Combining Normative and Psychosocial Perceptions for Assessing Orthodontic Treatment Needs

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Abstract: Whereas perceptions of malocclusion by the public are mainly subjective, currently orthodontic treatment needs are predominantly determined using normative need. There are considerable differences between normative and subjective perceptions of orthodontic need. Yet clinical measures determine current provision of orthodontic services, whereas subjective oral health-related quality of life (OHRQoL) measures are seldom used and play a small part in need assessment despite predicting perceived need. The sociodental approach to assessing orthodontic treatment needs overcomes deficiencies of the sole use of normative need. It is a gradual integration process, estimating orthodontic needs by combining normative and psychosocial perspectives, as well as considering behavioral factors affecting outcomes of orthodontic treatment and scientific evidence about the effectiveness of interventions. To be appropriately used in needs assessment, an OHRQoL measure should provide condition-specific estimates of the impact of malocclusion on daily life. The sociodental approach attempts to replicate the characteristics of good clinical practice using a structured, rational, and coherent system for assessing orthodontic needs and, therefore, is a useful tool in planning oral health services.

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While the definition of health is broad and encompasses physical, psychological, and social dimensions that people feel are important, health care is overwhelmingly reactive in nature, responding to diseases that are departures from the norm according to the professional perception. Malocclusion is not a disease per se but rather a departure from an aesthetic norm in a society. The main expected benefits of orthodontic treatment relate to improvements of oral function and appearance that will lead to improved psychological and social well-being, though the degree to which this actually happens has been recently challenged. In any case, subjective perceptions play a key role in orthodontics, especially as the demarcation between an acceptable and unacceptable occlusion is influenced by idiosyncratic judgments and therefore may differ considerably according to the aesthetic standards of the person and the respective societal norms. This article discusses the differences between normative and psychosocial perceptions in orthodontics and presents a new sociodental approach that combines them for the assessment of needs.

In contrast to the considerable subjective focus on malocclusion, orthodontic research has traditionally focused on “hard clinician-driven outcome measures at the expense of more subjective patient-driven measures.” A number of orthodontic need indices, such as the Dental Aesthetic Index (DAI), the Index of Orthodontic Need (IOTN), and the Index of Complexity, Outcome, and Need (ICON), have been developed and used for assessing orthodontic treatment need. At present, orthodontic treatment need in the United Kingdom is determined through the use of the IOTN; treatment is recommended for patients with a Grade 4 or 5 of the dental health component of the IOTN, as well as for patients with a Grade 3 of the dental health component and a Grade 6 or more of the aesthetic component of the IOTN.

Despite its utility and extensive use, clinically defined (normative) need—when used alone—is not free from limitations. The assumed objectivity and reliability of clinical measures have been questioned. They have also been criticized for leading to unrealistic estimates of need, and thereby limiting their appropriateness for treatment planning. Most importantly, the exclusive use of normative needs deprives us of information on the psychosocial aspects of the effects of malocclusions on a person’s quality of life. From the point of view of contemporary definitions of health (which expands beyond the traditional clinical dimensions and incorporates physical, psychological, and social well-being), clinical measures have serious limitations. They tell us nothing about the function-
ing of either the oral cavity or the person as a whole and nothing about subjectively perceived symptoms such as pain and discomfort.\textsuperscript{13} Furthermore, they do not consider the attitudes and behaviors of patients, which in turn influence the effectiveness of treatments and improvements in oral health.

For example, Shaw et al.\textsuperscript{2} showed that lack of cooperation from orthodontic patients was the most common cause of treatment failures. Clinical indices are essential for measuring oral disease, but the problem arises when these indices are used as measures of health and treatment need.\textsuperscript{14} This is even more the case in orthodontics, a nonprogressive condition in which subjective perceptions about psychosocial domains of quality of life are influential. Clinical measures reflect only the professional viewpoint, thereby ignoring the disability experienced by the patient or consumer of care.\textsuperscript{6}

Differences Between Normative and Subjective Perceptions of Orthodontic Need

There are considerable differences between a clinician’s and a patient’s perceptions of dental appearance and needs for orthodontic treatment. O’Brien et al.\textsuperscript{6} highlighted these differences by showing that some patients rejected the professionally defined treatment need, while others demanded treatment for conditions clinically perceived as minor deviations. Different studies on children and adolescents have shown that they had a more positive view than oral health professionals about their malocclusions. Patients were less concerned and had a lower threshold of detecting malocclusion traits than did professionals.\textsuperscript{15-17} In a study among both adolescents and young adults, only 50–65 percent of those normatively assessed as in need of orthodontic treatment actually perceived such a need.\textsuperscript{18} And these figures were nearly identical to those derived from studies of orthognathic surgery patients, in which 50–60 percent of those clinically assessed as requiring treatment reported that they perceived such a need for treatment.\textsuperscript{19,20}

Worse clinical orthodontic status is associated with a more negative psychosocial impact.\textsuperscript{21} However, association does not indicate agreement between the two constructs. The inconsistencies between the normative and subjective perceptions of malocclusion were also confirmed when assessing agreement between clinical and oral health-related quality of life (OHRQoL) measures. Although normative needs and OHRQoL in children were associated, there were considerable differences between them, with the difference being greater for appearance-related conditions, such as orthodontic treatment.\textsuperscript{22} De Oliveira and Sheiham\textsuperscript{23} showed that a high percentage of Brazilian adolescents normatively considered to need orthodontic treatment did not report oral impacts on their quality of life; 46 percent of those with IOTN Grades 4 and 5 and 67 percent of those with IOTN Grade 3 did not perceive a need for treatment. In addition, about one-fourth of the adolescents with oral impacts were not considered to have normative treatment need. Similar findings were replicated in a study in England.\textsuperscript{24}

Furthermore, the conversion of clinical data into orthodontic need estimates resulted in unrealistically high amounts of normative orthodontic needs. To illustrate this point, 57 percent of nine-year-old children and 30 percent of twelve-year-olds in Britain were assessed as in either great or very great need of orthodontic treatment,\textsuperscript{25} while over 30 percent of children approaching school-leaving age had untreated malocclusions.\textsuperscript{26} In a study in Turkey, 38 percent of primary schoolchildren were classified as having a definite to severe orthodontic need.\textsuperscript{27} Considering the high cost of orthodontic treatment, such need estimates are highly unlikely to be met.

The reported inconsistencies between clinical and perceived assessments for orthodontic need may reflect the broader conceptual distinction between disease and health.\textsuperscript{12,28} They show the inadequacy of clinical measures to assess people’s feelings about, and satisfaction with, their dental appearance, as well as the psychosocial dimensions of their functioning and well-being. Obviously, the reported differences between professional and patient perceptions in a sample do not imply that this is necessarily the predominant feature in everyday orthodontic practice. There will be many times when a professional opinion is requested by a prospective patient. However, it has been clearly shown that clinical and perceived assessments of need represent different standpoints that should both be considered.

This distinction between normative and perceived need has clear service-related implications, highlighted by the fact that the use of orthodontic services is primarily determined by the clinical need and is not seriously influenced by subjective measures.
of OHRQoL.\textsuperscript{24,29} This is the logical consequence of the overruling influence of clinical measures on clinical decision making about orthodontic treatment provision—despite the fact that clinical measures fail to predict perceived need for orthodontic treatment, which is in turn explained by OHRQoL measures.\textsuperscript{24} Under the normative system of orthodontic needs assessment, children with oral impacts are denied treatment or, paradoxically, some of those without oral impacts are treated. Therefore, an appropriate measure of orthodontic need should go beyond the simple use of a normative measure. If one accepts the argument that psychosocial factors should play a major part in needs assessment, the issue then is to achieve the necessary balance between clinical assessments and subjective perceptions, while also considering factors that are important for the outcome of orthodontic treatment.

### The Sociodental Approach to Orthodontic Needs Assessment

In order to overcome the deficiencies associated with the normative assessment of need in oral health, a new approach to oral health needs assessment has been recommended.\textsuperscript{12,30} This sociodental approach to needs assessment proposes the incorporation of normative assessments with the respective subjective perceptions and oral impacts, as well as also considering the relevant behavioral factors for a specific treatment. Assessing dental needs with a sociodental approach is based on the principles of evidence-based dentistry and considers need for treatments for which there is scientific evidence regarding their effectiveness. The main elements of this approach are

1. clinical estimates of normative need,
2. subjective perceptions, including perceived treatment needs and oral health impacts in relation to functional, psychological, and social dimensions,
3. propensity to adopt health-promoting behaviors, and
4. scientific evidence of the effectiveness of treatments.

The sociodental approach is influenced by the definition of need as the capacity to benefit. If health needs are to be identified, then there should be an effective intervention available to meet these needs and improve health.\textsuperscript{31}

### Using OHRQoL Measures in Orthodontic Needs Assessment

The overall importance of OHRQoL measures in orthodontics and their potential role for needs assessment have been highlighted.\textsuperscript{12-15} In an important contribution to the literature on orthodontic needs and outcomes, O’Brien et al.\textsuperscript{32} went so far as to say that orthodontic treatment outcome should perhaps only be evaluated by subjective quality of life measures. These are patient-reported measures that cover a wide nonclinical spectrum of the physical, psychological, and social dimensions of oral health.

Oral health-related quality of life is a multidimensional concept that incorporates relatively abstract and not clearly demarcated domains, such as survival, illness, and impairment; social, psychological, and physical function and disability; oral health perceptions; and opportunity—as well as interactions among the aforementioned domains.\textsuperscript{36} The measurement of OHRQoL in orthodontics presents different challenges, of both a conceptual and a technical nature, such as using condition-specific or generic measures, applying them in a clinical setting, and determining crucial technical details such as the mode of administration.\textsuperscript{34} This determination implies the use of standardized, valid, and reliable data collection instruments.\textsuperscript{3}

A further important issue relates to the changing concern of appearance over time. While there may not be excessive appearance-related oral impacts on the quality of life among children, by early adulthood, when securing employment or meeting a boyfriend/girlfriend become more relevant issues, young people may think very differently about the impact of their dental appearance.

A number of studies have focused on the improvement of quality of life following orthognathic surgery.\textsuperscript{7,33,37-40} Using OHRQoL measures, it was shown that malocclusion has considerable impact on the daily life of adolescents,\textsuperscript{41,42} most commonly affecting the psychosocial domain, such as their ability to smile, laugh, and show their teeth without embarrassment.\textsuperscript{23,41-45} Furthermore, OHRQoL measures successfully distinguished between treated and untreated groups,\textsuperscript{6,23,46} as well as among different malocclusion traits.\textsuperscript{37}

While subjective measures of quality of life have been suggested for needs assessment for over two decades,\textsuperscript{46} their use in needs assessment has been largely ignored in oral health. Researchers have primarily focused on the relationship between subjective
measures of quality of life and clinical status and on the use of subjective measures in the evaluation of treatment outcomes. The use of OHRQoL measures in orthodontic needs assessment involves combining them with clinical measures of treatment needs. In this sense, measures of patients’ views and feelings complement clinical measures.35

Although there are a number of OHRQoL indicators available, and despite the fact that they are increasingly used in national oral health surveys,39,51 these indicators have seldom been used in dental service planning because they have not been integrated with traditionally collected clinical data. However, combining the clinical with the OHRQoL measures is not straightforward, mainly due to the fact that OHRQoL assessments are usually not directly attributed to specific oral conditions, such as malocclusion. As a result, it is not possible to directly link an oral impact with an oral health condition that the person sees as fully or partly responsible for the experience of the impact.

Though still preferable, the ability to attribute oral impact to a specific oral condition may not be absolutely crucial when looking for associations between clinical malocclusion traits and subjective perceptions of oral impacts or when assessing the effect of orthodontic treatment in a clinical trial, in which different OHRQoL measures may potentially be used.6,6 These studies (e.g., trials on the effectiveness of orthodontic treatment) predominantly refer to samples with the “disease” (malocclusion), and it can be assumed, though not really known, that the vast majority of oral impacts experienced are due to malocclusion. However, the condition-specific feature becomes essential when assessing orthodontic needs, as it provides a clear picture of the oral impacts that are due to malocclusion, according to subjective perception. Orthodontic needs assessment is usually carried out in general population samples, where the reported oral impacts may be due to different oral conditions. In such a case, it is crucial to be able to identify oral impacts that are due to malocclusion, and hence can be remedied with orthodontic interventions.

Therefore, the assessment of need for orthodontic services should also include a measure that detects impacts caused by malocclusions or oral deformities.32,34 This calls for the use of either an OHRQoL measure specifically developed for orthodontics or a generic OHRQoL measure that facilitates the link of oral impacts with clinical conditions. In relation to the former, the adequately tested Orthognathic Quality of Life Questionnaire52,53 refers to surgical orthodontic patients, while the recent Psychosocial Impact of Dental Aesthetics Questionnaire54 has been used with young adults but not with children and adolescents, who are the main target group for the provision of orthodontics. Indeed, children have been the recent focus of the development of generic OHRQoL measures.55-58

Of the generic measures, the Child-OIDP56 is the only one that allows for the attribution of oral impacts to specific dental conditions such as malocclusion. The Child-OIDP assesses the impacts of oral conditions in relation to the ability of the person to carry out eight important daily activities and behaviors that collectively cover the functional and psychosocial domains. In addition to the overall score, there is provision for the calculation of condition-specific scores, whereby oral impacts are related to a specific dental condition, such as malocclusion, by directly asking the respondent which oral condition is causing each impact. As a result, the Child-OIDP can serve as both a generic and condition-specific instrument.
This condition-specific feature makes the index very well placed to be used for needs assessment and treatment planning.

Behavioral Propensity in Orthodontic Needs Assessment

Behavioral factors should be considered in orthodontic needs assessment because they affect the outcome of orthodontic treatment. The two behavioral factors relevant for orthodontics are oral hygiene and dental compliance.2,3,59 Poor oral hygiene significantly increases the risk of caries and gingival diseases while a child is having orthodontic treatment.50,61 Similarly, compliance plays an important role, particularly in treatments that require several dental visits.62 The patient’s cooperation must be taken into consideration in orthodontics because failure of treatment is commonly associated with poor cooperation, noncompliance, or discontinuation of treatment.2

From the Components to the Sociodental Approach

The sociodental approach suggests a gradual process of integrating its main elements in order to identify and prioritize oral health needs. This is done in three levels (Figure 1). The first level refers
to normative need, which is equivalent to the current practice. Then, normative need assessments are integrated with subjective perceptions (impact-related need), through the use of an OHRQoL measure, while the additional incorporation of information on the behavioral pattern and propensity of people leads to the third level (propensity-related need). Information on the effectiveness of interventions is a prerequisite for needs assessment and refers to all levels of the sociodental approach.

A more specific model for the sociodental needs assessment approach for orthodontics is presented in Figure 2. While the measurement of the first level is straightforward and refers to the sole use of clinical assessments, such as the IOTN and the DAI, the other two levels need to be further clarified. The first important issue relates to the applicability of the impact-related need (IRN) assessment for different oral conditions. The integration of OHRQoL into the needs system requires sound concepts of the life history of diseases. In this framework, it is crucial to consider whether the condition is progressive and whether current treatments change the life history of the condition for the better.12,30

While the integration should be performed for most oral conditions, this should not be done in the case of life-threatening or chronically progressive oral health conditions or those requiring emergency treatment, such as precancerous lesions, abscesses, dentinal caries, and traumatic injuries involving the dentine or pulp. For these conditions, the normative assessment is dominant, and the IRN does not play a crucial role in the whole process and should not be assessed, because treatment should be provided even in the absence of oral impacts caused by the condition.

For example, it is an unethical and unacceptable practice to refrain from providing treatment on children who have progressive dentinal caries lesions but have not reported oral impacts. Waiting for the experience of pain and the reporting of oral impacts would further worsen their oral health, and this would partly be due to the absence of an early intervention. In those cases, the need for intervention should not be based on the subjective perceptions of the child but solely considering the best available evidence in relation to the natural history of diseases. Therefore, the sociodental approach in those cases covers the assessment of normative and propensity-related needs.

However, malocclusions, together with a number of other oral health conditions, such as enamel defects and dental traumatic lesions not involving

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### Figure 1. Levels of dental treatment needs and relevant key factors

<table>
<thead>
<tr>
<th>Dental Need Level</th>
<th>Key Factors*</th>
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</thead>
<tbody>
<tr>
<td>Normative Need</td>
<td>✓ Clinical impairments</td>
</tr>
</tbody>
</table>
| Impact-Related Need        | ✓ Clinical impairments  
|                           | ✓ Perceived oral health impacts and needs |
| Propensity-Related Need    | ✓ Clinical impairments  
|                           | ✓ Perceived oral health impacts and needs  
|                           | ✓ Behavioral propensity for treatment |

*Evidence-based treatment is a factor considered throughout the sociodental system.*
the dentine or pulp, clearly do not belong in the category of life-threatening, emergency, or progressive oral conditions. The aforementioned conditions are unlikely to progress or cause important adverse health consequences in the absence of treatment; therefore, IRN estimates should be performed in the case of orthodontic treatment.

In relation to orthodontic needs assessments, the second level (IRN) aims to identify and prioritize children for treatment according to the level of oral impacts due to malocclusions and normative orthodontic need. At this level, children with normative orthodontic need are classified into different groups. Children who have both normative need for orthodontic treatment and oral impacts caused by their malocclusions are considered as having an impact-related need for orthodontic treatment. Their need for treatment may also be further prioritized according to the level of oral impacts attributed to their orthodontic condition. These children will then directly follow the needs assessment pathway to the assessment of propensity-related need. On the other hand, children with a clinically assessed malocclusion who do not have related impacts (no IRN group) will not follow the needs assessment pathway and should not be offered clinical treatment. Reversing the previous rationale about not considering OHRQoL for assessing needs of progressive conditions, it is equally unacceptable to provide treatment for nonprogressive conditions that do not impact on the children’s lives.

Figure 2. Sociodental needs assessment pathway for orthodontic treatment

DHE/OHP=dental health education/oral health promotion

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Instead, those children should be advised to follow a preventive intervention that aims to address the potential future negative consequences of their malocclusion, such as those linked to the enhanced plaque accumulation associated with malocclusion. On a community planning level, they are allocated to a group in need of preventive intervention (dental health education and oral health promotion).

Furthermore, there is also the possibility that children may report oral impacts attributed to malocclusion and/or perceive a need for orthodontic treatment without at the same time having a normative need for orthodontics. In such a case, there is no rationale for providing orthodontic treatment. Indeed, the orthodontist should not provide treatment for conditions considered not in need of treatment or for which there is no evidence of effectiveness and patient benefit. Those children will potentially require psychological counseling and further investigation and monitoring to check whether the reported oral impacts are serious and persist over a longer period of time.

The final level of measurement in the sociodental approach refers to the propensity-related need (PRN), calculated by integrating normative estimates with OHRQoL and behavioral propensity. For this, information on the behaviors or, even better, the behavioral propensity of the child is also considered. Then, treatment is prescribed in light of the probability of success, using the best available evidence on the effectiveness of treatments and the child’s propensity to adopt a favorable behavioral pattern that will facilitate the success of orthodontic treatment. Children who have both normative and impact-related need for orthodontic treatment are classified into different PRN groups according to their behavioral pattern in relation to oral hygiene and dental attendance. Then, different options for effective treatment and care may be available for the different groups. This level facilitates decision making by addressing the issue of which type of treatment/intervention should be provided for a specific PRN group and also by considering the level of priority for this treatment.

Children in the high PRN group will benefit most from orthodontic treatment and therefore should be considered to need treatment as normatively planned. On the other hand, children who have clinically assessed malocclusion that affects their daily lives but do not have high behavioral propensity should be first offered a preventive intervention to improve their behavioral propensity. Also, their treatment plan may need to be modified. While decisions should be based on the best available scientific evidence, the assessment of PRN could be adjusted to local circumstances, resources, and priorities.

PRN is comparable to what a good orthodontist would do to assess treatment need in order to maximize health gain. Instead of considering only clinical assessments, an orthodontist takes into account the subjective perception of the child about his or her malocclusion and also considers whether the child’s behavioral pattern will allow for a successful outcome of the treatment. In cases where the adoption of a particular behavior, such as adequate oral hygiene, is a prerequisite for orthodontic treatment and has not yet been achieved by a patient, the orthodontist will provide another initial intervention and/or a dental health education program. Then, treatment will be reconsidered later in light of the patient’s response to dental health education. Decisions to provide any alternative treatment should be made by taking into consideration the child’s condition and the availability of dental resources, as well as the type of tooth movement required. For example, a removable appliance can be used for simple tooth movements, such as tipping anterior teeth or correcting posterior cross bite, or treatment with a fixed appliance can be delayed until the child can maintain adequate oral hygiene. Consequently, treatment for the low PRN groups should be adjusted to suit their propensity, and they should also receive dental health education/oral health promotion.

This approach is very much in line with need being defined as the capacity to benefit. Providing treatment to those who have not adopted a favorable behavioral pattern will jeopardize the successful outcome of treatment, hence indicating inappropriate use of the generally limited resources. On the other hand, refraining from providing the appropriate care to those who have both normative need and reported oral impacts due to malocclusion but have not yet achieved a behavioral pattern that facilitates a successful treatment outcome is unethical. Here there is a clear need, as well as potential to benefit from orthodontic treatment once the behavioral pattern has been adjusted. Such an attitude places all responsibility on the patient for his or her oral health behaviors, although there is evidence in the literature that behaviors are socially patterned and that detrimental oral health behaviors tend to cluster on the most deprived sections of a society.

The integration process of the sociodental approach is performed at an individual level before
summing up the needs into population estimates. This can be quite accurately performed in clinical practice by assessing individual orthodontic treatment needs and reassessing the progress of a child through recall appointments. In dental public health planning, the amount of initially planned treatment can be approximately estimated. But because the changes in propensity and individual details cannot be assessed, only an estimate of the needs for dental health education/oral health promotion can be made, with guidelines to reassess for treatment thereafter.

The sociodental approach provides an overall framework for needs assessment. However, at the same time, the approach allows for a degree of flexibility in deciding the details of its implementation (e.g., categorization of behavioral propensity, cut-off points for oral impacts and detrimental oral health behaviors, selection of treatments) so that the local setting, available resources, and the extent of general needs in the community are taken into consideration.

Applying the Sociodental Approach

The sociodental approach requires the collection of data on normative need, as well as on subjective perceptions of OHRQoL and health behaviors. While the assessment of normative need is done through a clinical examination, data collection in relation to the subjective elements of the sociodental approach (OHRQoL and health) requires the use of questionnaires. Focusing specifically on orthodontic needs, Gherunpong et al. showed that the procedures associated with the sociodental approach were acceptable in terms of children’s response, time consumed, and personnel burden. This is important because the sociodental approach implies additional data collection compared to the traditional clinical method.

The measurement of OHRQoL was based on the Child-OIDP, and the selected behaviors were oral hygiene and dental attendance pattern, assessed through relevant simple questions. Each behavior was further categorized into three levels (poor, moderate, and good), and then children were categorized into four different levels of propensity-related need according to the different combinations of the behavioral groupings. While this can serve as an example of PRN groupings, it is obvious that other equally valid questions can be used to gather behavioral information, as well as different options for PRN categorizations. The selection among options may be influenced by different factors, such as the prevalence of oral health behaviors in the population under study, the relative perceived importance of behaviors, and the local setting and priorities. Such options will not considerably affect the acceptability of the procedures, as the respective questions are broadly similar in terms of understanding and time burden. However, the choice of questions (and instruments) may have an effect on the actual estimates of orthodontic need.

The application of the sociodental approach to orthodontic needs assessment among children in Thailand indicated a marked decrease from the normative need estimates, with less than one-third of the children with normative need actually having impact-related need and requiring care. In addition, a considerable proportion of the children with IRN did not have high behavioral propensity, hence potentially needing alternative interventions and programs to improve their propensity. This marked decrease in needs assessment estimates that accompanied the application of the sociodental approach has also been the case for different oral conditions in the same population. Studies in different settings are needed to assess the level of differences between the traditional clinical and the sociodental approach to orthodontic needs assessment.

In conclusion, the new sociodental approach to assessing orthodontic needs attempts to overcome the inadequacies of the sole use of clinical assessments of orthodontic need by combining them with subjective measurements of the child’s perceptions and the propensity to adopt appropriate health behaviors that facilitate the success and effectiveness of orthodontic care. This new approach goes beyond the narrow clinical focus of needs assessment and is in line with current health concepts that consider the broader socioenvironmental perspective. The sociodental approach attempts to replicate the characteristics of good clinical practice into a structured, rational, and coherent system for assessing orthodontic needs. As such, it is a useful tool in planning oral health services.

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