

John C. Greene,* D.M.D., M.P.H.,
and Jack R. Vermillion,† M.P.H.,
San Francisco, Calif.

THE SIMPLIFIED ORAL HYGIENE INDEX

The Oral Hygiene Index, a method for classifying oral hygiene status of population groups, has been simplified. Although the Simplified Oral Hygiene Index does not possess as great a degree of sensitivity as the original Index, it offers a more rapid method for evaluating oral cleanliness of population groups. It differs from the original Index in the number of tooth surfaces scored, the method of selecting surfaces to be scored, and scores which can be obtained. For the Simplified Oral Hygiene Index, only six surfaces (from four posterior and two anterior teeth) are examined for debris and calculus, whereas 12 surfaces are examined for the Oral Hygiene Index. When more detail about oral cleanliness is required than can be provided by the Simplified Oral Hygiene Index, either the original Index or the all surfaces method can be used.

dental epidemiology and program evaluation.

Though sensitive, simple and useful, the Oral Hygiene Index nevertheless requires the user to make more decisions and to spend more time in arriving at his evaluation of an individual's oral cleanliness than is always warranted. Therefore, an effort was made to develop another equally sensitive index which would reduce both the number of decisions required on the part of the examiner and the time required for the inspection. After considerable trial and error, another index was developed. This Index, named the Simplified Oral Hygiene Index, (OHI-S), and its effectiveness in assessing oral hygiene status are described in this report.

The Simplified Oral Hygiene Index differs from the original OHI in the number of tooth surfaces scored (6 rather than 12), the method of selecting the surfaces to be scored, and the scores which can be obtained. The criteria used for assigning scores to the tooth surfaces are the same as those used for the OHI. The OHI-S, like the OHI, has two components, the Debris Index (DI-S) and the Calculus Index (CI-S). Each of these indexes, in turn, is based on numerical determinations representing the amount

The original Oral Hygiene Index¹ (OHI) was depicted as "a sensitive, simple method for assessing group or individual oral hygiene quantitatively." Used by many people since its introduction, the Index has proved to be a useful tool in

Table 1 • Range of scores by age group for debris, calculus and oral hygiene (debris and calculus) obtained by each of three methods of assessment in 232 subjects from Suitland, Md., and Huntington, W. Va.

Oral hygiene component and method of assessment	Age group					
	10-19	20-29	30-39	40-49	50-59	60 & over
No. of persons examined	85	30	51	29	25	12
Debris						
6 surfaces method	0.3-2.8	0.5- 3.0	0.0- 3.0	0.0- 3.0	0.5- 3.0	0.8- 3.0
12 surfaces method	0.8-5.2	2.3- 6.0	0.5- 6.0	0.7- 6.0	1.5- 5.7	2.2- 6.0
All surfaces method	0.4-4.5	1.0- 5.9	0.2- 5.8	0.4- 5.7	1.1- 4.8	1.1- 6.0
Calculus						
6 surfaces method	0.0-2.0	0.0- 3.0	0.0- 3.0	0.0- 3.0	0.0- 3.0	0.3- 3.0
12 surfaces method	0.0-2.8	0.2- 5.8	0.2- 6.0	0.8- 6.0	0.0- 6.0	0.7- 6.0
All surfaces method	0.0-2.2	0.1- 5.8	0.1- 5.9	0.5- 6.0	1.0- 5.6	0.4- 6.0
Oral hygiene						
6 surfaces method	0.5-4.5	0.7- 6.0	0.2- 6.0	0.0- 6.0	0.5- 6.0	1.1- 6.0
12 surfaces method	1.0-7.9	2.8-11.8	0.9-11.5	1.9-11.5	3.0-11.7	3.0-12.0
All surfaces method	0.5-6.7	1.3-11.4	0.3-11.3	1.3-11.2	2.6- 9.7	2.6-12.0

of debris or calculus found on six pre-selected tooth surfaces.

SELECTION OF TOOTH SURFACES

The six surfaces examined for the OHI-S are selected from four posterior and two anterior teeth. In the posterior portion

of the dentition, the first fully erupted tooth distal to the second bicuspid, usually the first molar but sometimes the second or third molar, is examined on each side of each arch. The buccal surfaces of the selected upper molars and the lingual surfaces of the selected lower molars are inspected. In the anterior por-

Table 2 • Mean scores and standard deviations by age group for debris, calculus and oral hygiene (debris and calculus) obtained by each of three methods of assessment in subjects from Suitland, Md., and Huntington, W. Va.

Oral hygiene component and method of assessment	Age group					
	10-19	20-29	30-39	40-49	50-59	60 & over
Debris						
6 surfaces method	1.5 ± .50	2.3 ± .80	2.1 ± .82	2.0 ± .96	2.1 ± .70	2.2 ± .95
12 surfaces method	3.1 ± .81	4.4 ± 1.13	4.1 ± 1.35	3.8 ± 1.60	4.2 ± 1.05	4.3 ± 1.48
All surfaces method	2.4 ± .66	3.8 ± 1.34	3.3 ± 1.36	3.3 ± 1.64	3.5 ± .90	3.8 ± 1.61
Calculus						
6 surfaces method	0.5 ± .48	1.6 ± 1.14	1.9 ± .90	2.0 ± .97	2.1 ± .74	2.3 ± .75
12 surfaces method	0.8 ± .74	3.1 ± 1.83	3.9 ± 1.51	4.0 ± 1.74	4.2 ± 1.19	4.3 ± 1.81
All surfaces method	0.5 ± .50	2.5 ± 1.84	3.2 ± 1.57	3.5 ± 1.80	3.6 ± 1.33	4.0 ± 1.82
Oral hygiene						
6 surfaces method	2.0 ± .87	3.9 ± 1.79	4.0 ± 1.56	4.0 ± 1.86	4.2 ± 1.28	4.5 ± 1.59
12 surfaces method	3.9 ± 1.38	7.5 ± 2.67	8.0 ± 2.72	7.8 ± 3.24	8.4 ± 1.92	8.6 ± 3.16
All surfaces method	2.9 ± 1.04	6.3 ± 2.89	6.5 ± 2.73	6.8 ± 3.37	7.1 ± 1.90	7.8 ± 3.27

tion of the mouth, the labial surfaces of the upper right and the lower left central incisors are scored. In the absence of either of these anterior teeth, the central incisor on the opposite side of the midline is substituted.

For this procedure each surface, buccal or lingual, is considered to encompass half of the circumference of the tooth. For example, the buccal surface of the molar includes half of the mesial and half of the distal surfaces.

Only fully erupted permanent teeth are scored. A tooth is considered to be fully erupted when the occlusal or incisal surface has reached the occlusal plane. Natural teeth with full crown restorations and surfaces reduced in height by caries or trauma are not scored. Instead, an alternate tooth is examined.

EXAMINATION METHODS AND SCORING SYSTEM

To obtain the scores for debris and calculus, each of the six preselected tooth surfaces is examined first for debris and then for calculus. The following criteria are applied to determine the respective debris and calculus score values for each of the six surfaces examined:

Oral Debris—Oral debris is the soft foreign matter loosely attached to the teeth. It consists of mucin, bacteria and food, and varies in color from greyish-white to green or orange. The surface area covered by debris is estimated by running the side of a no. 5 explorer (Shepard's Crook) along the tooth surface being examined. The occlusal or incisal extent of the debris is noted as it is removed.

The following scoring system is used:

0—No debris or stain present.

1—Soft debris covering not more than one third of the tooth surface being examined or the presence of extrinsic stains without debris regardless of surface area covered.

2—Soft debris covering more than one

third but not more than two thirds of the exposed tooth surface.

3—Soft debris covering more than two thirds of the exposed tooth surface.

Oral Calculus—Calculus is defined as a deposit of inorganic salts composed primarily of calcium carbonate and phosphate mixed with food debris, bacteria and desquamated epithelial cells. There are two main types of dental calculus which are differentiated primarily by location on the tooth in relation to the free gingival margin: (1) supragingival calculus denotes deposits—usually white to yellowish-brown in color—occlusal to the free gingival margin; (2) subgingival calculus denotes deposits apical to the free gingival margin. These deposits usually are light brown to black in color because of the inclusion of blood pigments. A no. 5 explorer is used to estimate surface area covered by supragingival calculus and to probe for subgingival calculus.

Scores are assigned according to the following criteria:

0—No calculus present.

1—Supragingival calculus covering not more than one third of the exposed tooth surface being examined.

2—Supragingival calculus covering more than one third but not more than two thirds of the exposed tooth surface, or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth.

3—Supragingival calculus covering more than two thirds of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth.

CALCULATING THE INDEX

After the scores for debris and calculus are recorded, the Index values are calculated. For each individual, the debris scores are totaled and divided by the number of surfaces scored. At least two of the six possible surfaces must have been examined for an individual score to be calculated. A score for a group of indi-

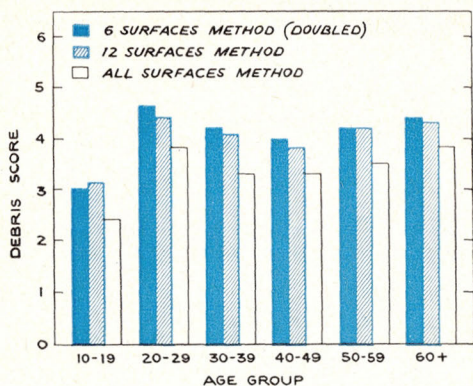


Fig. 1 • Mean debris scores by age group obtained by each of three methods of assessment

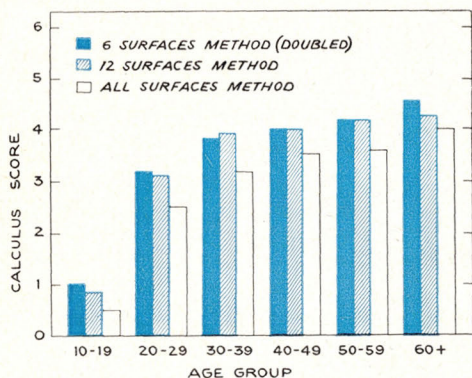


Fig. 2 • Mean calculus scores by age group obtained by each of three methods of assessment

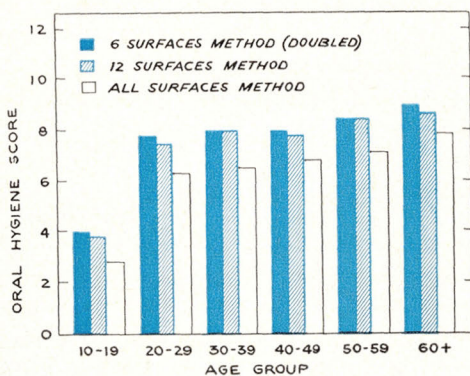


Fig. 3 • Mean oral hygiene score by age group obtained by each of three methods of assessment

viduals is obtained by computing the average of the individual scores. (Individual scores are calculated to one decimal place. Group scores may be calculated to either one or two decimal places depending on the sample size and use to be made of the data.) The average individual or group score is known as the Simplified Debris Index (DI-S).

The same methods are used to obtain the calculus score or the Simplified Calculus Index (CI-S).

The average individual or group debris and calculus scores are combined to obtain the Simplified Oral Hygiene Index.

The CI-S and DI-S values may range from 0 to 3; the OHI-S values, from 0 to 6. These values are just half the score magnitude possible with the OHI.

APPRAISING THE OHI-S

The appraisal of the Simplified Oral Hygiene Index is based on data describing the relationship between the OHI-S, the OHI and the oral hygiene status determined by examining all tooth surfaces and on its demonstrated usefulness in the field since its development.

In the development of the OHI-S, 232 men, women and children from Huntington, W. Va. and Suitland, Md. were examined, and every tooth surface was scored for debris and calculus. After careful study, six surfaces were selected from among all of these surfaces as those which provide reasonably representative information on the oral cleanliness of the segment of the mouth of which they are a part as well as of the whole mouth. The surfaces selected also differ greatly from one person to the next with respect to the amounts of debris or calculus which may be found on them.

Data on the same 232 people are used in this appraisal of the OHI-S. Individual and group scores were calculated for debris, calculus and oral hygiene according to three methods of assessment: the Simplified system (6 surfaces method), the

original system (12 surfaces method) and by examining all teeth (all surfaces method).

The number of persons examined, by age group and the range of scores obtained by each of the three methods are presented in Table 1. One of the potential deficiencies of the OHI-S is demonstrated by these ranges. For example, for age group 30 to 39, the lowest value in the range of debris scores obtained using the 6 surfaces method was 0.0. With the 12 surfaces method, a low value of 0.5 was obtained. With the all surfaces method, the low value was 0.2. On an individual basis, the 6 surfaces method is shown here to be less sensitive than the other two methods in detecting presence of debris. Examination of Table 1 reveals similar underdetection in a number of other age groups for debris, calculus and for their sums.

This apparent lack of sensitivity is caused by the small number of tooth surfaces and by the particular tooth surfaces selected for examination. For the anterior segment, the 6 surfaces method relies on scores obtained by examining only the labial surfaces of selected anterior teeth. The calculus and debris on the lingual surfaces which often are present in even relatively clean mouths are not scored as they are in the other two methods. The condition of the labial surfaces of the two anterior teeth with respect to debris and calculus nevertheless seems to reflect the overall status of oral hygiene in the anterior segment and in the whole mouth more precisely than does that of the lingual surfaces.

Contradiction to the apparent lack of sensitivity of the 6 surfaces method also is demonstrated in Table 1. When the 6 surfaces method is used, the maximum score of 3.0 occurs more frequently than does the maximum score of 6.0 when the all surfaces method is used. The difference in the frequency with which these maximum scores are obtained results from the fact that there is a greater

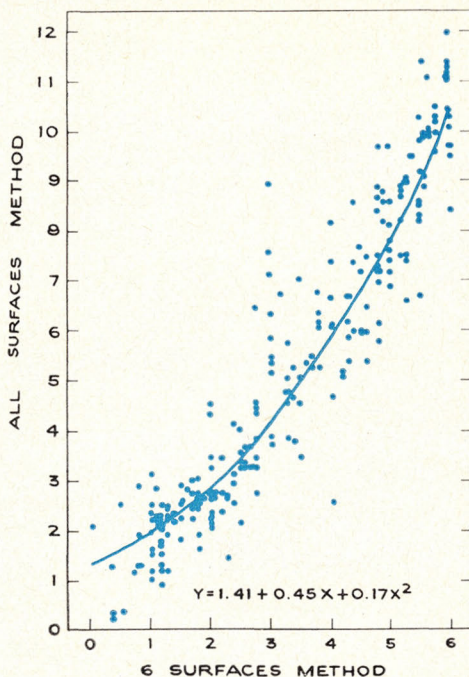


Fig. 4 • Relation between oral hygiene scores obtained by the 6 surfaces (OHI-S) and the all surfaces methods

chance of obtaining low mean scores for individuals when examining all surfaces than there is when examining only 6 or 12 surfaces which are selected for their sensitivity. In this respect, the OHI-S and the original OHI are similar.

The table also describes the broad range of individual values which may be obtained for a group of people similar in age. This variation in individual mean scores is primarily responsible for the high values obtained for the standard deviations which are presented with the mean scores in Table 2.

The mean scores in Table 2 show the relation between group values obtained with each method of assessment. For debris, although the actual score values obtained using the 6 surfaces method necessarily differ from the scores obtained by the other two methods, they parallel them closely for each age group. For example,

Table 3 • Mean scores and ratios between mean scores by age group for debris, calculus and oral hygiene (debris and calculus) obtained by each of three methods of assessment in subjects from Suitland, Md., and Huntington, W. Va.

Oral hygiene component and method of assessment	Age group					
	10-19	20-29	30-39	40-49	50-59	60 & over
Debris						
6 surfaces method*	3.0	4.6	4.2	4.0	4.2	4.4
12 surfaces method	3.1	4.4	4.1	3.8	4.2	4.3
All surfaces method	2.4	3.8	3.3	3.3	3.5	3.8
Ratio 6:12	1.0	1.0	1.0	1.0	1.0	1.0
Ratio 6:All	0.8	0.8	0.8	0.8	0.8	0.9
Calculus						
6 surfaces method*	1.0	3.2	3.8	4.0	4.2	4.6
12 surfaces method	0.8	3.1	3.9	4.0	4.2	4.3
All surfaces method	0.5	2.5	3.2	3.5	3.6	4.0
Ratio 6:12	0.8	1.0	1.0	1.0	1.0	0.9
Ratio 6:All	0.5	0.8	0.8	0.9	0.9	0.9
Oral hygiene						
6 surfaces method*	4.0	7.8	8.0	8.0	8.4	9.0
12 surfaces method	3.9	7.5	8.0	7.8	8.4	8.6
All surfaces method	2.9	6.3	6.5	6.8	7.1	7.8
Ratio 6:12	1.0	1.0	1.0	1.0	1.0	1.0
Ratio 6:All	0.7	0.8	0.8	0.8	0.8	0.9

*Original mean scores obtained by the six surfaces method were doubled in order to provide comparability.

for age group 20 to 29, the mean scores for debris obtained by each method are appreciably higher than those obtained for age group 10 to 19. For the remaining age groups, the scores are either less than or equal to those in age group 20 to 29. Mean calculus scores obtained by the three methods are similar and increase consistently with each age group.

The three methods are compared directly in Table 3. In this table, mean scores obtained by the 6 surfaces method (presented in Table 2) have been doubled to provide more comparability with the scores derived by the other methods. As mentioned earlier, 3.0 is the maximum score obtainable for either debris or calculus with the 6 surfaces method, but for the other methods, a score of 6.0 is possible. Two types of ratios also are presented in Table 3: (1) the ratio between the mean scores obtained using the 6 sur-

faces method and the 12 surfaces method and (2) the ratio between the scores obtained using the 6 surfaces method and the all surfaces method. For each component, debris and calculus, the 6:12 ratios range from 1:0.8 to 1:1.0, with a 1:1.0 ratio predominating. For oral hygiene, a 1:1.0 ratio is obtained for each age group. The 6:All ratios for debris and calculus range from 1:0.5 to 1:0.9 with 1:0.8 predominating. For oral hygiene, a 1:0.8 ratio is shown for each age group except the lowest and highest.

Presented graphically (Fig. 1-3), the mean values obtained by each of the three methods for debris, calculus and oral hygiene show a high degree of similarity with respect to the differences in oral hygiene which are demonstrated between age groups. Ratios (not shown) between means for each sex in each age group also showed no dissimilarities.

Further indication of the effectiveness of the 6 surfaces method in representing the oral hygiene status of the whole mouth accurately is shown in Figure 4. In this figure the mean values obtained for each individual by the 6 surfaces method (the OHI-S) and by the all surfaces method are shown as 232 points. Using these values, a curve was calculated which expresses the relationship between the values obtained by the two methods. (The curve is based on the calculated value of $Y = 1.41 + 0.45X + 0.17X^2$.) Similar curves (not shown) were obtained for each component of the Index. What appears to be a slight raising of the curve at the low end of the scale of mean scores results from an inherent peculiarity in the method employed for calculating the curve.²

The real test for any measurement system comes when it is employed in the field and is used by people other than those who developed it. The 6 surfaces method (the OHI-S) has been used in this country and abroad by a number of investigators, and it appears to have stood the test well.

Based on the behavior of the Index in this original test and in subsequent studies, it may be concluded that the OHI-S, like the original OHI, is a sufficiently sensitive method for assessing the oral hygiene of population groups and that it may be used with confidence. Whatever

limitations the OHI-S may have, either in terms of underestimating or overestimating debris or calculus, they are more than compensated for by the rapidity with which it can be used in field studies—less than one minute per person. In special instances requiring more detail about oral cleanliness than is provided by the OHI-S, either the original OHI or the all surfaces method can be employed.

SUMMARY

1. A simplified version of the OHI, referred to as the OHI-S, has been described.
2. The mean OHI-S values obtained compare favorably with values obtained on the same population group using the original OHI and using the all surfaces method for assessing oral hygiene.
3. The OHI-S appears to be a reasonably sensitive method for assessing oral hygiene in population groups.

*Chief, Epidemiology Branch, National Dental Health Center, Division of Dental Public Health and Resources, Public Health Service, United States Department of Health, Education and Welfare, San Francisco.

†Assistant chief, Epidemiology Branch, National Dental Health Center, Division of Dental Public Health and Resources, Public Health Service, United States Department of Health, Education and Welfare, San Francisco.

1. Greene, J. C., and Vermillion, J. R. Oral hygiene index: a method for classifying oral hygiene status. *J.A.D.A.* 61:172 Aug. 1960.

2. Waugh, A. E. *Elements of statistical method*, ed. 2. New York, McGraw-Hill, 1943, p. 450.

Surplus property for which the federal government paid \$71,533,693 was made available to the States for education, public health, and civil defense purposes during October, November, and December 1962, by the Department of Health, Education, and Welfare.

Real property accounted for \$8,338,109 and personal property for \$63,195,584.