years	100.0	8.0	90.9	0.0	1.1
15 years	100.0	18.2	81.8	0.0	0.0
16 years	100.0	12.1	87.9	0.0	0.0
17 years	100.0	12.2	87.8	0.0	0.0
Black	Standard errors				
Both sexes 12-17 years	...	1.12	1.18	0.00	0.31
12 years	...	1.98	2.04	0.00	0.46
13 years	...	1.57	1.77	0.00	0.53
14 years	...	2.62	2.54	0.00	0.83
15 years	...	1.80	1.80	0.00	0.00
16 years	...	3.16	3.36	0.00	0.70
17 years	...	2.30	2.30	0.00	0.00
Male 12-17 years	...	1.62	1.67	0.00	0.58
12 years	...	4.62	4.72	0.00	0.92
13 years	...	2.16	2.16	0.00	0.00
14 years	...	4.20	4.42	0.00	1.37
15 years	...	3.19	3.19	0.00	0.00
16 years	...	3.45	4.09	0.00	1.43
17 years	...	1.18	1.18	0.00	0.00
Female 12-17 years	...	1.33	1.34	0.00	0.25
12 years	...	3.17	3.17	0.00	0.00
13 years	...	2.05	2.74	0.00	1.04
14 years	...	2.12	1.76	0.00	1.04
15 years	...	2.72	2.72	0.00	0.00
16 years	...	4.17	4.17	0.00	0.00
17 years	...	4.59	4.59	0.00	0.00

Table 19. Number and percent distribution of youths aged 12-17 whose teeth have not been straightened by whether or not parents thought the youths' teeth need to be straightened, according to race and annual family income, with standard errors of the estimates: United States, 1966-70

Race and annual family income	Total	Parents reported need for tooth straightening			
		Yes	No	Don't know	Not reported
Estimated number of youths in thousands	20,151	2,344	17,602	59	146
		Percent distribution			
Total[1]					
All incomes	100.0	11.6	87.4	0.3	0.7
Less than $3,000	100.0	11.3	88.0	0.1	0.6
$3,000-$4,999	100.0	9.2	90.3	0.2	0.3
$5,000-$6,999	100.0	10.2	89.2	0.2	0.4
$7,000-$9,999	100.0	12.4	85.8	0.7	1.1
$10,000-$14,999	100.0	14.7	84.5	0.1	0.7
$15,000 or more	100.0	11.3	87.0	0.6	1.1
Unknown	100.0	10.0	89.2	0.0	0.8
White					
All incomes	100.0	12.0	86.9	0.3	0.8
Less than $3,000	100.0	12.6	86.8	0.2	0.4
$3,000-$4,999	100.0	9.3	90.1	0.2	0.4
$5,000-$6,999	100.0	10.6	88.8	0.2	0.4
$7,000-$9,999	100.0	12.5	85.7	0.7	1.1
$10,000-$14,999	100.0	14.8	84.4	0.1	0.7
$15,000 or more	100.0	11.6	86.6	0.6	1.2
Unknown	100.0	9.8	89.3	0.0	0.9
Black					
All incomes	100.0	9.5	89.9	0.0	0.6
Less than $3,000	100.0	9.1	90.0	0.0	0.9
$3,000-$4,999	100.0	9.1	90.6	0.0	0.3
$5,000-$6,999	100.0	8.6	90.8	0.0	0.6
$7,000-$9,999	100.0	11.7	87.5	0.0	0.8
$10,000-$14,999	100.0	11.0	89.0	0.0	0.0
$15,000 or more	100.0	5.8	94.2	0.0	0.0
Unknown	100.0	11.0	89.0	0.0	0.0

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

Table 19. Number and percent distribution of youths aged 12-17 whose teeth have not been straightened by whether or not parents thought the youths' teeth need to be straightened, according to race and annual family income, with standard errors of the estimates: United States, 1966-70—Con.

Race and annual family income	Total	Parents reported need for tooth straightening			
		Yes	No	Don't know	Not reported
		Standard errors			
Total[1]					
All incomes	...	0.45	0.47	0.13	0.16
Less than $3,000	...	1.31	1.41	0.12	0.37
$3,000-$4,999	...	1.10	1.06	0.13	0.22
$5,000-$6,999	...	1.14	1.27	0.13	0.18
$7,000-$9,999	...	0.89	1.00	0.49	0.27
$10,000-$14,999	...	1.18	1.27	0.08	0.39
$15,000 or more	...	1.13	1.19	0.33	0.39
Unknown	...	1.82	1.77	0.00	0.54
White					
All incomes	...	0.53	0.59	0.16	0.17
Less than $3,000	...	1.97	2.03	0.20	0.39
$3,000-$4,999	...	1.47	1.49	0.19	0.28
$5,000-$6,999	...	1.20	1.35	0.15	0.20
$7,000-$9,999	...	0.96	1.06	0.52	0.28
$10,000-$14,999	...	1.24	1.32	0.08	0.41
$15,000 or more	...	1.14	1.23	0.34	0.41
Unknown	...	2.04	1.98	0.00	0.65
Black					
All incomes	...	1.12	1.18	0.00	0.31
Less than $3,000	...	1.73	1.89	0.00	0.56
$3,000-$4,999	...	1.69	1.86	0.00	0.30
$5,000-$6,999	...	2.37	2.44	0.00	0.55
$7,000-$9,999	...	3.59	3.49	0.00	0.81
$10,000-$14,999	...	2.56	2.56	0.00	0.00
$15,000 or more	...	5.34	5.34	0.00	0.00
Unknown	...	6.10	6.10	0.00	0.00

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

Table 20. Number of youths aged 12-17 whose teeth have not been straightened and the average Treatment Priority Index (TPI) per youth, by race, sex, and whether or not parents thought the youths' teeth need to be straightened, with standard errors of the estimates: United States, 1966-70

Parents reported need for tooth straightening	Total[1]			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	19,999	10,213	9.786	16,970	8,710	8,259	2,928	1,441	1,486
	Average TPI								
All youths	5.1	5.2	5.1	5.2	5.3	5.1	4.8	4.6	5.1
Yes	8.2	8.8	7.6	8.2	8.9	7.6	8.2	8.6	7.8
No	4.7	4.8	4.7	4.8	4.8	4.7	4.5	4.2	4.7
Don't know	6.4	6.0	7.2	6.4	6.0	7.2	-	-	-
Not reported	5.3	4.7	6.3	5.2	4.8	5.9	6.0	3.9	10.3
	Standard errors								
All youths	0.15	0.15	0.18	0.17	0.16	0.21	0.12	0.21	0.22
Yes	0.34	0.44	0.34	0.38	0.49	0.39	0.61	0.96	0.71
No	0.14	0.13	0.17	0.16	0.15	0.19	0.16	0.24	0.28
Don't know	1.04	1.76	2.31	1.04	1.76	2.31	-	-	-
Not reported	1.36	1.55	1.69	1.34	1.75	1.40	4.54	1.97	7.51

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

Table 21. Number of youths aged 12-17 whose teeth have not been straightened and the average Treatment Priority Index (TPI) per youth, by race, sex, and whether or not youths have been told by dentists that their teeth need to be straightened, with standard errors of the estimates: United States, 1966-70

Dentists have said teeth need to be straightened	Total[1]			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	19,999	10,213	9.786	16,970	8,710	8,259	2,928	1,441	1.486
	Average TPI								
All youths	5.1	5.2	5.1	5.2	5.3	5.1	4.8	4.6	5.1
Yes	8.7	9.5	7.9	8.6	9.5	7.8	9.7	9.9	9.5
No	4.9	4.9	4.8	4.9	5.0	4.8	4.7	4.5	4.9
Not reported	4.8	4.4	5.4	4.9	4.5	5.6	3.7	3.7	3.8
	Standard errors								
All youths	0.15	0.15	0.18	0.17	0.16	0.21	0.12	0.21	0.22
Yes	0.38	0.48	0.36	0.40	0.50	0.38	1.19	2.16	0.90
No	0.15	0.14	0.18	0.17	0.16	0.21	0.14	0.24	0.22
Not reported	0.89	1.19	0.95	0.94	1.30	0.99	0.91	1.49	1.97

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

Table 22. Number of youths aged 12-17 and average Treatment Priority Index (TPI) per youth, by race, sex, and whether or not the youths' teeth have been straightened, with standard errors of the estimates: United States, 1966-70

Reported tooth straightening	Total[1]			White			Black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Estimated number of youths in thousands	22,170	11,196	10,974	19,094	9,676	9,418	2,961	1,459	1,502
	Average TPI								
All youths	5.0	5.1	4.9	5.1	5.2	4.9	4.8	4.6	5.1
Yes	4.1	4.5	3.7	4.0	4.5	3.7	5.1	3.9	6.4
No	5.1	5.2	5.1	5.2	5.3	5.1	4.8	4.6	5.1
Not reported	5.8	5.8	—	5.8	5.8	—	–	–	–
	Standard errors								
All youths	0.14	0.14	0.16	0.16	0.15	0.18	0.12	0.21	0.22
Yes	0.16	0.23	0.21	0.17	0.24	0.21	0.20	0.12	4.85
No	0.15	0.15	0.18	0.17	0.16	0.21	0.12	0.21	0.22
Not reported	3.05	3.05	—	3.05	3.05	—	–	-	–

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

Table 23. Number and percent distribution of youths aged 12-17 whose teeth have not been straightened by whether or not they thought their own teeth need to be straightened, according to sex and age, with standard errors of the estimates: United States, 1966-70

Sex and age	Total[1]	Self-reported need for tooth straightening			
		Yes	No	Don't know	Not reported
	Percent distribution				
Both sexes 12-17 years	100.0	18.3	73.9	7.6	0.2
12 years	100.0	20.1	71.6	8.2	0.1
13 years	100.0	17.6	73.7	8.4	0.3
14 years	100.0	17.8	74.2	7.8	0.2
15 years	100.0	19.0	74.8	5.9	0.3
16 years	100.0	19.6	74.0	6.3	0.1
17 years	100.0	15.5	75.6	8.8	0.1
Male 12-17 years	100.0	17.9	74.7	7.3	0.1
12 years	100.0	19.4	74.4	6.2	—
13 years	100.0	16.7	74.9	8.0	0.4
14 years	100.0	17.2	75.8	6.8	0.2
15 years	100.0	19.6	74.5	5.9	—
16 years	100.0	20.4	71.8	7.6	0.2
17 years	100.0	13.9	76.7	9.4	—
Female 12-17 years	100.0	18.8	73.1	7.9	0.2
12 years	100.0	20.9	68.5	10.4	0.2
13 years	100.0	18.6	72.3	8.9	0.2
14 years	100.0	18.4	72.6	8.8	0.2
15 years	100.0	18.3	75.2	5.9	0.6
16 years	100.0	18.8	76.3	4.9	—
17 years	100.0	17.3	74.4	8.1	0.2
	Standard errors				
Both sexes 12-17 years	...	0.43	0.68	0.45	0.08
12 years	...	1.14	1.36	0.84	0.08
13 years	...	1.03	1.44	1.02	0.20
14 years	...	0.81	1.53	0.92	0.12
15 years	...	1.05	1.29	0.76	0.16
16 years	...	0.98	1.79	1.23	0.12
17 years	...	1.43	1.91	1.09	0.10
Male 12-17 years	...	0.51	0.86	0.48	0.08
12 years	...	1.29	1.83	1.07	0.00
13 years	...	1.46	1.57	1.12	0.36
14 years	...	1.76	1.96	0.94	0.17
15 years	...	1.77	2.07	1.08	0.00
16 years	...	1.68	2.78	2.02	0.24
17 years	...	1.49	2.71	1.86	0.00
Female 12-17 years	...	0.87	0.94	0.62	0.10
12 years	...	2.12	2.14	1.33	0.18
13 years	...	1.38	2.02	1.46	0.17
14 years	...	1.64	2.57	1.67	0.17
15 years	...	1.89	2.26	0.92	0.33
16 years	...	1.57	1.88	1.03	0.00
17 years	...	2.11	1.96	1.27	0.22

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

Table 24. Number of youths per 1000 youths aged 12-17 whose teeth have been straightened, by sex and annual family income, with standard errors of the estimates: United States, 1966-70

Annual family income	Both sexes	Male	Female
	Number per 1,000 youths		
All incomes	107.0	96.4	117.8
Less than $3,000	19.9	21.0	18.9
$3,000-$4,999	34.5	34.1	34.9
$5,000-$6,999	63.4	47.5	78.8
$7,000-$9,999	99.7	75.8	127.6
$10,000-$14,999	136.0	128.2	143.3
$15,000 or more	291.5	271.8	313.3
Unknown	154.5	147.8	162.3
	Standard errors		
All incomes	6.90	7.21	8.35
Less than $3,000	4.52	10.25	10.25
$3,000-$4,999	5.73	7.13	9.34
$5,000-$6,999	6.36	11.08	8.29
$7,000-$9,999	7.71	9.48	13.22
$10,000-$14,999	16.10	17.95	18.24
$15,000 or more	29.93	28.55	39.45
Unknown	29.16	37.52	41.29

APPENDIX I

ASSESSMENT OF OCCLUSION AND TRAINING OF EXAMINERS

On the form used to record dental findings on sample youths examined during 1966-70, a recorder either wrote down the measurements obtained for various occlusal components or circled printed values corresponding to the measurements. The examination documents were reviewed daily for completeness and legibility. The form was processed on an IBM Optical Mark Page Reader, Model I, which entered the examination data directly on punchcards.

After the data recorded on the forms had been put on punchcards, they were transferred to magnetic tape. As the final step in data processing, an edit program was used to search for impossible codes and inconsistencies. Each record that failed an edit was printed out for review. A correction was made by the survey's dental advisers.

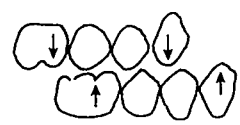
Procedures for Assessment of Occlusion

1. Buccal segment relation.—This assessment describes the anterior-posterior relation of the teeth in the lower arch with the teeth in the upper arch. Most often the score is based on the relation of the permanent upper and lower first molars. When the permanent molars were absent, not fully erupted, or misshaped because of extensive decay or fillings, the primary molars or the permanent canines and premolars were used to determine the buccal segment relation. For assessment purposes, the position of the upper cuspid is regarded in the same way that the position of the mesiobuccal cusp is when the upper first molar is present.

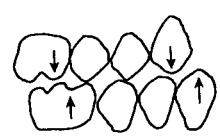
With the teeth resting together, the right and left sides are assessed separately. To enable a right-angle view of the area, a mouth mirror may be used. The schematic drawings that follow serve as a scoring guide.

A. Permanent molars.—Buccal Aspect—Right Side

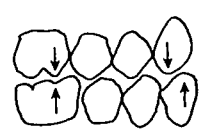
1. Mesial severe (more than cusp-to-cusp mesial).—A mesial positioning of the lower molar beyond a cusp-to-cusp deviation.



2. Mesial moderate (cusp-to-cusp mesial or less).—A mesial positioning of the lower molar resulting in a cusp-to-cusp relation.

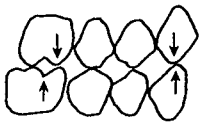


3. Normal.—Normal relation, mesiobuccal cusp of upper molar in the buccal groove of the lower molar.

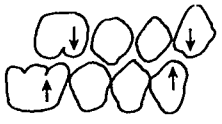


4. Distal moderate (cusp-to-cusp distal or less).—A distal positioning of the lower

molar resulting in a cusp-to-cusp relation.

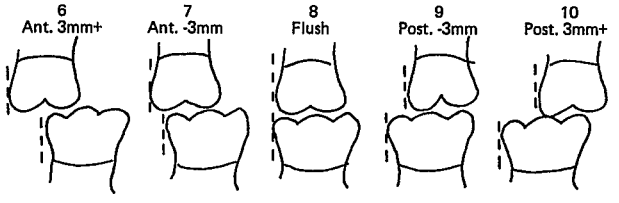


5. Distal severe (more than cusp-to-cusp distal).—A distal positioning of the lower molar beyond a cusp-to-cusp deviation.



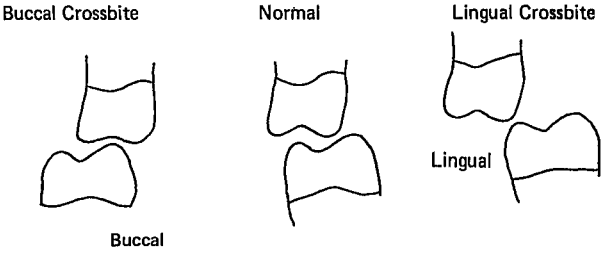
B. Primary molars.—The assessment is made by observing the position of the distal surface of the primary lower second molar in relation to the distal surface of the primary upper second molar. The schematic drawing that follows serves as a scoring guide.

Buccal Aspect—Right Side



Primary 1. Lower is anterior to upper by 3 mm. or more.
Primary 2. Lower is anterior to upper but less than 3 mm.
Primary 3. Lower is flush with upper.
Primary 4. Lower is posterior to upper but less than 3 mm.
Primary 5. Lower is posterior to upper by 3 mm. or more.

2. Posterior Crossbite.—This is a measure of buccal-lingual deviation in the bicuspid and molar areas. Both primary and permanent teeth are included in the appraisal. To simplify the assessment it is assumed that the upper tooth has deviated. The entire tooth must be deviated, not merely rotated, as far as or beyond a cusp-to-cusp relation (see drawings below). The scores that are recorded are the number of upper teeth in buccal crossbite and the number in lingual crossbite. The totals are entered on the form in the designated spaces.



3-4. Incisor relation.—This assessment is made only when the permanent central incisors, at least one upper and one lower, are present and fully erupted. When fully erupted permanent central incisors are not present, a mark is made in the "not applicable" space on the form.

A. Upper anterior overjet or lower anterior overjet.—With the teeth occluding, the distance from the most anterior labial surface of a permanent lower incisor to the most anterior labial surface of an upper incisor is measured with a Boley gauge. The measurement is made parallel to both the occlusal and the midsagittal planes. The measurements are rounded to the nearest whole millimeter and recorded in the appropriate box ("overjet" for overjet of the upper incisors and "mandibular protrusion" for overjet of the lower incisors). Since upper overjet and lower overjet are mutually exclusive, N.A. (not applicable) is marked for the one not present. An edge-to-edge bite is recorded as 0-0 for the mandibular protrusion box, N.A. for the overjet box, N.A. for overbite, 0-0 for openbite, and code 3 for the incisor vertical relation.

B. Anterior overbite or openbite.—The measurement, in millimeters, of the vertical overlap of the incisal edges of the upper incisors (overbite) or the vertical space between the incisal edges of the upper and lower incisors (openbite) is made with a Boley gauge.

When overlapping is present, a pencil mark is made on the permanent lower right or left central incisor to indicate the extent of overlap. The distance from the incisal edge to the pencil mark is measured, rounded to nearest whole millimeter, and entered on the form in the "overbite" space.

When openbite is present, the vertical space separating the incisal edges of the upper and lower central incisors is measured and that measurement is entered on the examination form in the "openbite" space.

When lower overjet occurs with anterior crossbite, N.A. is marked for openbite, overbite, and the vertical incisal relation.

When it is difficult to measure upper or lower overjet, edge-to-edge bite, or anterior crossbite because of the presence of rotated or displaced anterior teeth, the examiner uses his judgment to select the set of measurements and codes that best describe the vertical and horizontal incisor relations. When indicated, the condition is described on the examination form under "Remarks."

C. Incisor vertical relation.—This assessment is made in conjunction with the overbite or openbite measurement. When lower overjet is measured, the most applicable box is checked for item 18.

The appropriate code number is marked to describe the location of the line on the lower incisor (the incisal third, 0-1/3; the middle third, 1/3-2/3; the gingival third, 2/3-3/3). If the line would appear on tissue below the gingival margin of the lower incisor or if the lower incisors are in contact with the soft tissue of the palate [impinging overbite (E)], it is coded as *Tis* or *Imp. ob.*, respectively.

If an openbite is present, the code number 1, 2, or 3 is marked to correspond with the measurement recorded for openbite.

5. Malaligned teeth.—A count is made of the number of teeth rotated about 45° or displaced about 2 mm. from a presumed ideal alignment. Next, a count is made of the number of teeth rotated more than 45° or displaced more than 2 mm. from the ideal. In the upper arch, anterior teeth are counted before posterior teeth. The same procedure is repeated for the lower teeth. The totals for each segment are entered in the appropriate spaces on the form.

Calculation of Treatment Priority Index

Figure I reproduces a form on which the examination data are entered to calculate the Treatment Priority Index (TPI). Directions for its use follow:

1. Observe the first molar relation and place a check mark in the column heading that applies.
2. On the left-hand margin circle the appropriate measurement for the horizontal incisor relation. If this measurement is 2-4 mm., it is considered normal with weight zero.
3. On the left-hand margin also circle the appropriate score for vertical incisor relation and for tooth displacement. An upper incisor overbite from zero to two-thirds is considered normal with weight zero. Displacement scores of 0 and 1 are discarded with weight zero.
4. Find the appropriate weights for the first three items at the intersection of the row and column and enter them in the column on the right.
5. Transpose the constant for the designated column to the right.
6. Circle the appropriate scores for posterior crossbite, and transpose the weights to the right-hand column.
7. Add up the right-hand column to obtain the Treatment Priority Index.

Training Examiners

Each of the 6,757 sample youths who received dental examinations during 1966-70 was examined by one of seven dentists. The dentists included two senior examiners, designated 1 and 2, who trained and supervised the other examiners, designated 3-7.

Sample youths were not assigned randomly or equally to the various examiners. At most survey

FIRST MOLAR RELATION Choose appropriate column		(6) Distoclusion				Neutro	(7) Mesioclusion				Weights	Syndrome Type
		2 sides full c	1 side c to c and 1 side full	2 sides c to c or 1 side full	1 side c to c		1 side c to c	2 sides c to c or 1 side full	1 side c to c and 1 side full	2 sides full c		
Horizontal incisor relation	mm											
(1) Upper Overjet	9+	2.0	3.4	5.4	9.3	10+	9.3	5.4	3.4	2.0		Retrognathism
	9	1.4	2.5	4.0	6.9	10+	6.9	4.0	2.5	1.4		
	8	1.0	1.8	2.8	4.8	8.0	4.8	2.8	1.8	1.0		
	7	.6	1.1	1.8	3.0	5.1	3.0	1.8	1.1	.6		
	6	.4	.6	1.0	1.7	2.9	1.7	1.0	.6	.4		
2-4 mm. NORMAL Score 0	5	.2	.3	.4	.8	1.3	.8	.4	.3	.2		
	1	.2	.3	.4	.8	1.3	.8	.4	.3	.2		Prognathism
	0	.4	.6	1.0	1.7	2.9	1.7	1.0	.6	.4		
(2) Lower Overjet	1	.6	1.1	1.8	3.0	5.	3.0	1.8	1.1	.6		
	2	1.0	1.8	2.8	4.8	8.0	4.8	2.8	1.8	1.0		
	3	1.4	2.5	4.0	6.9	10+	6.9	4.0	2.5	1.4		
	3+	2.0	3.4	5.4	9.3	10+	9.3	5.4	3.4	2.0		
Vertical incisor relation												
(3) Overbite in crown thirds	Bite	2.9	3.8	4.8	6.2	8.0	6.2	4.8	3.8	2.9		Overbite
	3/3+	1.5	2.0	2.4	3.2	4.1	3.2	2.4	2.0	1.5		
	2/3-3/3	.5	.7	.9	1.1	1.5	1.1	.9	.7	.5		
0-2/3 NORMAL Score 0												
	<2	1.5	2.0	2.4	3.2	4.1	3.2	2.4	2.0	1.5		Openbite
	2-4	2.9	3.8	4.8	6.2	8.0	6.2	4.8	3.8	2.9		
(4) Openbite in mm.	4+	4.9	6.3	7.9	10+	10+	10+	7.9	6.3	4.9		
(10) Tooth displacement score												
Count teeth rotated about 45° or displaced about 2 mm.	2	.1	.1	.2	.3	.4	.3	.2	.1	.1		Is distoclusion and/or posterior crossbite max. to buccal
	3	.2	.3	.4	.7	1.1	.7	.4	.3	.2		
	4	.3	.5	.9	1.2	1.9	1.2	.9	.5	.3		
Count teeth rotated >45° or displaced more than 2mm x 2	5	.5	.8	1.2	1.9	3.0	1.9	1.2	.8	.5		
	6	.7	1.1	1.8	2.8	4.3	2.8	1.8	1.1	.7		
	7	1.0	1.5	2.4	3.9	5.9	3.9	2.4	1.5	1.0		
Total (0, 1 no score)	8	1.3	1.9	3.1	4.9	7.7	4.9	3.1	1.9	1.3		
	9	1.7	2.5	4.1	6.2	9.7	6.2	4.1	2.5	1.7		
	9+	2.0	3.0	4.9	7.7	10+	7.7	4.9	3.0	2.0		PRESENT → YES: Max. Expansion Syndrome; NO: Max. Collapse Syndrome
CONSTANT		5.17	3.95	2.72	1.50	0.27	1.50	2.72	3.95	5.17		
(8) Posterior Crossbite Count No. of teeth												
MAX. TO BUCCAL	No.	0	1	2	3	4	5	6	7	8	more	
	Weight	0	.1	.6	1.3	2.2	3.5	5.0	6.9	9.0	10	
MAX. TO LINGUAL	No.	0	1	2	3	4	5	6	more			
	Weight	0	.3	1.0	2.3	4.2	6.5	9.4	10			
SUM OF WEIGHTS IS TREATMENT PRIORITY INDEX												

Figure I. Calculating form for deriving the Treatment Priority Index.

locations youths were examined by only one dentist—3, 4, 5, 6, or 7. At 14 of 40 locations, however, a small subsample was examined by either 1 or 2 or, as occurred at two locations, by both 1 and 2. Thus the senior dentists examined relatively few sample youths. The number and

percent distribution of youths examined by each dentist follow:

Dentist	Number of sample youths examined	Percent distribution of sample youths examined
7 dentists	6,757	100.0
1	236	3.5
2	302	4.5
3	1,055	15.6
4	448	6.6
5	1,689	25.0
6	1,472	21.8
7	1,555	23.0

Most examinations completed by the senior dentists resulted from a planned series of replicate examinations. As a rule, the findings of the senior dentists were included in the sample youth's examination record, and the findings of the dentists with whom the senior dentists were paired were kept separate. The primary aim of the replicate examinations was to correct any examiner divergence from the accepted examination procedures.

Throughout the replicate examinations, the senior dentist completed his examination first, while the other dentist was absent, and dictated his findings to a trained recorder. Then the other dentist completed his examination, and the senior dentist recorded the findings. Appreciable interexaminer differences as well as any procedure that diverged from the accepted one were discussed and, if indicated, either resolved or corrected while the sample youth was still present. The findings originally recorded by the examiner were not altered.

To indicate the level of agreement on the TPI and its component measures, interexaminer differences are shown in table I. The direction of disagreement that occurred is shown by positive or negative numbers. A positive number indicates that findings of the senior dentists were higher than those of the other dentists, and a negative number indicates the opposite.

The replicated TPI scores of the senior dentists and of the other dentists were exactly the same for about 27 percent of the examinations. Further, about 55 percent of the scores differed by no more than 1.0. Agreement on the component measures of the TPI ranged from a high of about 95 percent for buccal crossbite to a low of 24 percent for tooth displacement. But of the replicated tooth displacement scores, only about 54 percent differed by more than 1.0.

The data do not indicate that the senior dentists tended to assign either generally higher or lower scores than the other dentists. Three of the distributions in table I have a higher percentage of positive than of negative scores, while the reverse is true for the four other distributions. The percentage of positive scores for openbite was much higher than the percentage of negative scores, but only 11 of the sample youths had openbites.

The results of the replicate examinations indicate that the level of examiner agreement was not as high during the survey of youths as it was during the survey of children.[6] The lower level of agreement during the survey of youths is at least partly due to the fact that the variability of tooth displacement scores, and therefore of TPI scores, is greater among youths than among children. For instance, about 26 percent of U.S. youths aged 12-17 have tooth displacement scores greater than 7, but only about 2 percent of children 6-11 have scores that high. And about twice as many youths (25.1 percent) as children (11.4 percent) have TPI scores greater than 7. Thus there is a greater probability of wider examiner disagreement occurring for these two measures during the examinations conducted on youths than during those conducted on children.

FORTRAN Program for Computing TPI Scores

TPI scores may be computed by using either the manual calculating form (figure I) or the computer program printed below, which closely follows the arithmetic of the form. Another computer program, which appears in an earlier publication,[5] has a printing error in statement 20; it produces somewhat different results than the following program.

The subroutine TPIS is called from a main program which reads in the data and prints the results. Input is as follows:

A. Set-up and title card
   Col. 1 punch 1 if congenitally lost tooth scores are to be included

Table I. Percent distribution of interexaminer differences in the Treatment Priority Index (TPI) and its components on replicate dental examinations: Health Examination Survey, 1966-70

Difference in score (senior dentist minus other dentist)	TPI	Component score					
		Posterior crossbite		Upper anterior overjet[1]	Overbite	Openbite	Tooth displacement
		Lingual	Buccal				
Mean difference	0.22	0.10	-0.02	-0.06	-0.03	0.18	0.12
Standard deviation of the difference	2.73	0.67	0.29	0.79	0.78	0.94	2.67
Number of replicate examinations	391	399	399	384	375	11	408
	Percent distribution						
All replicate examinations	100.0	100.0	100.0	100.0	100.0	100.0	100.0
-6 or less	3.1	–	–	–	–	–	1.5
-5	1.5	–	–	–	–	–	1.5
-4	1.3	–	–	0.3	–	–	4.4
-3	4.6	–	–	0.3	0.3	–	7.6
-2	10.0	0.5	0.5	3.1	1.9	9.1	11.8
-1	13.3	3.2	3.0	18.2	17.9	9.1	11.5
0	26.3	89.7	94.7	60.7	62.7	36.4	24.0
1	15.1	3.0	1.3	15.4	16.3	45.4	10.3
2	8.7	1.3	0.5	1.6	0.8	–	12.0
3	6.4	1.3	–	0.5	0.3	–	6.4
4	3.8	0.8	–	–	–	–	3.7
5	2.1	–	–	–	–	–	1.2
6 or more	3.8	0.2	–	–	–	–	4.2

[1]Too few youths with a lower overjet measurement were included in the replicate examinations to permit an assessment of the interexaminer agreement for the component score.

in the calculations. If not, leave blank.
Col. 2-4 blank
Col. 5-80 any alphanumeric message or title

B. Punching format for cards
Col. 1, 2 upper anterior overjet in mm
Col. 3 lower anterior overjet in mm
Col. 4 overbite in crown thirds
Col. 5 openbite in mm
Col. 6 number of congenitally missing incisors
Col. 7 distoclusion score
Col. 8 mesioclusion score
Col. 9, 10 number of teeth in posterior crossbite maxilla to buccal
Col. 11, 12 number of teeth in posterior crossbite maxilla to lingual
Col. 13, 14 tooth displacement score

C. End of file card ('99' in col. 1, 2)

```
C       PGM TO CALL SUBROUTINE TPIS
C       READS ORTHODONTIC TREATMENT DATA FROM MARK SENSE CARDS.
      DIMENSION IDAT(10), NAME(19)
      COMMON/LABEL/ TAB(5,4)
      READ (5, 1) MSK, (NAME(L), L=1,19)
1     FORMAT (A1, 3X, 19A4)
      WRITE (6, 100) (NAME(L), L=1,19)
100   FORMAT (' ', 19A4)
2     READ (5, 3) (IDAT(L), L=1,10)
3     FORMAT (I2, 6I1, 3I2)
      IF (IDAT(1) - 99) 10, 8, 8
C       99 IN FIRST 2 COLS OF DATA CARD CALLS STOP
10     IF (MSK) 5,5,4
C     SET FLAG IF CONGENIATALLY LOST TEETH ARE TO BE USED.
4     M = 1
      GO TO 6
5     M = 0
6     T = 0.0
      CALL TPIS (IDAT, T, M)
      WRITE (6, 7) IDAT, T
7     FORMAT (1X, 10I3, F8.2)
      GO TO 2
8     STOP
      END
      SUBROUTINE TPIS (MEAS, TPI, M5)
C       THIS SUBRTN CALCULATES TPI INDEX WHEN CALLED FROM MAIN.
C       THIS SUBROUTINE FOLLOWS THE MANUAL FORM
C       MEAS IS A VECTOR OF TEN ORAL MEASUREMENTS ASSEMBLED BY MAIN
C       MEAS(1) UPPER INCISOR OVERJET IN MM
C       MEAS(2) LOWER INCISOR OVERJET IN MM
C       MEAS(3) INCISOR OVERBITE IN LOWER CROW THIRDS, 1, 2, 3
C       4 IS GINGIVAL, 5 IS IMPINGING OF LOWERS ON PALATE
C       MEAS(4) INCISOR OPENBITE IN MM
C       MEAS(5) NO. OF CONGEN. MISSING INCISORS 0, 1, 2, 3
C       MEAS(6) DISTOCCLUSION SCORE0-4
C       MEAS (7) MESIOCCLUSIONSCORE0-4
C       MEAS(8) POST XBITE, MAX TO BUC
C       MEAS(9) POST XBITE, MAX TO LING
C       MEAS(10) TOOTH DISPLACEMENT COUNT
      DIMENSION MEAS(10), A(10)
      COMMON/LABEL/ TAB(5,4)
      DO 1 J = 1, 10
1     A(J)=MEAS(J)
      K = MEAS(6) + MEAS(7) + 1
      H = TAB(K,4) + ((A(1) - A(2) - 3.0)**2) * TAB(K,1)
      IF (H-10.0) 3, 3, 2
2     H = 10.0
3     IF (A(4) - 1.0) 9, 4, 4
4     IF (A(4) - 2.0) 5, 6, 6
5     A(4) = 1.0
      GO TO 9
6     IF (A(4) - 4.0) 7, 8, 8
7     A(4) = 2.0
      GO TO 9
8     A(4) = 3.0
9     V = ((A(3) - A(4) - 1.5)**2) * TAB(K,2)
      IF (V -10.0) 11, 11, 10
10    V = 10.0
11    X = ((A(8)**2) * 0.14) + ((A(9)**2) * 0.26)
      IF (X - 10.0) 13, 13, 12
12    X = 10.0
13    D = (A(10)**2) * TAB(K,3)
      IF (D - 10.0) 15, 15, 14
14    D = 10.0
15    TPI = H + V + X + D
      IF (M5) 19, 19, 16
16    IF (A(5)) 19, 19, 17
17    B = A(5) + 7.0
      IF (B-TPI) 19, 19, 18
18    TPI = B
19    RETURN
      END
      BLOCK DATA
      COMMON/LABEL/ TAB(5,4)
C       THE TAB ARRAY IS INITIALIZED BY COLUMNS
      DATA TAB/ 0.31, 0.19, 0.11, 0.07, 0.04,
     1          0.67, 0.49, 0.39, 0.31, 0.24,
     2          0.12, 0.08, 0.05, 0.03, 0.02,
     3          0.27, 1.50, 2.72, 3.95, 5.17/
C
      END
```

APPENDIX II

DEMOGRAPHIC AND SOCIOECONOMIC TERMS

Age.—The age recorded for each youth was the age at last birthday on the date of examination. The age criterion for inclusion in the sample was defined as age at time of interview. Since the examination usually took place 2 to 4 weeks after the interview, some of those who were 17 years old at the time of the interview had become 18 years old before they were examined. There were 23 such cases. In the adjustment and weighting procedures used to produce national estimates, these 23 were included in the 17-year-old group.

Race.—The race classification recorded by observation was confirmed whenever possible by comparison with the race classification on the youth's birth certificate. Race was recorded as "white," "black," or "other." The last category included American Indian, Chinese, Japanese, and all races other than white or black. Mexican persons were included with "white" unless definitely known to be American Indian or of race other than white. Blacks and persons of mixed black and other parentage were recorded as "black."

Family income.—The income recorded was the total income received during the past 12 months by the head of the household and all other household members related to the head by blood, marriage, or adoption. This income was the gross cash income (excluding pay in kind, e.g., meals, living quarters, or supplies provided in place of cash wages) except in the case of a family with its own farm or business, in which case net income was recorded. Also included in the family income figure were allotments and other money received by the family from a member of the Armed Forces whether he was living at home or not.

Education of head of household.—The highest grade that had been completed in school was recorded. The only grades counted were those that had been completed in a regular graded school where persons were given formal education—either public or private school, either day or night school, and either full-time or part-time attendance. A "regular" school is one that advances a person toward an elementary or high school diploma or a college, university, or professional school degree. Education in vocational, trade, or business schools outside the regular school system was not counted in determining the highest grade of school completed.

Geographic region.—For purposes of stratification, the United States was divided into four broad geographic regions of approximately equal population. These regions, which correspond closely to those used by the U.S. Bureau of the Census, were as follows:

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

APPENDIX III

STATISTICAL NOTES

The Survey Design

The sample designs for the first three programs, or Cycles I-III, of the Health Examination Survey have been similar, in that each has been a multistage, stratified probability sample of clusters of households in land-based segments. The successive elements for this sample design are primary sampling unit (PSU), census enumeration district (ED), segment (a cluster of households), individual household, eligible youth, and finally, the sample youth.

The 40 sample areas and the segments utilized in the design of Cycle III were the same as those in Cycle II. Previous reports describe in detail the sample design used for Cycle II and in addition discuss the problems and considerations given to other types of sampling frames and whether or not to control the selection of siblings.[3,22]

Requirements and limitations placed on the design for Cycle III, similar to those for the design for Cycle II, were that:

1. The target population be defined as the civilian, noninstitutional population of the United States, including Alaska and Hawaii, in the age range of 12 through 17 years, with the special exclusion of children residing on reservation lands of the American Indians. The latter exclusion was adopted as a result of operational problems encountered on these lands in Cycle I.
2. The time period of data collection be limited to about 3 years for each cycle and the length of the individual examination within the specially constructed mobile examination center be between 2 and 3 hours.
3. Ancillary data be collected on specially designed household, medical history, and school questionnaires, and from copies of birth certificates.
4. Examination objectives be related primarily to factors of physical and intellectual growth and development.
5. The sample be sufficiently large to yield reliable findings within broad geographic regions and population density groups as well as within age, sex, and limited socioeconomic groups for the total sample.

The sample was drawn jointly with the U.S. Bureau of the Census, beginning with the 1960 decennial census list of addresses and the nearly 1,900 PSU's into which the entire United States was divided. Each PSU is either a standard metropolitan statistical area (SMSA), a county, or a group of two or three contiguous counties. These PSU's were grouped into 40 strata, with each stratum having an average size of about 4.5 million persons. Stratification was accomplished so as to maximize the degree of homogeneity within strata with regard to the population size of the PSU's, degree of urbanization, geographic proximity, and degree of industrialization. The 40 strata were then classified into four broad geographic regions of 10 strata each and then within each region, cross-classified by four population density classes and classes of rate of population change from 1950 to 1960. Using a modified Goodman-Kish controlled-selection technique, one PSU was drawn from each of the 40 strata.

Generally, within each PSU, 20 census enumeration districts were selected, with the probability of selection of a particular ED proportional to its population in the age group 5-9

years in the 1960 census, which by 1966 approximated the target population for Cycle III. A similar method was used for selecting one segment (a smaller cluster of households) in each ED. Because of the approximately 3-year time interval between Cycle II and Cycle III, the Cycle III sampling frame was updated for new construction and to compensate for segments where housing was partially or totally demolished to make room for highway construction or urban redevelopment. Each of the resulting 20 segments within a PSU was either a bounded area or a cluster of households (or addresses). All youths in the appropriate age range who resided at the address visited were eligible for inclusion in the sample. Operational considerations made it necessary to reduce the number of prospective examinees at any one location to a maximum of 200. When the number of eligible youths in a particular location exceeded this number, the "excess" eligible youths were deleted from the sample through a systematic sampling technique. Youths who were not selected as sample youths in the Cycle III sample, but who had been examined in Cycle II, were scheduled for examination if time permitted and will be included in special longitudinal analyses. In addition, a twin who was deleted from the Cycle III sample was also scheduled for examination, as in Cycle II, to provide data on twins for future analysis. These data are not included in the report as part of the national probability sample of youths.

The sample was selected in Cycle III, as it had been for the children in Cycle II, to contain proportional representation of youths from families having only one eligible youth, two eligible youths, and so on, so as to be representative of the total target population. However, since households were one of the elements in the sample frame, the number of related youths in the resulting sample is greater than would have resulted from a design that sampled youths 12-17 years without regard to household. The resulting estimated mean measurements or rates should be unbiased, but their sampling variabilities will be somewhat greater than those from a more costly, time-consuming, systematic sample design in which every kth youth would be selected.

The total probability sample for Cycle III included 7,514 youths representative of the approximately 22.7 million noninstitutionalized U.S. youths of 12-17 years. The sample contained youths from 25 different States, with approximately 1,000 in each single year of age.

The response rate in Cycle III was 90 percent, with 6,768 youths examined out of the total sample. These examinees closely represented the population from which they were drawn with respect to age, sex, race, region, population density, and population growth in area of residence. Hence it appears unlikely that nonresponse could bias the findings appreciably.

Reliability

The methodological strength of the survey derives especially from its use of scientific probability sampling techniques and highly standardized and closely controlled 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.

Of the total sample, 746 were not examined. Findings for nonexamined youths were imputed by attributing to them the characteristics of comparable examined youths. The specific procedure used consisted in inflating the sampling weight for each examined person to compensate for nonexamined sample persons at the same survey location and in the same age-sex group.[2] It is impossible, of course, to be certain that the average number of, for instance, malaligned teeth per person is the same for the examined and the nonexamined groups.

Only 11 examined sample youths did not receive a dental examination. Thus, dental findings were recorded for 6,757 youths who are classified in table II by age and sex; the estimated U.S. population aged 12-17 years is shown in table III by age, race, and sex.

Dental findings for the 11 youths were supplied by forming pools of examined youths

Table II. Number of sample youths who received a dental examination, by age and sex: Health Examination Survey, 1966-70

Age	Male	Female
	Number of sample youths	
12-17 years	3,538	3,219
12 years	642	545
13 years	625	582
14 years	618	586
15 years	612	503
16 years	554	535
17 years	487	468

Table III. Estimated number of noninstitutionalized civilian youths aged 12-17 years, by race, sex, and age: United States, 1966-70

Age	Total[1]	White		Black	
		Male	Female	Male	Female
	Number in thousands				
12-17 years	22,692	9,929	9,623	1,496	1,527
12 years	4,002	1,747	1,685	280	272
13 years	3,952	1,729	1,667	262	275
14 years	3,852	1,686	1,633	256	266
15 years	3,751	1,646	1,594	241	235
16 years	3,625	1,594	1,542	231	243
17 years	3,510	1,528	1,502	225	237

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

with demographic characteristics that matched those of the unexamined youths. One youth was randomly selected from each of the 11 pools, and the missing measurements were assumed to be the same as those recorded for the randomly selected, examined youths.

At the close of the survey there were 349 sample youths whose occlusal status had not been fully recorded. When a sample youth's record had only one occlusal measurement missing, the measurement was imputed. The imputed value was randomly selected from a pool of the records of youths with occlusal characteristics the same as or similar to those of the youths with the missing measurements.

Sampling and Measurement Error

Several references have been made in this report to efforts to evaluate both bias and the 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 all elements in the universe.

The task of presenting sampling errors for a study of the type of the Health Examination Survey is complicated by at least three factors: (1) measurement error and "pure" sampling error are confounded in the data—it is not easy to find a procedure that will either completely include both or treat one or the other separately, (2) the survey design and estimation procedure are complex and accordingly require computationally involved techniques for the calculation of variances, and (3) thousands of statistics come from the survey, many for subclasses of the population for which there are small numbers of sample cases. Estimates of sampling error are obtained from the sample data and are themselves subject to sampling error, which may be large when the number of cases in a cell is small or, occasionally, even when the number of cases is substantial.

Estimates of approximate sampling variability for selected statistics used in this report are included in the detailed tables. These estimates have been prepared by a replication technique that 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 the usual practice, the interval estimate for any statistic may be considered the range within one standard error of the tabulated statistics with 68-percent confidence or the range within two standard errors of the tabulated statistic with 95-percent confidence.

Expected Values

In tables 14-16, the actual mean Treatment Priority Index (TPI) per person for each of

various demographic variables is compared with the expected value. The computation of expected values was done as follows:

> Suppose it is estimated that in a subgroup there are N_i persons in the ith age group (i-1, 2, . . . , 7; sum of N_i=N). Suppose it is estimated that the mean TPI per person for the United States in the ith age-sex group is X_i. Then the expected mean TPI for the subgroup 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 that 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 youths and lower values for older youths than the values 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 of the specific data, including data not presented in this report; but it must be recognized that balancing such evidence is a qualitative exercise rather than a quantitative one. The standard error of the difference between an actual and expected value may be approximated by the standard error of the actual value.

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; it merely indicates that the true quantity is small. Such numbers have sometimes been included to convey an impression of the overall story of the table.

Tests of Significance

Tests of significance for percent and mean statistics were performed in two ways. The first was to determine if the difference between two estimated averages was equal to or greater than two times the standard error of the difference. The test assumes, in accordance with usual practice, that a 68-percent confidence interval ranges within one standard error of the tabulated statistics and that a 95-percent confidence interval ranges within two standard errors. The latter is used as the level of significance in this report. An approximation of the standard error of the difference $d = \dot{X} - y$ of two statistics x and y is given by the formula

$$S_d = (S_x^2 + S_y^2)^{1/4}$$

where S_x and S_y are standard errors, respectively, of x and y.

For example, table 13 shows that the average TPI is 5.2 for white males aged 12 and 5.4 for white males aged 17; the corresponding standard errors are 0.27 and 0.20, respectively. The formula yields a standard error of the difference of $S_d = .3360$. Since the observed difference ($d = 0.2$) is less than twice the standard error of the difference, it may be concluded that the mean TPI for white males aged 12 is not significantly lower than that for white males aged 17.

The second test was to determine whether the difference between the estimated actual and expected values was at least two times the standard error of the actual value. For example, for females from families with less than $3,000 yearly income, the difference between the actual and expected mean TPI scores is 0.5 (table 14), and the standard error of the actual value is 0.21. Since the difference is more than twice the standard error, it is statistically significant.

The criterion for significance among geographical regions was more stringent than that for the other demographic characteristics. To determine whether the difference between estimated averages for youths in any two of the four geographic regions was significant, the difference was required to be at least 2.5 times the standard error.

APPENDIX IV

THE RELATION BETWEEN TPI SCORES AND ORTHODONTISTS' RATINGS OF THE SEVERITY OF MALOCCLUSION

The Division of Health Examination Statistics conducted a special study in 1967 to find out how well orthodontists' appraisals of the severity of malocclusion in children agree with the levels of severity indicated by the Treatment Priority Index (TPI). The study was made possible by the cooperation of the American Association of Orthodontists; the Bureau of Dental Health, New York State Department of Health; and thirty practicing, Board-qualified orthodontists who personally took part in the study. The National Center for Health Statistics is especially grateful to Dr. J. A. Saltzman, a former president of the American Association of Orthodontists, for his interest in the study and his support of it.

The clinical judgments used in developing the estimating equation of the TPI were made by two orthodontists who examined casts of the teeth of 375 twelve-year-old children residing in three Canadian communities.[5] The present study was undertaken in 1967 in an attempt to answer the following questions: How well do TPI scores reflect the severity of malocclusion present in youths 15-18 years old? Are the weights and constants developed to measure the severity of malocclusion in the Canadian children also suitable for measuring the severity of malocclusion in the U.S. population which, unlike that of the three Canadian communities, is composed of children of many races and with many ethnic backgrounds? And, lastly, how well do the clinical judgments of two orthodontists, staff members of the same orthodontic research project, represent the judgments of U.S. orthodontists, who are trained in many schools and practice in various parts of the country?

To begin to answer those questions, plaster casts of the teeth of some 1,400 youths were borrowed by the Division of Health Examination Statistics from the New York Bureau of Dental Health. The youths had been randomly selected from a sampling frame comprising all students enrolled during 1963 in grades 10 through 12 in the public senior high schools of upstate New York. The schools were stratified according to their location—metropolitan or nonmetropolitan—and the students were sampled to represent the populations enrolled in both groups of schools.[8]

Impressions of the sample students' teeth were taken and the bites were registered in wax. Pretreatment casts were obtained for most of those who either had received orthodontic treatment or were receiving it at the time of the study. The final study group consisted of 1,413 youths, 96.6 percent of the total sample.

After plaster casts of the impressions had been poured and finished, they were examined independently by two practicing, Board-qualified orthodontists. Each was instructed to take certain measurements on the casts and to record them. Following his examination of each set of casts, he was asked to make the clinical judgment whether or not the youth's malocclusion was so severe that he would be eligible for orthodontic treatment under the State-aid-to-county dental rehabilitation program. When the judgments of the two orthodontists differed, they jointly reexamined the set of casts in

question, and discussed the case until they came to an agreement.

When the casts were made available for the present study, they were randomly numbered and laid out. One or the other of the dental advisers of the Division of Health Examination Statistics measured each set of casts, and the occlusal components that are needed to calculate the TPI scores were recorded. In all, 1,379 casts were measured by the two advisers, and 114 of them were measured by both advisers. The measurements were sent to Dr. Robert M. Grainger, who calculated the TPI scores.

Arrangements were made through the American Association of Orthodontists for 30 practicing, Board-eligible orthodontists from 15 States to examine the casts. The casts were laid out on tables in a large room at the site of the Association's annual meeting in 1967. The following instructions had previously been sent to the orthodontists that participated in the study.

1. Examine each set of casts quickly but carefully to determine the degree of handicapping malocclusion that is present.
2. Base your appraisal on how severely health, function, and esthetics may be impaired. Only the seriousness of the problem and the urgency of treatment, not the difficulty or cost of correction, should enter into your judgment.
3. Express your judgment of the degree of handicap by assigning a number from 0 through 10. A suggested interpretation of the scale is shown below:

Scale of severity	Interpretation
0	Virtually classic normal occlusion
1	Minor variations for which treatment need is slight
2	
3	
4	Definite malocclusion but treatment is a matter of choice
5	
6	
7	Severe handicap for which treatment is highly desirable
8	
9	
10	Very severe malocclusion for which treatment is mandatory

Before each orthodontist began to examine the study casts, one of the Division's dental advisers reviewed and discussed with him the instructions he was to follow. He then was asked to practice the procedure by grading 28 casts randomly removed from the study casts. Finally, he examined about 50 study casts and graded the severity of malocclusion that, in his judgment, each represented. The severity rating he assigned to each set of casts was written down by a recorder.

The casts were assigned to each orthodontist in such a way that half of them were graded by a second orthodontist and the other half by a third orthodontist. For example, orthodontist 1 started with cast 1 and finished with cast 50. A second orthodontist graded casts 51 through 100, and a third one graded casts 25 through 75. Thus, when the last orthodontist had graded the casts assigned to him, there were 30 sets of replicated measurements.

After all data for the study had been collected, they were transferred to a magnetic tape. The information on the tape included the following: the severity scores of the 30 orthodontists (two for each of 1,379 casts), the TPI scores based on the two dental advisers' measurements (one score for each of 1,265 casts and two scores for each of 114), and codes indicating whether or not the malocclusion of each of the 1,379 youths was so severe that he would have been eligible for treatment under the New York State dental rehabilitation program, if he had met certain other requirements.

Correlation coefficients were computed for the paired orthodontists' ratings and for the replicated TPI scores. The coefficients for the orthodontists' ratings ranged from a low of 0.41 to a high of 0.85, with the median 0.69. The coefficient for the replicated TPI scores was 0.85.

The number and percent distributions of the

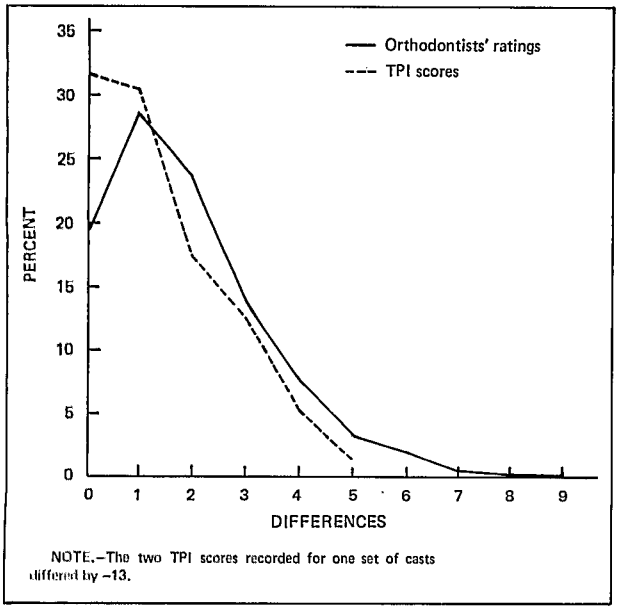


Figure II. Percent distribution of the differences between 1,379 paired orthodontists' ratings and between 114 replicated TPI scores, according to the size of the differences.

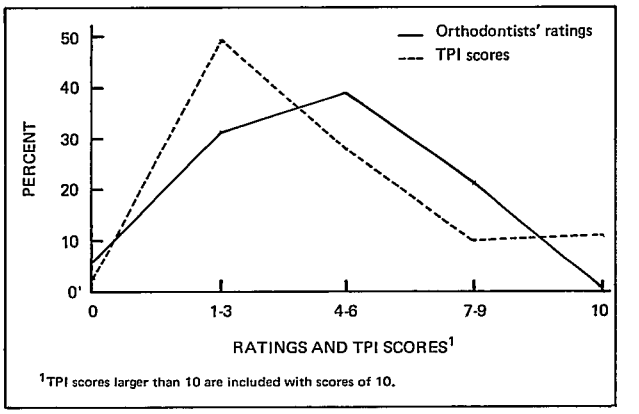


Figure III. Percent distribution of average orthodontists' ratings and of TPI scores of 1,379 casts by specified intervals: Health Examination Survey, 1967.

differences between the paired orthodontists' ratings and of the differences between the replicated TPI scores are shown in figure II. A comparison of both the data and the correlation coefficients suggests that TPI scores are more

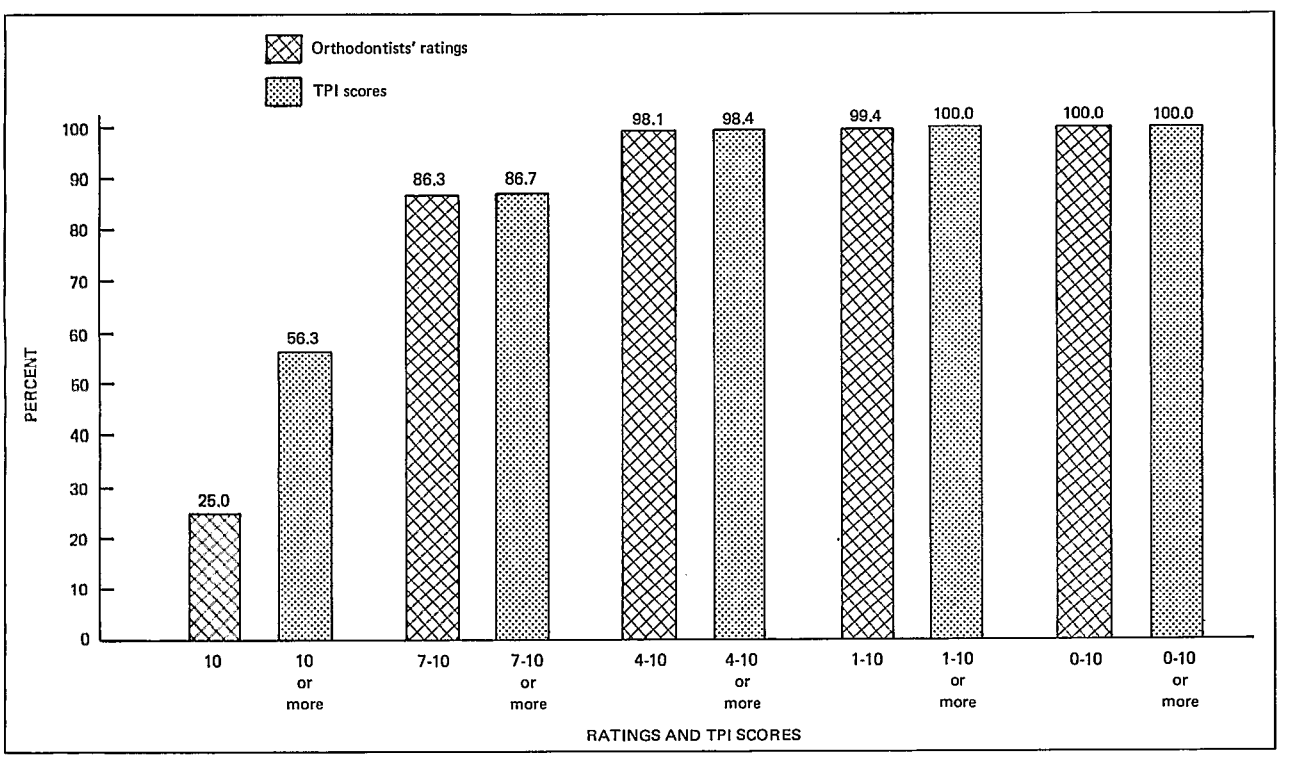


Figure IV. Percent of 182 children classified in 1962 New York study as having severe handicapping malocclusions, according to specified ranges of the severity ratings of orthodontists and of TPI scores: Health Examination Survey, 1967.

highly reproducible than orthodontists' severity ratings. About one-third of the replicated TPI scores, but only about one-fifth of the replicated orthodontists' ratings, were exactly the same. Furthermore, about two-thirds of the scores, but only about one-half of the ratings, differed by no more than one point. The average difference between the replicated TPI scores was 1.4, or 0.4 less than that between the replicated orthodontists' ratings.

The percent distributions both of the averages of all paired orthodontists' ratings and of all TPI scores are shown in figure III. The averages of the two orthodontists' ratings for each cast were used because they are generally more representative of orthodontic opinion than an individual orthodontist's ratings.

Correlation of the TPI scores with the average of the orthodontists' ratings gave a coefficient of 0.62. The coefficients for the scores with the individual orthodontists' ratings were 0.57 and 0.55. The smallness of the differences between the coefficient for the scores with the average ratings and the median coefficient for the paired orthodontists' ratings (0.69 minus 0.62) suggests that orthodontists can reproduce other orthodontists' ratings little better than the TPI can.

In the earlier New York study, 204 sample youths (14.4 percent) were found to have malocclusions so "handicapping" that the youths would have been eligible for treatment under the dental rehabilitation program. The present study included casts of the teeth of 182 of those youths. Figure IV shows the orthodontists' severity ratings and the TPI scores that were recorded for the 182 casts. It will be seen that 56 percent of the TPI scores were 10 or more—upward of twice the percentage the orthodontists graded 10. On the other hand, 75.8 percent of all casts graded 10 by the orthodontists, but only 65.4 percent of the ones with TPI scores of 10 or more, were those of the eligible youths (table IV).

In summary, the findings indicate that the clinical judgments of orthodontists of the severity levels of malocclusion represented by plaster casts of the teeth of youths are correlated almost as highly with TPI scores recorded for the same casts as they are with replicated ratings by other orthodontists. They further suggest that dentists who have been carefully and uniformly taught to measure the occlusal variables used to calculate TPI scores can reproduce each other's scores better than orthodontists can reproduce the severity ratings of other orthodontists. And, finally, the Treatment Priority Index, compared with the severity ratings of the orthodontists, more efficiently identified the casts found in the earlier New York study to represent very severe "handicapping" malocclusion. That is, 86 percent of those casts were given both TPI scores and orthodontists' ratings of 7 or more, and 98 percent were given both scores and ratings of 4 or more. But of the casts found not to represent very severe malocclusion, only 11.9 percent had TPI scores of 7 or more and only 41.4 percent had scores of 4 or more. On the other hand, 22.0 percent of the same casts were graded 7 or more by the orthodontists and 59.6 percent were graded 4 or more.

Table IV. Number and percent distribution of 1,379 casts by orthodontic treatment approved (New York), according to specified ranges of severity ratings of orthodontists and of Treatment Priority Index (TPI) scores: Health Examination Survey, 1967

Malocclusion severity scale	Orthodontic treatment approved (New York)			
	Yes	No	Yes	No
	Number		Percent distribution	
Orthodontists' ratings				
Total	364	2,394	...	...
0	2	230	0.9	99.1
1-3	5	738	0.7	99.3
4-6	43	899	4.6	95.4
7-9	223	498	30.9	69.1
10	91	29	75.8	24.2
TPI scores				
Total	182	1,197	...	...
0	0	31	0.0	100.0
1-3	3	670	0.4	99.6
4-6	21	354	5.6	94.4
7-9	56	88	38.9	61.1
10 or more	102	54	65.4	34.6

Thus it would seem that the TPI is at least as accurate as orthodontists' judgments are in *screening* a large population for very severe cases of malocclusion, and using it instead of orthodontists' judgments would result in fewer "false positives."

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