Chapter 20

Indices and Scoring Methods

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Chapter 20 provides an introduction to scoring methods used by clinicians, researchers, and community practitioners to evaluate indicators of oral health status. It is not possible to explain all of the many dental indices that have been used in a variety of settings, but several well-known and widely used indices and scoring methods are described in this chapter. “Suggested Readings” section at the end of the chapter contains references to other indices. Box 20-1 defines related terminology.

Types of Scoring Methods

Indices and scoring methods are used in clinical practice and by community programs to determine and record the oral health status of individuals and groups. Familiarity with the various types of indices is useful to distinguish between different evaluation criteria needed for an individual oral health assessment and a group oral health survey.

Box 20-1 Key Words

Key Words: Indices and Scoring Methods

Calibration: agreement with a set standard of performance; determination of accuracy and consistency between examiners to standardize procedures and gain reliability of recorded findings. Examiners who collect dental index data for epidemiological research or community health assessment are trained to measure the index in exactly the same way each time.

Community Oral Health Assessment: a multifaceted process of identifying factors that affect the oral health status of a selected population.

Data: pieces of information collected using measurements and/or counts.

Data Collection: the process of gathering information (through the use of tools such as dental indices).

Epidemiology: the study of the relationships of various factors that determine the frequency and distribution of diseases in the human community; study of health and disease in populations.

Incidence: the rate at which a certain event occurs, as the number of new cases of a specific disease occurring during a certain period of time.

Index: a graduated, numeric scale with upper and lower limits; scores on the scale correspond to a specific criterion for individuals or populations; pl. indices or indexes.

Dental Index: describes oral status by expressing clinical observations as numeric values.

Indicator: a factor that typically characterizes a disease or health condition; a factor measured and analyzed to describe health status. Dental indices described in this chapter measure oral health indicators.

Pilot study: a trial run of a planned study using a small sample to pretest an instrument, survey, or questionnaire.

Placebo: an inactive substance or preparation with no intrinsic therapeutic value given to satisfy a patient’s symbolic need for drug therapy; used in controlled research studies in a form identical in appearance to the material being tested.

Prevalence: the total number of cases of a specific disease or condition in existence in a given population at a certain time.

Ramfjord Index Teeth: teeth used for epidemiologic studies of periodontal diseases: the maxillary right and mandibular left first molars, maxillary left and mandibular right first premolars, and maxillary left and mandibular right central incisors.

Reliability: ability of an index or test procedure to measure consistently at different times and under a variety of conditions; reproducibility; consistency.

Sample: a portion or subset of an entire population.

Screening: assessment of many individuals to disclose certain characteristics or diseases in a population.

Individual Screening: brief assessment for initial evaluation and classification of need for additional examination and treatment planning.

Status: refers to the state or condition of an individual or population.

Surveillance: the ongoing systematic collection, analysis, and interpretation of outcome-specific data for use in planning, implementing, and evaluating the effect of public health programs and practices.

Validity: ability of an index or test procedure to measure what it is intended to measure.

I. Individual Assessment Score

A. Purpose

In clinical practice, an index, biofilm record, or scoring system for an individual patient can be used for education, motivation, and evaluation.

- The effects of personal disease control efforts, the progress of healing between professional treatments, and the maintenance of health over time can be monitored.
- An example is the “plaque-free score,” in which a patient is able to measure the effects of personal daily care efforts by the changes in the scores.

B. Uses

- To provide individual assessment to help a patient recognize an oral problem.
- To reveal the degree of effectiveness of present oral hygiene practices.
- To motivate the person in preventive and professional care for the elimination and control of oral disease.
- To evaluate the success of individual and professional treatment over a period of time by comparing index scores.

II. Clinical Trial

A. Purpose

A clinical trial is planned to determine the effect of an agent or procedure on the prevention, progression, or control of a disease.

- The trial is conducted by comparing an experimental group with a control group that is similar to the experimental group in every way except for the variable being...
Examples of indices used for clinical trials are the Plaque Index (PI) of Silness and Löe (page 328) and the Patient Hygiene Performance (PHP) of Podshadley and Haley (page 331).

B. Uses

- To determine baseline data before experimental factors are introduced.
- To measure the effectiveness of specific agents for the prevention, control, or treatment of oral conditions.
- To measure the effectiveness of mechanical devices for personal care, such as toothbrushes, interdental cleaning devices, or irrigators.

III. Epidemiologic Survey

A. Purpose

The word epidemiology denotes the study of disease characteristics of populations. Epidemiologic surveys provide information on the trends and patterns of oral health and disease in populations.

- An example is the DMFT (Decayed, Missing, and Filled Teeth) Index (page 342) that has been used with populations around the world to determine the extent of dental caries.
- Such a survey was designed for evaluation of groups of people rather than an individual patient.

B. Uses

- To determine the prevalence and incidence of a particular condition occurring within a given population.
- To provide baseline data on indicators that show existing dental health status in populations. The Surgeon General's Report on Oral Health in America uses epidemiologic data to identify oral health disparities in certain populations.
- To provide data to support recommendations for public health interventions to improve the health status of populations, such as those provided in the United States Healthy People 2010 document.

IV. Community Surveillance

A. Purpose

Community surveillance of oral health indicators and determinants can be accomplished at many levels.

- Government agencies, local community-based service-providing agencies, and professional associations are examples of groups that collect data to determine oral health status by conducting oral health screenings.
- The techniques for conducting community-based oral screenings are similar to those used when conducting epidemiologic surveys, but there is usually a practical application in mind of planning for local community-based oral health services or education.
- An example of a system designed to be used by a community-based group is the Association of State and Territorial Dental Directors' (ASTDD) Basic Screening Survey (page 348).

B. Uses

- To assess the needs of a community.
- To provide information to help plan community-based health promotion/disease prevention programs.
- To compare the effects or evaluate the results of community-based programs.

Indices

An index is an expression of clinical observations in numeric values. It is used to describe the status of the individual or group with respect to a condition being measured. The use of a numeric scale and a standardized method for interpreting observations of a condition results in an index score that is more consistent and less subjective than a word description of that condition.

I. Descriptive Categories of Indices

A. General Categories

- Simple index: One that measures the presence or absence of a condition. An example is an index that measures the presence of dental biofilm without evaluating its effect on the gingiva.
- Cumulative index: One that measures all the evidence of a condition, past and present. An example is the DMFT Index for dental caries (page 342).

B. Types of Simple and Cumulative Indices

- Irreversible: One that measures conditions that will not change. An example is an index that measures dental caries.
- Reversible: One that measures conditions that can be changed. Examples are indices that measure dental biofilm.

II. Selection Criteria

A useful and effective index:

- Is simple to use and calculate.
- Requires minimal equipment and expense.
Indices that Measure Oral Hygiene Status (Biofilm, Debris, Calculus)

Indices that measure oral hygiene status can be used in a clinical setting to educate and motivate an individual patient. When data is collected in a community setting, such as a nursing home, the findings can help determine how daily oral care is being provided and monitor the results of oral hygiene education programs.

I. “Plaque Index” (PI I)
(Silness and Löe1 and Löe7)

A. Purpose
To assess the thickness of biofilm at the gingival area.

B. Selection of Teeth
The entire dentition or selected teeth can be evaluated.

- Areas examined: Examine four gingival areas (distal, facial, mesial, lingual) systematically for each tooth.
- Modified procedures: Examine only the facial, mesial, and lingual areas. Assign double score to the mesial reading, and divide the total by 4.

C. Procedure
- Dry the teeth and examine visually using adequate light, mouth mirror, and probe or explorer.
- Evaluate dental biofilm on the cervical third; pay no attention to biofilm that has extended to the middle or incisal thirds.
- Use probe to test the surface when no biofilm is visible. Pass the probe or explorer across the tooth surface in the cervical third and near the entrance to the sulcus. When no biofilm adheres to the probe tip, the area is scored 0. When biofilm adheres, a score of 1 is assigned.
- Use a disclosing agent, if necessary, to assist evaluation for the 0 to 1 scores. When the PI I is used in conjunction with the Gingival Index (GI) (page 341), the GI must be completed first because the disclosing agent masks the gingival characteristics.
- Include biofilm on the surface of calculus and on dental restorations in the cervical third in the evaluation.
- Criteria

<table>
<thead>
<tr>
<th>PI I Score</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No biofilm.</td>
</tr>
<tr>
<td>1</td>
<td>A film of biofilm adhering to the free gingival margin and adjacent area of the tooth. The biofilm may be recognized only after application of disclosing agent or by running the explorer across the tooth surface.</td>
</tr>
<tr>
<td>2</td>
<td>Moderate accumulation of soft deposits within the gingival pocket that can be seen with the naked eye or on the tooth and gingival margin.</td>
</tr>
<tr>
<td>3</td>
<td>Abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin.</td>
</tr>
</tbody>
</table>

D. Scoring
- PI I for Area
  Each area (distal, facial, mesial, lingual, or palatal) is assigned a score from 0 to 3.
- PI I for a Tooth
  Scores for each area are totaled and divided by 4.
- PI I for Groups of Teeth
  Scores for individual teeth may be grouped and totaled and divided by the number of teeth. For instance, a PI I may be determined for specific teeth or groups of teeth. The right side may be compared with the left.
- PI I for the Individual
  Add the scores for each tooth and divide by the number of teeth examined. The PI I ranges from 0 to 3.

Suggested Range of Scores for Patient Reference

<table>
<thead>
<tr>
<th>Rating</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>0</td>
</tr>
<tr>
<td>Pl I for a Group</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>Good 0.1–0.9</td>
<td></td>
</tr>
<tr>
<td>Fair 1.0–1.9</td>
<td></td>
</tr>
<tr>
<td>Poor 2.0–3.0</td>
<td></td>
</tr>
</tbody>
</table>

Add the scores for each member of a group and divide by the number of individuals.

II. "Plaque Control Record"
(O'Leary, Drake, and Naylor)

A. Purpose
To record the presence of dental biofilm on individual tooth surfaces to permit the patient to visualize progress while learning biofilm control.

![Diagram of teeth with spaces to record biofilm](https://pt.wkhealth.com/pt/re/9780781763226/bookContentPane_frame.htm...)

**FIGURE 20-1** "Plaque Control Record." Diagrammatic representation of the teeth includes spaces to record biofilm on six areas of each tooth. The facial surfaces are on the outer portion and the lingual and palatal surfaces are on the inner portion of the arches. Teeth are numbered by the ADA System on the inside and by the FDI System on the outside. (Modified from Ramfjord, S.P. and Ash, M.M.: *Periodontology and Periodontics*. Philadelphia, W.B. Saunders Co., 1979, p. 273 and from O'Leary, T.J., Drake, R.B., and Naylor, J.E.: *J. Periodontal.*, 43, 38, 1972.)

B. Selection of Teeth and Surfaces
- All teeth are included. Missing teeth are identified on the record form by a single thick horizontal line.
- Four surfaces are recorded: facial, lingual, mesial, and distal.
- Six areas may be recorded. The mesial and distal segments of the diagram may be divided to provide space to record proximal surfaces from the facial separately from the lingual or palatal surfaces (Figure 20-1).

C. Procedure
- Apply disclosing agent or give a chewable tablet. Instruct patient to swish and rub the solution over the tooth surfaces with the tongue before rinsing.
- Examine each tooth surface for dental biofilm at the gingival margin. No attempt is made to differentiate quantity of biofilm.
- Record by making a dash or coloring in the appropriate spaces on the diagram (Figure 20-1) to indicate biofilm on facial, lingual, palatal, mesial, and/or distal surfaces.

D. Scoring
- Total the number of teeth present; multiply by 4 (or 6 if modification is used) to obtain the number of available surfaces. Count the number of surfaces with biofilm.
- Multiply the number of biofilm-stained surfaces by 100 and divide by the total number of available surfaces to derive the percentage of surfaces with biofilm.
- Compare scores over subsequent appointments as the patient learns and practices biofilm control. Ten percent or fewer biofilm-stained surfaces can be considered a good goal, but if the biofilm is regularly left in the same areas, special instruction is indicated.

**Calculation: Example for "Plaque Control Record"**

Individual findings: 26 teeth scored; 8 surfaces with biofilm

- Multiply the number of teeth by 4:
  
  \[ 26 \times 4 = 104 \text{ surfaces} \]

- Percent with biofilm
Interpretation: Although 0% is ideal, fewer than 10% biofilm-stained surfaces has been suggested as a guideline in periodontal therapy. After initial therapy and when the patient has reached a 10% level of biofilm control or better, necessary additional periodontal and restorative procedures may be initiated. In comparison, a similar evaluation using a biofilm-free score would mean that a goal of 90% or better biofilm-free surfaces would have to be reached before the surgical phase of treatment could be undertaken.

III. “Plaque-Free Score”
(Grant, Stern, Everett10)

A. Purpose
To determine the location, number, and percentage of biofilm-free surfaces for individual motivation and instruction. Interdental bleeding can also be documented.

B. Selection of Teeth and Surfaces
- All erupted teeth are included. Missing teeth are identified on the record form by a single thick horizontal line through the box in the chart form.
- Four surfaces are recorded for each tooth: facial, lingual or palatal, mesial, and distal.

C. Procedure
1. “Plaque-Free Score”
   - Apply disclosing agent or give chewable tablet. Instruct patient to swish and rub the solution over the tooth surfaces with the tongue before rinsing.
   - Examine each tooth surface for evidence of biofilm. Use adequate light and a mouth mirror for visualizing all surfaces. The patient needs a hand mirror to see the location of the biofilm that has been missed during personal hygiene procedures.
   - Record in red the surfaces showing biofilm. Use an appropriate tooth chart form or a diagrammatic form, such as that shown in Figure 20-2. Red ink for recording the biofilm is suggested when a red disclosing agent is used to help the patient associate the location of the biofilm in the mouth with the recording.
2. Papillary Bleeding on Probing
   - The small circles between the diagrammatic tooth blocks in Figure 20-2 are used to record proximal bleeding on probing.
   - Improvement in the gingival tissue health will be demonstrated over a period of time as fewer bleeding areas are noted.

D. Scoring: “Plaque-Free Score”
   - Total the number of teeth present.
   - Total the number of surfaces with biofilm that appear in red on the tooth diagram.
   - Consult Table 20-1:
     1. Read across the top or bottom to locate the number of teeth and total surfaces.
     2. Read down the side to locate the number of surfaces with biofilm.
     3. Find the intersection of the top and side numbers; this number is the biofilm-free score, listed as a percentage.
   - To calculate without Table 20-1 reference
     1. Multiply the number of teeth by 4 to determine the number of available surfaces.
     2. Subtract the number of surfaces with biofilm from the total available surfaces to find the number of biofilm-free surfaces.
     3. Biofilm-free score = \[ \frac{\text{Number of biofilm-free surfaces} \times 100}{\text{Number of available surfaces}} = \text{Percentage of biofilm-free surfaces} \]
   - Evaluate biofilm-free score. Ideally, 100% is the goal. When a patient maintains a percentage under 85%, check individual surfaces to determine whether biofilm is usually left in the same areas. To prevent the development of specific areas of periodontal infection, remedial instruction in the areas usually missed is indicated.

Calculation: Example for “Plaque-Free Score”
Individual findings: 24 teeth scored and 37 surfaces with biofilm
- With Table 20-1
  1. Locate the number of teeth across the top of Table 20-1 (24-96); the second number indicates the number of surfaces, which in this case total 96.
2. Locate the number of surfaces with biofilm down the side (37); find the intersection.
3. The percentage of biofilm-free surfaces is 61.5%.

- Without reference to Table 20-1
  1. Multiply the number of teeth by 4: 
  2. \(24 \times 4 = 96\) available surfaces.
  3. Subtract the number of surfaces with biofilm from total available surfaces: \(96 - 37 = 59\) biofilm-free surfaces.
  4. Percentage of biofilm-free surfaces = \(\frac{59 \times 100}{96} = 61.5\%\)

**Interpretation**: On the basis of the ideal 100%, 61.5% is poor. More personal daily oral care instruction is indicated.

**E. Scoring: Papillary Bleeding on Probing**
- Total the number of small circles marked for bleeding. A person with 32 teeth has 30 interdental areas. The mesial or distal surface of a tooth adjacent to an edentulous area is probed and counted.
- Evaluate total interdental bleeding. In health, bleeding on probing does not occur.

**IV. Patient Hygiene Performance (PHP)**
(Podshadley and Haley2)

**A. Purpose**
To assess the extent of biofilm and debris over a tooth surface. Debris is defined for the PHP as the soft foreign material consisting of dental biofilm, materia alba, and food debris that is loosely attached to tooth surfaces.

**B. Selection of Teeth and Surfaces**
- Teeth Examined
  (F.D.I. system tooth numbers are in parentheses.)

<table>
<thead>
<tr>
<th>Table 20-1 “Plaque-Free Score”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NUMBER OF TOOTH SURFACES</strong></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
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</table>


<table>
<thead>
<tr>
<th>Maxillary</th>
<th>Mandibular</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 3 (16)</td>
<td>No. 19 (36)</td>
</tr>
<tr>
<td>Right first molar</td>
<td>Left first molar</td>
</tr>
<tr>
<td>No. 8 (11)</td>
<td>No. 24 (31)</td>
</tr>
<tr>
<td>Right central incisor</td>
<td>Left central incisor</td>
</tr>
</tbody>
</table>
Substitutions

When a first molar is missing, is less than three-fourths erupted, has a full crown, or is broken down, the second molar is used. The third molar is used when the second is missing. The adjacent central incisor is used for a missing incisor.

Surfaces

The facial surfaces of incisors and maxillary molars and the lingual surfaces of mandibular molars are examined. These surfaces are the same as those used for the Simplified Oral Hygiene Index (see Figure 20-4).

C. Procedure

Apply disclosing agent. Instruct the patient to swish for 30 seconds and expectorate, but not rinse.

- Examination is made using a mouth mirror.
- Each tooth surface to be evaluated is subdivided (mentally) into five sections (Figure 20-3A) as follows:
  1. Vertically: Three divisions—mesial, middle, and distal.
  2. Horizontally: The middle third is subdivided into gingival, middle, and occlusal or incisal thirds.
- Each of the five subdivisions is scored for the presence of stained debris as follows:

<table>
<thead>
<tr>
<th>Score</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No debris (or questionable).</td>
</tr>
<tr>
<td>1</td>
<td>Debris definitely present.</td>
</tr>
<tr>
<td>M</td>
<td>When all three molars or both incisors are missing.</td>
</tr>
<tr>
<td>S</td>
<td>When a substitute tooth is used</td>
</tr>
</tbody>
</table>

![Figure 20-3](http://pt.wkhealth.com/pt/re/9780781763226/bookContentPane_frame.htm...)

**FIGURE 20-3** Patient Hygiene Performance (PHP). (A) Oral debris is assessed by dividing a tooth into 5 subdivisions, each of which is scored 1 when debris is shown to be present after use of a disclosing agent. (B) Example of debris score of 3. Shaded portion represents debris stained by disclosing agent. (C) Example of debris score of 1. (From Podshadley, A.G. and Haley, J.V.: A Method for Evaluating Oral Hygiene Performance, Public Health Rep., 83, 269, 1968.)

D. Scoring

- **Debris Score for Individual Tooth**

  Add the scores for each of the five subdivisions. The scores range from 0 to 5. Examples are shown in Figure 20-3B and C.

- **PHP for the Individual**

  Total the scores for the individual teeth and divide by the number of teeth examined. The PHP ranges from 0 to 5.

- **Suggested Range of Scores for Evaluation**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>0 (no debris)</td>
</tr>
<tr>
<td>Good</td>
<td>0.1–1.7</td>
</tr>
<tr>
<td>Calculation: Example for an Individual</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tooth</th>
<th>Debris Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 3 (16)</td>
<td>5</td>
</tr>
<tr>
<td>No. 8 (11)</td>
<td>3</td>
</tr>
<tr>
<td>No. 14 (26)</td>
<td>4</td>
</tr>
<tr>
<td>No. 19 (36)</td>
<td>5</td>
</tr>
<tr>
<td>No. 24 (31)</td>
<td>2</td>
</tr>
<tr>
<td>No. 30 (46)</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
</tr>
</tbody>
</table>

\[
\frac{\text{Total debris score}}{\text{Number of teeth scored}} = \frac{22}{6} = 3.66
\]

Interpretation: According to the suggested range of scores, this person with a PHP of 3.66 would be classified as exhibiting poor hygiene performance.

- **PHP for a Group**
  
  To obtain the average PHP score for a group or population, total the individual scores and divide by the number of people examined.

**V. Simplified Oral Hygiene Index (OHI-S)**

(Greene and Vermillion11 and Greene12)

**A. Purpose**

To assess oral cleanliness by estimating the tooth surface covered with debris and/or calculus.

**B. Components**

The OHI-S has two components, the Simplified Debris Index (DI-S) and the Simplified Calculus Index (CI-S). The two scores may be used separately or may be combined for the OHI-S.

**C. Selection of Teeth And Surfaces**

- **Identify the Six Specific Teeth (Figure 20-4)**
  
  1. **Posterior.** The first fully erupted tooth distal to each second premolar is examined. The facial surfaces of the maxillary molars and the lingual surfaces of the mandibular molars are used. Although usually the first molars are used, the second or third molars also may be used.
  
  2. **Anterior.** The facial surfaces of the maxillary right and the mandibular left central incisors are used. When either is missing, the adjacent central incisor is scored.

- **Extent**
  
  1. Either the facial or lingual of the selected teeth are scored, including the proximal surfaces to the contact areas.
D. Procedure

- Qualification: At least two of the six possible surfaces must have been examined for an individual score to be calculated.
- Record Six Debris Scores
  1. Definition of Oral Debris. Oral debris is the soft foreign matter on the surfaces of the teeth that consists of dental biofilm, materia alba, and food debris.
  2. Examination. Run the side of the tip of a probe or explorer across the tooth surface to estimate the surface area covered by debris.
  3. Criteria (Figure 20-5)

<table>
<thead>
<tr>
<th>Debris Score</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No debris or stain present.</td>
</tr>
<tr>
<td>1</td>
<td>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.</td>
</tr>
<tr>
<td>2</td>
<td>Soft debris covering more than one third but not more than two thirds of the exposed tooth surface.</td>
</tr>
<tr>
<td>3</td>
<td>Soft debris covering more than two thirds of the exposed tooth surface.</td>
</tr>
</tbody>
</table>

- Record Six Calculus Scores
  1. Definition of Calculus. Dental calculus is a hard deposit of inorganic salts composed primarily of calcium carbonate and phosphate mixed with debris, microorganisms, and desquamated epithelial cells.
  2. Examination. Use an explorer to estimate surface area covered by supragingival calculus deposits. Identify subgingival deposits by exploring and/or probing. Record only definite deposits of hard calculus.
  3. Criteria. Location and tooth surface areas scored are illustrated in Figure 20-6.
FIGURE 20-5 Simplified Oral Hygiene Index. For the Debris Index, 6 teeth (Figure 20-4) are scored. Scoring of 0 to 3 is based on tooth surfaces covered by debris as shown.

FIGURE 20-6 Simplified Oral Hygiene Index. For the Calculus Index, 6 teeth (Figure 20-4) are scored. Scoring of 0 to 3 is based on location and tooth surface area with calculus as shown. Note slight subgingival calculus recorded as 2 and more extensive subgingival calculus as 3.

<table>
<thead>
<tr>
<th>Calculus Score</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No calculus present.</td>
</tr>
<tr>
<td>1</td>
<td>Supragingival calculus covering not more than one third of the exposed tooth surface being examined.</td>
</tr>
<tr>
<td>2</td>
<td>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.</td>
</tr>
<tr>
<td>3</td>
<td>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.</td>
</tr>
</tbody>
</table>

E. Scoring

OHI-S for an Individual

1. Determine Simplified Debris Index (DI-S) and Simplified Calculus Index (CI-S)
   - Divide each total score by the number of sextants.
   - DI-S and CI-S values range from 0–3.
2. Simplified Oral Hygiene Index (OHI-S)
   - Combine the DI-S and CI-S.
   - OHI-S value ranges from 0–6.

Suggested Range of Scores for Evaluation

<table>
<thead>
<tr>
<th>DI-S and CI-S Rating</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>0</td>
</tr>
<tr>
<td>Good</td>
<td>0.1–0.6</td>
</tr>
<tr>
<td>Fair</td>
<td>0.7–1.8</td>
</tr>
<tr>
<td>Poor</td>
<td>1.9–3.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OHI-S Rating</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>0</td>
</tr>
</tbody>
</table>
Calculation: Example for an Individual

<table>
<thead>
<tr>
<th>Tooth No.</th>
<th>DI-S</th>
<th>CI-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 3 (16)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>No. 8 (11)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>No. 14 (26)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>No. 19 (36)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>No. 24 (31)</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>No. 30 (46)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>

**Calculation:**

\[
\text{DI-S} = \frac{\text{Total debris scores}}{\text{Number of teeth scored}} = \frac{13}{6} = 2.17
\]

\[
\text{CI-S} = \frac{\text{Total calculus scores}}{\text{Number of teeth scored}} = \frac{9}{6} = 1.50
\]

\[
\text{OHI-S} = \text{DI-S} + \text{CI-S} = 2.17 + 1.50 = 3.67
\]

**Interpretation:** According to the suggested range of scores, the score for this individual (3.67) indicates a poor oral hygiene status.

**OHIS Group Score**

Compute the average of the individual scores by totaling the scores and dividing by the number of individuals.

**Indices that Measure Gingival and Periodontal Health**

Measurements for gingival and periodontal indices have varied over the years. Two indices, not completely described here, are of historic interest.

- The P-M-A (Papillary-Marginal-Attached) Index, attributed to Schour and Massler, was used to assess the extent of gingival changes in large groups for epidemiologic studies.
- The Periodontal Index (PI) of Russell, another acclaimed contribution to the study of disease incidence, was a complex index that accounts for both gingival and periodontal changes. Its aim was to survey large populations.
- For patient instruction and motivation, a variety of bleeding indices and scoring methods has been developed.
- Bleeding on gentle probing or flossing is an early sign of gingival inflammation and precedes color changes and enlargement of the gingival tissues.

**I. Periodontal Screening and Recording (PSR)**

(American Academy of Periodontology and American Dental Association)

**A. Purpose**

To assess the state of periodontal health of an individual patient.

- A modified form of the original CPITN index.
- Designed to indicate periodontal status in a rapid and effective manner and to motivate the patient to seek necessary complete periodontal assessment and treatment.
- Used as a screening procedure to determine the need for comprehensive periodontal evaluation.

**B. Selection of Teeth**

The dentition is divided into sextants. Each tooth is examined. Posterior sextants begin distal to the canines.

**C. Procedure**

- Instrument: Probe specially designed for World Health Organization surveys. (Figure 20-7)
  1. Markings. At intervals from tip: 3.5, 2.0, 3.0, and 3.0 mm (total 11.5 mm).
  2. Working Tip. A ball 0.5 mm in diameter. The functions of the ball are: to aid in the detection of calculus, rough overhanging margins of restorations, and other
tooth surface irregularities and to facilitate assessment at the probing depth and reduce risk of overmeasurement.

3. Color-coded between 3.5 and 5.5 mm.

- Probe Application
  1. Insert probe gently into a sulcus until resistance is felt.
  2. Apply a circumferential walking step to probe systematically about each tooth through each sextant.
  3. Observe color-coded area of the probe for prompt identification of probing depths.
  4. Each sextant receives one code number corresponding to the deepest position of the color-coded portion of the probe.

- Criteria
  1. Five codes and an asterisk are used. Table 20-2 shows the clinical findings, code significance, and patient management guidelines.

2. Each code may include conditions identified with the preceding codes; for example, Code 3 with probing depth from 3.5 to 5.5 mm also may include calculus, an overhanging restoration, and bleeding on probing.

3. One need not probe the remaining teeth in a sextant when a Code 4 is found. For Codes 0, 1, 2, and 3, the sextant is completely probed.

- Recording
  1. Use a simple six-box form to provide a space for each sextant. The form can be made into peel-off stickers or a rubber stamp to facilitate recording in the patient’s permanent record.
  2. One score is marked for each sextant; the highest code observed is recorded. When indicated, an asterisk is added to the score in the individual space with the sextant code number.

D. Scoring

- Follow-up Patient Management
  Patients are classified into assessment and treatment planning needs by the highest coded score of their PSR (Table 20-2, right column).

<table>
<thead>
<tr>
<th>CLINICAL FINDINGS</th>
<th>CODE DESCRIPTION</th>
<th>MANAGEMENT GUIDELINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code 0</td>
<td>Colored area of probe is completely visible in the deepest probing depth of the sextant</td>
<td>Code 0</td>
</tr>
<tr>
<td></td>
<td>No calculus, no defective margins, no bleeding</td>
<td>Dental biofilm control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preventive care</td>
</tr>
</tbody>
</table>

Table 20-2 Periodontal Screening and Recording (PSR)

FIGURE 20-7 Periodontal Probe. The probe, with markings as shown, is used to make determinations for the Periodontal Screening and Recording (PSR) and the Community Periodontal Index (CPI). (From Fédération Dentaire Internationale: A Simplified Periodontal Examination for Dental Practices: Based on the Community Periodontal Index of Treatment Needs-CPITN: Prepared by FDI WG6 and Joint FDI/WHO WG1, Aust. Dent. J., 30, 368, October, 1985.)
<table>
<thead>
<tr>
<th>Code 1</th>
<th>Code 1</th>
</tr>
</thead>
</table>
| • Colored area of probe is completely visible in the deepest probing depth of the sextant  
• Smooth surfaces, no calculus, no defective margins  
• There is bleeding after gentle probing | • Dental biofilm control  
• Preventive care |

<table>
<thead>
<tr>
<th>Code 2</th>
<th>Code 2</th>
</tr>
</thead>
</table>
| • Colored area of probe is completely visible in the deepest probing depth  
• Rough surface felt may be supragingival and/or subgingival calculus  
• Defective margins of restorations | • Dental biofilm control instruction  
• Complete preventive care  
• Calculus removal  
• Correction of irregular margins of restorations |

<table>
<thead>
<tr>
<th>Code 3</th>
<th>Code 3</th>
</tr>
</thead>
</table>
| • Colored area of probe is only partly visible in the deepest probing depth  
• Requirements for Codes 1 and 2 may be present | • Comprehensive periodontal assessment is indicated‡  
• Patient is counseled concerning appropriate treatment plan |

<table>
<thead>
<tr>
<th>Code 4</th>
<th>Code 4</th>
</tr>
</thead>
</table>
| • Colored area of probe completely disappears  
• Probing depth greater than 5.5 mm | • Comprehensive periodontal assessment is indicated†  
• Patient is counseled concerning appropriate treatment plan |

<table>
<thead>
<tr>
<th>Code*</th>
<th>Code*</th>
</tr>
</thead>
</table>
| • Any notable feature such as furcation involvement  
• Mobility  
• Mucogingival problem  
• Marked recession area | • Abnormality in Codes 0, 1, or 2: specific treatment is planned  
• In Codes 3 or 4: included in comprehensive assessment and treatment plan |

†American Dental Association and American Academy of Periodontology, 1992.
‡Comprehensive periodontal assessment includes but is not limited to radiographic and clinical examination (complete soft tissue record, identification of probing depths, mobility, gingival recession, mucogingival problems, and furcation involvements).

**Calculation: Example**

```
4x 2 3
3 2x 4x
```

PSR Sextant Score

Interpretation: With Codes 3 and 4, a comprehensive periodontal examination is indicated. Asterisks in this example indicate furcation involvement in two sextants, and a possible mucogingival involvement in the mandibular anterior sextant. When the patient has not been aware of the presence of periodontal involvement, counseling is important if cooperation and compliance are to be obtained.

**Calculation: Example 2**
PSR Sextant Score

Interpretation: An overall Code 2 can indicate calculus and overhanging restorations that must be removed. All restorations must be checked for recurrent dental caries. Appointments for instruction in dental biofilm control are of primary concern. In this example, the asterisks in two sextants indicate a notable clinical feature such as minimal attached gingiva.

II. Community Periodontal Index (CPI)
(World Health Organization21)

A. Purpose
To screen and monitor the periodontal status of populations.

- Originally developed as the CPITN index that included a code to indicate an individual and group-summary recording of treatment needs. However, because of changes in the management of periodontal disease, the treatment needs portion of the index has been eliminated.
- One component of a complete oral health survey designed by the World Health Organization that includes the assessment of many oral health indicators including mucosal lesions, dental caries, fluorosis, prosthetic status, and dentofacial anomalies.
- Later modified to form the PSR index for scoring individual patients (pages 336 and 337).

B. Selection of Teeth

The dentition is divided into sextants for recording on the assessment form.

- Posterior sextants begin distal to canines.

Adults (20 years and older)

- A sextant is examined only if there are two or more teeth present that are not indicated for extraction.

- Ten index teeth are examined.
  1. The first and second molars in each posterior sextant. If one is missing, no replacement is selected and the score for the remaining molar is recorded.
  2. The maxillary right central incisor and mandibular left central incisor.
  3. If no index teeth or tooth is present in the sextant, then all remaining teeth in the sextant are examined and the highest score is recorded.

Children and Adolescents (7–19 years of age)

- Six index teeth are examined; the first molar in each posterior quadrant and the maxillary right and the mandibular left incisors.
- For children under the age of 15, pocket depth is not recorded to avoid the deepened sulci associated with erupting teeth. Only bleeding and calculus are considered.

C. Procedure

- Instrument: A specially designed probe (Figure 20-7) is used to record both the CPI and PSR. The probe is described on page 336.

- Criteria: CPI score
  1. Five codes are used to record bleeding, calculus, and pocket depth. The criteria for the codes are similar to the criteria for the PSR, shown in Table 20-2. The CPI codes are illustrated in Figure 20-8.

<table>
<thead>
<tr>
<th>CPI Code</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Healthy periodontal tissues.</td>
</tr>
<tr>
<td>1</td>
<td>Bleeding after gentle probing; entire colored band of probe is visible.</td>
</tr>
<tr>
<td>2</td>
<td>Supragingival or subgingival calculus present; entire colored band of probe is visible.</td>
</tr>
<tr>
<td>3</td>
<td>4- to 5-mm pocket; colored band of probe is partially obscured.</td>
</tr>
<tr>
<td>4</td>
<td>6-mm or deeper; colored band on the probe is not visible.</td>
</tr>
</tbody>
</table>

- Criteria: Loss of Attachment Code
In conjunction with the CPI, the WHO probe is also used to record loss of attachment (LOA). The five LOA codes used are illustrated in Figure 20-9. Loss of attachment is not recorded for individuals less than 15 years of age.

**FIGURE 20-8** Community Periodontal Index Codes. The specially designed WHO probe measures 3.5, 5.5, 8.5, and 11.5 mm intervals (Figure 20-7). **Code 0.** Healthy periodontal tissues. Entire black band of the probe is visible. **Code 1.** Entire black band is visible, but bleeding is present after gentle probing. **Code 2.** Entire black band is visible, but calculus is present. (Bleeding may or may not be present.) **Code 3.** 4- to 5-mm pocket depth. (Black band on probe partially hidden by gingival margin.) **Code 4.** 6-mm or greater pocket depth. (Black band of the probe is completely hidden by the gingival margin.) (Modified from: World Health Organization, *Oral Health Surveys: Basic Methods*, Geneva, WHO, 1997, p. 26.)

**FIGURE 20-9** Loss of Attachment Codes. Code 0. 0-to 3-mm loss of attachment. (Cementoenamel junction [CEJ] is covered by the gingival margin and the CPI score is 0 to 3.) If the CEJ is visible, or if CPI score is 4, LOA codes 1 to 4 are used. **Code 1.** 3.5- to 5.5-mm loss of attachment. (CEJ is within the black band on the probe.) **Code 2.** 6-to 8-mm loss of attachment. (CEJ is between the top of the black band and the 8.5-mm mark on the probe.) **Code 3.** 9-to 11-mm loss of attachment. (CEJ is between the 8.5-and the 11.5-mm marks on the probe.) **Code 4.** 12-mm or greater loss of attachment. (CEJ is beyond the highest [11.5 mm] mark on the probe.) (Modified from World Health Organization, *Oral Health Surveys: Basic Methods*, Geneva, WHO, 1997, p. 27.)

<table>
<thead>
<tr>
<th>LOA Code</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 to 3 mm loss of attachment.</td>
</tr>
<tr>
<td>1</td>
<td>4 to 5 mm loss of attachment.</td>
</tr>
<tr>
<td>2</td>
<td>6 to 8 mm loss of attachment.</td>
</tr>
<tr>
<td>3</td>
<td>9 to 11 mm loss of attachment.</td>
</tr>
<tr>
<td>4</td>
<td>12 mm or greater loss of attachment.</td>
</tr>
</tbody>
</table>

**III. Sulcus Bleeding Index (SBI)**
A. Purpose
To locate areas of gingival sulcus bleeding and color changes in order to recognize and record the presence of early (initial) inflammatory gingival disease.

B. Areas Examined
Four gingival units are scored systematically for each tooth: the labial and lingual marginal gingiva (M units), and the mesial and distal papillary gingiva (P units).

C. Procedure
- Use standardized lighting while probing each of the four areas.
- Hold the probe parallel with the long axis of the tooth for M units, and direct the probe toward the col area for P units.
- Wait 30 seconds after probing before scoring apparently healthy gingival units.
- Dry the gingiva gently if necessary to observe color changes clearly.

Criteria

<table>
<thead>
<tr>
<th>SBI Code</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Healthy appearance of P and M, no bleeding on sulcus probing.</td>
</tr>
<tr>
<td>1</td>
<td>Apparently healthy P and M showing no change in color and no swelling, but bleeding from sulcus on probing.</td>
</tr>
<tr>
<td>2</td>
<td>Bleeding on probing and change of color caused by inflammation. No swelling or macroscopic edema.</td>
</tr>
<tr>
<td>3</td>
<td>Bleeding on probing and change in color and slight edematous swelling.</td>
</tr>
<tr>
<td>4</td>
<td>(1) Bleeding on probing and change in color and obvious swelling or (2) Bleeding on probing and obvious swelling.</td>
</tr>
<tr>
<td>5</td>
<td>Bleeding on probing and spontaneous bleeding and change in color, marked swelling with or without ulceration.</td>
</tr>
</tbody>
</table>

D. Scoring
- SBI for Area
  Score each of the four gingival units (M and P) from 0 to 5.
- SBI for Tooth
  Total scores for the 4 units and divide by 4.
- SBI for Individual
  Total the scores for individual teeth and divide by the number of teeth. SBI scores range from 0 to 5.

IV. Gingival Bleeding Index (GBI)
(Carter and Barnes22)

A. Purpose
To record the presence or absence of gingival inflammation as determined by bleeding from interproximal gingival sulci.

B. Areas Examined
Each interproximal area has two sulci, which are scored as one interdental unit or individually.

- Certain areas may be excluded from scoring because of accessibility, tooth position, diastemata, or other factors, and if exclusions are made, a consistent procedure should be followed for an individual and for a group if a study is to be made.
- A full complement of teeth has 30 proximal areas. In the original studies, third molars were excluded, and 26 interdental units were recorded.23

C. Procedure
- Instrument
  Unwaxed dental floss is used. Floss has the advantages of being readily available, disposable, and usable by the instructed patient.

- Steps
  - Pass the floss interproximally first on one side of the papilla and then on the other.
  - Curve the floss around the adjacent tooth, and bring the floss below the gingival margin.
  - Move the floss up and down for one stroke, with care not to lacerate the gingiva. Adapt finger rests to provide controlled, consistent pressure.
  - Use a new length of clean floss for each area.
  - Retract for visibility of bleeding from both facial and lingual aspects.
  - Allow 30 seconds for reinspection of an area that does not show blood immediately either in the area or on the floss.

- Criteria
Bleeding indicates the presence of disease. No attempt is made to quantify the severity of bleeding because no bleeding represents health.

D. Scoring
The numbers of bleeding areas and scorable units are recorded. Patient participation in observing and recording over a series of appointments can increase motivation.

V. Eastman Interdental Bleeding Index (EIBI)
(Abrams, Caton, and Polson23 and Caton and Polson24)

A. Purpose
To assess the presence of inflammation in the interdental area as indicated by the presence or absence of bleeding.

B. Areas Examined
Each interdental area around the entire dentition.

C. Procedure

Instrument
Triangular wooden interdental cleaner.

Steps
1. Insert gently, then immediately remove, a wooden cleaner into each interdental area in such a way as to depress the papilla 1 to 2 mm (Figure 20-10).

FIGURE 20-10 Eastman Interdental Bleeding Index. The test for interdental bleeding is made by inserting a wooden interdental cleaner into each interdental space. (A) Wooden interdental cleaner inserted in a horizontal path, parallel with the occlusal surfaces. (B) The presence or absence of bleeding is noted within a quadrant 15 seconds after final insertion. Bleeding indicates the presence of inflammation.

2. Make the path of insertion horizontal (parallel to the occlusal surface), taking care not to angle the point in an apical direction.
3. Insert and remove four times; move to next interproximal area.
4. Record the presence or absence of bleeding within 15 seconds for each area.

D. Scoring

Number of Bleeding Sites
The number may be totaled for an individual score for comparison with scores over a series of appointments.

Percentage Scores
Index is expressed as a percentage of the total number of sites evaluated. Calculations can be made for total mouth, quadrants, or maxillary versus mandibular.

Calculation Example
An adult with a complete dentition has 15 maxillary and 15 mandibular interproximal areas. The EIBI revealed 13 areas of bleeding. To calculate percentage:

\[
\frac{\text{Number of bleeding areas}}{\text{Total number of areas}} \times 100 = \frac{13}{30} \times 10 = 43\%
\]

VI. Gingival Index (GI)
(Löe7)

A. Purpose
To assess the severity of gingivitis based on color, consistency, and bleeding on probing.

B. Selection of Teeth and Gingival Areas
A gingival index may be determined for selected teeth or for the entire dentition.
Areas Examined

Four gingival areas (distal, facial, mesial, lingual) are examined systematically for each tooth.

Modified Procedure

The distal examination for each tooth can be omitted. The score for the mesial area is doubled, and the total score for each tooth is divided by four.

C. Procedure

- Dry the teeth and gingiva; under adequate light, use a mouth mirror and probe.
- Use the probe to press on the gingiva to determine the degree of firmness.
- Use the probe to run along the soft tissue wall near the entrance to the gingival sulcus to evaluate bleeding (Figure 20-11).

Criteria

![Figure 20-11 Gingival Index (GI). Probe stroke for bleeding evaluation. The broken line represents the level of attachment of the periodontal tissues. The probe is inserted a few millimeters and moved along the soft tissue pocket wall with light pressure in a circumferential direction. The stroke shown here is in contrast with the walking stroke used for probing depth evaluation and measurement.](http://pt.wkhealth.com/pt/re/9780781763226/bookContentPane_frame.htm...)

<table>
<thead>
<tr>
<th>GI Code</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal gingiva.</td>
</tr>
<tr>
<td>1</td>
<td>Mild inflammation-slight change in color, slight edema. <em>No bleeding</em> on probing.</td>
</tr>
<tr>
<td>2</td>
<td>Moderate inflammation-redness, edema, and glazing. <em>Bleeding</em> on probing.</td>
</tr>
<tr>
<td>3</td>
<td>Severe inflammation-marked redness and edema. Ulceration. Tendency to <em>spontaneous bleeding</em>.</td>
</tr>
</tbody>
</table>

D. Scoring

- GI for Area
  
  Each of the four gingival surfaces (distal, facial, mesial, lingual) is given a score of 0 to 3.
- GI for a Tooth
  
  Scores for each area are totaled and divided by four.
- GI for Groups of Teeth
  
  Scores for individual teeth may be grouped and totaled, and divided by the number of teeth. A GI may be determined for specific teeth, group of teeth, quadrant, or side of mouth.
- GI for the Individual
  
  By totaling scores and dividing by the number of teeth examined, the GI is determined. Indices range from 0 to 3.

Suggested Range of Scores for Patient Reference

<table>
<thead>
<tr>
<th>Rating</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent (healthy tissue)</td>
<td>0</td>
</tr>
</tbody>
</table>
Calculation: Example for an Individual

Using six teeth for an example of screening; teeth selected are known as the Ramfjord Index Teeth.\(^2\)

<table>
<thead>
<tr>
<th>M</th>
<th>F</th>
<th>D</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (16)</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>9 (21)</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>12 (24)</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>19 (36)</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>25 (41)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>28 (44)</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Total 12 5 12 6 = 35

Gingival index = \( \frac{\text{Total score}}{\text{Number of surfaces}} = \frac{35}{24} = 1.45 \)

Interpretation: According to the suggested range of scores, the score for this individual (1.45) indicates only fair gingival health (moderate inflammation). The ratings for each gingival area or surface can be used to help the patient compare gingival changes and improve oral hygiene procedures.

- GI for a Group
  - Add the individual GI scores and divide by the number of individuals examined.

Indices that Measure Dental Caries Experience

Dental caries experience data are most useful when measuring the prevalence of dental disease in groups rather than individuals. The population scores can document such information as the number of persons in any age group who are affected by dental caries, the number of teeth that need treatment, or the proportion of teeth that have been treated.

**I. Permanent Dentition: Decayed, Missing, and Filled Teeth (DMFT) or Surfaces (DMFS)**

(Klein, Palmer, and Knutson\(^3\) and U.S. Department of Health and Human Services \(^2\))

**A. Purpose**

To determine total dental caries experience, past and present, by recording either the number of affected teeth or tooth surfaces.

**B. Selection of Teeth and Surfaces**

- The DMFT is based on 28 teeth.
- The DMFS is based on surfaces of 28 teeth; 128 surfaces.

1. 16 posterior teeth × 5 surfaces (facial, lingual, mesial, distal, and occlusal) = 80 surfaces.
2. 12 anterior teeth × 4 surfaces (facial, lingual, mesial, and distal) = 48 surfaces.
3. Teeth that are missing due to dental caries are recorded using 5 surfaces for posterior and 4 surfaces for anterior teeth.

**C. Procedures**

- Examination
  1. Examine each tooth in a systematic sequence.
2. Observe teeth by visual means as much as possible.
3. Use adequate light.

Criteria for Recording

1. Each tooth is recorded once when using the DMFT index.
2. 5 surfaces for posterior teeth and 4 surfaces for anterior teeth are recorded when using the DMFS index.
3. DMF indices use a dichotomous scale (present or absent) to record decay.

<table>
<thead>
<tr>
<th>DMF Rating</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decayed (D)</td>
<td>Visible dental caries is present or both dental caries and a restoration are present.</td>
</tr>
<tr>
<td>Missing (M)</td>
<td>A tooth has been extracted because of dental caries or when it is carious, nonrestorable, and indicated for extraction.</td>
</tr>
<tr>
<td>Filled (F)</td>
<td>Any permanent or temporary restoration is present or a defective restoration without evidence of dental caries is present.</td>
</tr>
</tbody>
</table>

D. Scoring

Individual DMF

1. Total each component separately.
2. Total \( D + M + F = DMF \)

Example: An individual presents with dental caries on the mesial and occlusal surfaces of a posterior tooth, caries on the mesial surface of an anterior tooth, a molar tooth and an anterior tooth are missing because of dental caries, and there is an amalgam restoration on the mesial-distal-occlusal surfaces of a posterior tooth.

1. \( DMFT = 2 + 2 + 1 = 5 \)
2. \( DMFS = 3 + 9 + 3 = 15 \)
3. A DMF score may have different derivations. For example, an individual who had regular dental care may have a distribution such as \( D = 0, M = 0, F = 15 \).

Group DMF

1. Total the DMFs for each individual examined.
2. Divide the total DMFs by the number of individuals in the group.

Calculation: Example

A population of 20 individuals with individual DMF scores of 0, 0, 0, 0, 2, 3, 3, 4, 9, 9, 9, 9, 10, 10, 10, 11, 11, 12, and 16 equals a group total DMF of 124.

1. \( \frac{124}{20} = 6.2 = \text{the average DMF for the group} \)
2. This DMF average represents accumulated dental caries experience for the group.
3. The differences in caries experience between two groups of individuals within this population are notable and influence interpretation of the results. For the first 10 individuals, the group average is

\[
\text{average DMF} = \frac{10}{10} = 10.7. \text{ Scores for these two groups can be presented separately because of the wide difference.}
\]
4. Average DMF scores can also be presented by age group.
5. Specific Treatment Needs of a Group

1. To calculate the percentage of DMF teeth that need to be restored, divide the total D component by the total DMF.

Calculation: Example 1

To calculate the percent of DMF teeth that need to be restored, divide the total M component by the number of teeth.

\( D = 175, M = 55, F = 18 \)

Total DMFT = 248

\[
\frac{D}{DMF} = \frac{175}{248} = 0.70 \text{ or } 70\% \text{ of the teeth need restorations.}
\]

Calculation: Example 2

The same type of calculations can be used to determine the percentage of all teeth that are missing.

II. Primary Dentition: Decayed, Indicated for Extraction, and Filled (df and def)

(Grubeble27)

A. Purpose
To determine the dental caries experience for the primary teeth present in the oral cavity by evaluating teeth or surfaces.

B. Selection of Teeth or Surfaces
- deft or dft: 20 teeth evaluated.
-defs or dfs: 88 surfaces evaluated.

1. Posterior Teeth. Each has five surfaces: facial, lingual or palatal, mesial, distal, and occlusal. (8 teeth × 5 surfaces = 40 surfaces.)
2. Anterior Teeth. Each has four surfaces: facial, lingual or palatal, mesial, and distal. (12 teeth × 4 surfaces = 48 surfaces.)

C. Procedure
- Instruments and Examination
  Same as for DMFT.
- Criteria for Identification of Dental Caries

<table>
<thead>
<tr>
<th>df or def Rating</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>d</td>
<td>Primary teeth (or surfaces) with dental caries but not restored.</td>
</tr>
<tr>
<td>e</td>
<td>Primary teeth (or number of surfaces) that are indicated for extraction because of dental caries.</td>
</tr>
<tr>
<td>f</td>
<td>Primary teeth (or surfaces) that do not have dental caries. Each tooth (or surface) is scored once only, recurrent caries around a restoration receive a “d” score.</td>
</tr>
</tbody>
</table>

- Difference Between deft/defs and dft/dfs
  In the deft and defs, both “d” and “e” are used to describe teeth with dental caries. Thus, d and e are sometimes combined, and the index becomes the dft or dfs.

D. Scoring
**Calculation: Example 1 Individual dft**
A 2 1/2-year-old child has 18 teeth. Teeth A (55) and J (65) are unerupted. There is no sign of dental caries in teeth M (73), N (72), O (71), P (81), Q (82), and R (83). All other teeth have two carious surfaces each, except B (54), which is broken down to the gum line.

**Summary:**
- Total teeth = 18
- Caries-free = 6
- “d” teeth = 12
- “f” teeth = 0
- dft = d + f = 12 + 0 = 12

**Interpretation:**
12 of 18 teeth with carious lesions indicates a serious need for dental treatment and a prevention program for the child.

**Calculation: Example 2: Individual dfs**
Using the same 2 1/2-year-old child to calculate dfs:

- Total number of carious surfaces: 11 × 2 = 22
- Tooth B: 1 × 5 = 5
- Total dfs 27

**Interpretation:**
The child has 48 anterior surfaces (12 teeth × 4 surfaces) and 30 posterior surfaces (6 teeth × 5 surfaces) to total 78 surfaces.

\[
\text{dfs} = \frac{27}{78} = 0.34 \text{ or } 34\% \text{ of the surfaces in need of dental treatment}
\]

E. Mixed Dentition
A DMFT or DMFS and a deft or defs are never added together. Each child is given a separate index for permanent teeth and another for primary teeth.

**III. Primary Dentition: Decayed, Missing, and Filled (dmft and dmfs)**
(Grubbbeil27)

A. Purpose
To determine dental caries experience for children. Only primary teeth are evaluated.

B. Selection of Teeth or Surfaces
dmf: 12 teeth evaluated (8 primary molars; 4 primary canines).

dmfs: 56 surfaces evaluated.
- Primary molars: $8 \times 5$ surfaces each = 40
- Primary canines: $4 \times 4$ surfaces each = 16

Each tooth is counted only once. When both dental caries and a restoration are present, the tooth or surface is scored as “d.”

C. Procedure
- Instruments and examination are the same as for DMF or df.
- Criteria for dmft or dmfs

<table>
<thead>
<tr>
<th>dmf Rating</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>d</td>
<td>Primary molars and canines (or surfaces) that are carious.</td>
</tr>
<tr>
<td>m</td>
<td>Primary molars and canines (or surfaces) that are missing. A primary molar or canine is presumed missing because of dental caries when it has been lost before normal exfoliation.</td>
</tr>
<tr>
<td>f</td>
<td>Primary molars and canines (or surfaces) that have a restoration but are without caries.</td>
</tr>
</tbody>
</table>

D. Scoring

Calculation: Example 1: Individual dmf

A 7-year-old boy has all primary molars and canines present. Examination reveals two carious surfaces on one molar tooth, one missing canine tooth, and one two-surface amalgam filling on a molar tooth.

$\text{dmft} = 1 \times 1 + 1 = 3$
$\text{dmfs} = 2 \times 4 + 2 = 8$

Mixed Dentition

Permanent and primary teeth are evaluated separately. A DMFT or DMFS and a dmft or dmfs are never added together.

IV. Early Childhood Caries (ECC and S-ECC)

(Deury, Horowitz, Ismail, Maertens, Rizier, and Selwitz 28)

A. Purpose
To provide case definitions that determine caries status of children 5 years of age or younger.

B. Selection of Teeth or Surfaces
Each surface (mesial, distal, facial, lingual, occlusal) of each tooth visible in the child's mouth is evaluated. Only primary teeth are scored.

C. Procedure
- Visual examination of all surfaces of each erupted tooth.
- Criteria for Case Definition

<table>
<thead>
<tr>
<th>Age (Months)</th>
<th>Early Childhood Caries</th>
<th>Severe Early Childhood Caries</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;12</td>
<td>1 or more dmf surfaces*</td>
<td>1 or more smooth dmf surfaces*</td>
</tr>
<tr>
<td>12–23</td>
<td>1 or more dmf surfaces*</td>
<td>1 or more smooth dmf surfaces*</td>
</tr>
<tr>
<td>24–35</td>
<td>1 or more dmf surfaces*</td>
<td>1 or more smooth dmf surfaces*</td>
</tr>
<tr>
<td>36–47</td>
<td>1 or more dmf surfaces*</td>
<td>1 or more cavitated, filled, or missing (due to caries) smooth surfaces in primary maxillary anterior teeth OR dmfs score ≥4</td>
</tr>
<tr>
<td>48–59</td>
<td>1 or more dmf surfaces*</td>
<td>1 or more cavitated, filled, or missing (due to caries) smooth surfaces in primary maxillary anterior teeth OR dmfs score ≥5</td>
</tr>
<tr>
<td>60–71</td>
<td>1 or more dmf surfaces*</td>
<td>1 or more cavitated, filled, or missing (due to caries) smooth surfaces in primary maxillary anterior teeth OR dmfs score ≥5</td>
</tr>
</tbody>
</table>
D. Scoring

- A designation of ECC or S-ECC for a particular individual relates the age of the child with the status of decayed, missing, and filled tooth surfaces observed.
- Community-based surveys identify the percentage of a population with ECC and/or S-ECC.

V. Root Caries Index (RCI)
(Katz29)

A. Purpose
To determine total root caries experience for individuals and groups and provide a direct, simple method for recording and making comparisons.

B. Selection of Teeth

- Four surfaces (mesial, distal, facial, lingual/palatal with visible gingival recession are counted for each tooth.
- Teeth with multiple roots with extreme recession, though rare, could present with two or three lesions on the same surface. In this case, the most severe lesion is selected for recording and each surface is counted only once.

C. Procedure

- Examination
  1. Use adequate retraction and light to examine each tooth to determine where gingival recession has occurred and root surfaces are directly visible. Visible recession is shown in Figure 12-12 on page 224.
  2. Apply current knowledge of the stages of dental caries to prevent damage to remineralizing areas during examination (page 399). Only cavitated lesions are recorded.
- Record a rating for each root surface.

<table>
<thead>
<tr>
<th>RCI RatingCriteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>No R</td>
</tr>
<tr>
<td>R-D</td>
</tr>
<tr>
<td>R-F</td>
</tr>
<tr>
<td>R-N</td>
</tr>
<tr>
<td>M</td>
</tr>
</tbody>
</table>

D. Scoring

Calculation: Formula

\[
\text{RCI} = \frac{R-D + R-F}{R-D + R-F + R-N} \times 100
\]

Example Individual RCI

A gentleman, age 70, presents with 23 natural teeth (23 \times 4 = 92 surfaces). Clinical examination reveals:

\[
\text{RCI} = \frac{26 + 8}{26 + 8 + 58} = \frac{37}{92} \times 100 = 36.9\%
\]

Interpretation: A score of 36.9% for the individual means that of all tooth surfaces with visible gingival recession, 36.9% have cavitated carious lesions or have been restored.

- Group or Community RCI

The R-D, R-F, and R-N scores for all individuals in the group are added together and the RCI formula is calculated using the total scores.

Indices that Measure Dental Fluorosis

Dental indices such as the Thylstrup-Fejerskov Index30, the Fluorosis Risk Index31, and the Developmental Defects of Dental Enamel Index32,33 have been used to investigate the effects of fluoride concentration on dental enamel. The two indices described here are the most commonly used for community-based assessment.

I. Dean’s Fluorosis Index
(Dean34)
A. Purpose
To measure the prevalence and severity of dental fluorosis.

- Originally developed in the 1930's and refined in 1942 to relate the severity of hypomineralization of dental enamel to concentration of fluoride in the water supply.
- Considered less sensitive than some other measures of fluorosis, but still recommended for use in community studies.

B. Selection of Teeth
The smooth surface enamel of all teeth is examined.

C. Procedure
Each tooth is visually examined for signs of fluorosis and assigned a numerical score using the descriptive categories shown in Table 20-3.

D. Scoring
- An individual fluorosis score is assigned using the highest numerical score recorded for two or more teeth.
- Community levels of fluorosis are indicated by the percentage of individuals in the sample or population that receive scores in each category.

II. Tooth Surface Index of Fluorosis (TSIF)
(Horowitz, Driscoll, Mayers, Heifetz, and Kingman35)

A. Purpose
- To measure the prevalence and severity of dental fluorosis.

Table 20-3 Scoring System for Dean's Fluorosis Index

<table>
<thead>
<tr>
<th>Numerical Score</th>
<th>Descriptive Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal</td>
</tr>
<tr>
<td>1</td>
<td>Questionable</td>
</tr>
<tr>
<td>2</td>
<td>Very Mild</td>
</tr>
<tr>
<td>3</td>
<td>Mild</td>
</tr>
<tr>
<td>4</td>
<td>Moderate</td>
</tr>
<tr>
<td>5</td>
<td>Severe</td>
</tr>
</tbody>
</table>


- More sensitive than Dean's Index in identifying the mildest signs of fluorosis.

B. Selection of Teeth
The smooth surface enamel, cusp tips, and incisal edges of all teeth are examined.

C. Procedure
Each tooth is examined visually and assigned a numerical score using the criteria in Table 20-4.

Table 20-4 Descriptive Criteria and Scoring System for the Tooth Surface Index of Fluorosis (TSIF)

<table>
<thead>
<tr>
<th>Numerical Score</th>
<th>Descriptive Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Enamel shows no evidence of fluorosis.</td>
</tr>
<tr>
<td>1</td>
<td>Enamel shows definite evidence of fluorosis, namely, areas with parchment-white color that total less than one-third of the visible enamel surface. This category includes fluorosis confined only to incisal edges of anterior teeth and cusp tips of posterior teeth (“snowcapping”).</td>
</tr>
<tr>
<td>2</td>
<td>Parchment-white fluorosis totals at least one-third of the visible surface, but less than two-thirds.</td>
</tr>
<tr>
<td></td>
<td>Description</td>
</tr>
<tr>
<td>---</td>
<td>-------------</td>
</tr>
<tr>
<td>3</td>
<td>Parchment-white fluorosis totals at least two-thirds of the visible surface.</td>
</tr>
<tr>
<td>4</td>
<td>Enamel shows staining in conjunction with any of the preceding levels of fluorosis. Staining is defined as an area of definite discoloration that may range from light to very dark brown.</td>
</tr>
<tr>
<td>5</td>
<td>Discrete pitting of the enamel exists, unaccompanied by evidence of staining of intact enamel. A pit is defined as a definite physical defect in the enamel surface with a rough floor that is surrounded by a wall of intact enamel. The pitted area is usually stained or differs in color from the surrounding enamel.</td>
</tr>
<tr>
<td>6</td>
<td>Both discrete pitting and staining of the intact enamel exist.</td>
</tr>
<tr>
<td>7</td>
<td>Confluent pitting of the enamel surface exists. Large areas of enamel may be missing, and the anatomy of the tooth may be altered. Dark-brown stain is usually present.</td>
</tr>
</tbody>
</table>


**D. Scoring**

TSIF data are presented as a distribution citing the percent of the population with each numerical score, rather than as mean scores for the entire group.

**Indices Useful for Community-Based Oral Health Surveillance**

Community oral health screenings can be performed at every level: local, national, and worldwide.

**I. World Health Organization Basic Screening Survey**

(World Health Organization21)

**A. Purpose**

To collect comprehensive data on oral health status and dental treatment needs of a population. This system is suitable for surveying both adults and children.

**B. Tissues/Areas Examined**

Survey categories include:

- Orofacial (intraoral and extraoral) lesions and anomalies
- Temporomandibular joint status
- Periodontal status
- Dentition status and treatment need
- Prosthetic status and need
- Need for immediate care/referral

**C. Procedures**

- Standardized assessment form with boxes for data entry identifies the codes and descriptive criteria for each data collection category.
- Standardized codes facilitate computerized data entry and analysis.
- Photographs in the training manual provide examples of criteria for each code.

**D. Scoring**

- Data can be analyzed by survey team or arrangements can be made for data entry forms to be analyzed by the World Health Organization.

**II. Association of State and Territorial Dental Directors Basic Screening Survey (BSS)**

(Association of State and Territorial Dental Directors6)

**A. Purpose**

To provide oral screening for adult, school age, and/or preschool populations.

- Data levels are consistent with monitoring the United States Public Health Service national health objectives.
- Data collected can easily be compared with data collected by other communities and states using the data collection techniques.

The system was designed to be used by screeners with or without dental background because:

- Sometimes nondental personnel have better access to some population groups.
- Some communities have little access to dental public health professionals.

**B. Selection of Teeth**

All teeth are examined, but each individual person receives one score for each category (Table 20-5).
C. Procedure

- Oral screening can be combined with an optional questionnaire that collects additional data on demographics and access to dental care.
- Screeners are trained and calibrated. They record oral findings using photographs and detailed descriptions of associated criteria.

Everyday Ethics

Susanna began practicing in the team clinic at the dental school and found the work to be very challenging. As a hygienist she was not only performing preventive treatment on maintenance patients but was also responsible for data collection for several research projects. Suddenly, the importance of understanding and calculating the various indices became critical. In particular, Susanna found herself reviewing the procedures for the OHI-S, bleeding indices, and the DMFT.

Susanna had always enjoyed her clinical interactions with patients, but now scoring and recording information on each and every tooth was beginning to cause her some stress. Generally Susanna worked without an assistant and found it difficult to do both examining and recording. Near the end of one day when she was organizing the day's work for Dr. Lowe's caries study, she discovered that she had omitted several surfaces in one quadrant. This was the patient's final visit to the dental school. Susanna contemplated what to do when she realized the data was missing.

Questions for Consideration

1. Discuss how ADHA’s roles for dental hygienists apply to Susanna’s daily duties.
2. Can Susanna “defend” her actions to Dr. Lowe by submitting the data she does have on the patient? Explain your rationale.
3. Which of the core values or principles of ethical behavior come into play in collecting research data such as described in this scenario?

### Table 20-5 Association of State and Territorial Dental Directors Basic Screening Survey (BSS) Scoring Criteria

<table>
<thead>
<tr>
<th>Score</th>
<th>Preschoolers</th>
<th>Schoolchildren</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated Caries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(≥ 1/2 mm discontinuity in tooth surface)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = no untreated caries</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1 = untreated caries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caries Experience (ever had a cavity)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = no caries experience</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>1 = caries experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early Childhood Caries (ECC) (3 years old with one or more upper front teeth that were ever decayed, filled, or missing due to caries)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = no ECC</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = ECC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Urgency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = no obvious problem (routine dental care indicated)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1 = early dental care (within two weeks)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = urgent care (as soon as possible—presents with pain, swelling, etc.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sealants on Permanent Molars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = no sealants</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = sealants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Teeth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = no natural teeth</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>1 = at least one natural tooth</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A ✓ mark indicates that the oral condition category is scored in that particular age group. Some categories (i.e., sealants) are not scored in all age groups.

D. Scoring

- Table 20-5 outlines the scoring criteria and categories recorded for each age group.
- Data from each indicator can be compiled and expressed in frequency graphs or tables as a percentage of the population that exhibits a specific category trait.

**Factors To Teach The Patient Or Members Of The Community**

- How an index is used and calculated, and what the scores mean.
- Correlation of index scores with current oral health practices and procedures.
- Procedures to follow to improve index scores and bring the oral tissues to health.

**References**


Additional Suggested Readings


Dental Caries Indices


Periodontal and Gingival Indices


**Fluorosis Indices**


**Other Indices**

