COMMUNITY
DENTISTRY AND
ORAL EPIDEMIOLOGY

Factors associated with parents' and adolescents' perceptions of oral health and need for dental treatment

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Abstract – *Objective:* The aim of this study was to characterize the association between clinical and psychosocial factors as they related to perceptions by parents and adolescents to the adolescent's oral health status and treatment need. Additionally, the degree to which adolescent's and parent's perceptions of oral health and treatment need were related was examined. *Methods:* Data from the Pennsylvania oral health needs assessment for 530 parent–adolescent pairs were used to address the objectives of this study. Comparisons between clinical oral health measures, psychosocial factors, and the parent- and adolescent-reported perceptions of the adolescent's oral health status were made using descriptive and inferential statistics, including exploratory factor analysis and path analysis. *Results:* Parents and adolescents exhibited only modest concordance on ratings of the adolescent's oral health status and need for dental treatment. Furthermore, parents tended to rate their adolescent's oral health status as better than did the adolescent. The results of the path analysis showed that adolescents based their ratings of oral health status more on oral symptoms, while parents rated their adolescent's oral health more on esthetic or psychosocial factors. *Conclusions:* Adolescents and parents based their perceptions of oral health status and treatment need on different underlying factors. Additionally, adolescents' perceptions of their oral health status and treatment needs did not appear to be communicated to their parents.

A child's or adolescent's perceptions of need for dental treatment may intuitively appear to be based upon a perception of his or her oral health status; however, little research exists to document this relationship. Similarly, the relationship between perceived oral health status and normatively defined oral health status in children and adolescents is not well studied. Understanding these relationships may inform approaches to improving access and utilization for children with dental treatment needs and in designing health promotion interventions. Complicating this understanding, however, is the need to consider the perceptions and attitudes of parents regarding

their children, given the parent's critical role in facilitating access to care for the child.

Among children and adolescents, Reisine and Bailit (1) found that missing and decayed teeth were the best predictors of self-rated oral health. The presence of unrestored dental caries, however, has been shown to have low sensitivity (34%) but high specificity (96%) with regard to predicting self-rated oral health status (2). Conversely, adolescent perceptions of occlusal status showed excellent sensitivity (3) but poor specificity (4) with regard to predicting objectively measured oral health status.

Interestingly, self-rated oral health status does not appear to be strongly associated with a

perceived need for treatment (5–7). Among children, Vargas and Ronzio (8), using NHANES III data found that neither normative nor self-rated oral health status correlated well with a perceived need for dental care.

Further complicating these issues is the fact that, for children, parents generally must also perceive a need for treatment for the child before care is sought. Jokovic et al. (9) showed that parents had limited knowledge of their children's oral health status, but a high level of agreement with their children regarding oral health-related quality of life. Similarly, a lack of concordance was found between parent and child with regard to another measure of oral health status, orthodontic treatment needs, as reported by Hamdan (10).

To begin the process of elucidating the factors that underlie self-assessed oral health status and its association with perceived need for dental care, we developed an exploratory (path) model based on the limited literature in this area. The model uses as exogenous variables, factors derived empirically from the data (see the factor analysis below). Using these factors in a path analysis, we tested a model that hypothesized a direct and indirect (mediated) path between each factor and perceived treatment need. The mediating variable was perception of the adolescent's oral health status. We also hypothesized that the adolescent's perceived need for treatment would predict the parent's perceived need for treatment of the adolescent.

To test this model, we used data from a large cross-sectional study of children and adolescents and their parents in Pennsylvania. This study examines the degree to which clinical and psychosocial factors relating to oral health are associated with parent and adolescent perceptions of the adolescent's oral health status and perceived need for treatment.

Methods

This study uses data collected as part of the Pennsylvania Oral Health Needs Assessment (PaOHNA), which concluded data collection in May 2000. The PaOHNA collected data on a sample of 6040 public school children and adolescents in grades 1, 3, 9, and 11. These students provided a representative sample of Pennsylvania's public school children in the indicated grades. Details of the sampling methodology have been reported elsewhere (11). Briefly, the sample design for the

PaOHNA was a multistage probability proportional to size (PPS) selection of school districts and schools within districts from the public school system of Pennsylvania.

All 9th and 11th grade adolescents completed an additional 14-item self-administered (child) questionnaire assessing utilization of dental services, oral hygiene behavior, tobacco use, oral symptoms, global oral health rating, and perceived need for treatment.

Additionally, a systematic subsampling of families of 298 of the screened 9th graders and 232 of the screened 11th graders were selected from the 2289 (9 and 11) adolescents examined, with the same implicit stratification and clustering characteristics as the student-screening survey. A primary caregiver of each adolescent in each of these selected families received a 50-item telephone-administered (parent) questionnaire. This questionnaire assessed socioeconomic status, dental insurance, utilization of dental services, difficulties with access to care, parent's perceived need for treatment for their adolescent, parent's perception of their adolescent's oral health status, parent's concerns over their adolescent's oral health status, and adolescent's exposure to preventive modalities, such as fluoridated water, fluoride supplements, and fluoridated toothpaste. Parents also responded to questions about their own oral health status and history of dental treatment.

The 530 9th and 11th grade adolescents who completed the clinical examination and questionnaire and whose parents completed the telephone questionnaire are the samples used in this study.

Institutional Review Board clearance was obtained prior to initiation of this survey. The parent or guardian of each adolescent selected for the study received a consent form approved by the University of Pittsburgh's Institutional Review Board, and prior to study participation, consent was obtained.

Each adolescent participant received the following.

Clinical examination
Each adolescent received a clinical assessment by a licensed dental hygienist, often accompanied by an assistant, using portable dental equipment in the selected schools. Details of the training and calibration of examiners and details of the clinical protocols have been reported elsewhere (11). Strict infection control guidelines recommended by CDC (Bloodborne Pathogens Standard), OHSA, and the

American Dental Association were followed and observed at all times. Parents were given a report of findings via the school nurse. It was made clear to all parents via the treatment need form that the adolescent had not received a comprehensive oral examination and that the findings should not take the place of a routine dental examination from a licensed dentist. In addition, the form provided referral options to those families without a usual source of dental care, including local private practicing dentists, community health centers, dental school clinics, and other sources appropriate to each school district.

Caries protocol

The caries assessment was carried out visually with the aid of a mouth mirror, tongue blade, and artificial illumination (either headlamp or dental exam light). Explorers were not used. Data were collected only at the tooth level. Each permanent tooth was classified as sound, filled, carious, or missing. Teeth were classified as carious if they met the NHANES III criteria (12). Filled teeth that also contained caries were classified as carious. The sound category was used for teeth with no evidence on any surface of treated or untreated caries and could include teeth with slight staining in an otherwise sound fissure. When permanent teeth were missing, the reason was solicited by the examiner, and teeth were classified when possible into the categories of missing as a result of caries, trauma, orthodontics, or other. Third molars were not included in this study. For each adolescent, the numbers of decayed (D), missing (M), and filled (F) teeth were determined.

Occlusion

Occlusion was classified into a three-level variable: no orthodontic treatment indicated, minor treatment, and significant need. Significant need was defined as having at least one of the following present: overjet ≥6 mm, major posterior crossbite, overbite with palatal trauma, missing nonreplaced permanent tooth, and tooth blocked from occlusion. Minor orthodontic need occurred when occlusion was less than ideal, but not meeting the criteria for major need.

Treatment need

After assessing all of the aspects of oral health status included in the PaOHNA screening, the examiner made a final judgment as to whether the adolescent required dental treatment and whether that treatment was required urgently or nonurgently. The urgent treatment need designation was given when one of the following conditions was present: caries deep into dentin, acute infection anywhere in the oral cavity, adolescent report of significant pain, or a suspicious oral soft tissue lesions requiring additional diagnostic follow-up (i.e., lesions that did not appear to be minor, self-limiting conditions such as aphthous ulcers, cheek bites, etc.). The nonurgent treatment need designation was given to any adolescent with: untreated decay insufficient to merit urgent treatment need, significant malocclusion, or periodontal inflammation.

Student self-administered questionnaire

While waiting for their oral screening examination or just after its completion, each adolescent was given a 14-item questionnaire that assessed the following.

History of oral symptoms

Students were asked three questions addressing oral health symptoms and concerns using the common stem; 'in the past month how often have you had…' (i) pain in your mouth, teeth, or gums, (ii) difficulty chewing because of problems/pain in your mouth, teeth, or gums, and (iii) concern or nervousness over the appearance or problems with your mouth, teeth, or gums. Concerns associated with orthodontic appliances were expressly excluded. These three items were then combined into a single variable indicating presence/absence of symptoms.

Global oral health status

A single item asked each adolescent to rate the overall health of the teeth, gums, and inside of their mouth (excellent, good, fair, and poor). This variable was used as a dependent variable for assessment of perceived oral health status, often in a dichotomized form (grouped as excellent or good versus fair or poor).

Adolescent-perceived need for treatment

A single yes/no item asked each adolescent to respond to the question, 'Do you think you currently need dental treatment?' This variable was used as the dependent variable in assessments of perceived need for treatment.

Parent telephone questionnaire

A parent (or legal guardian) of the selected subsample of participant adolescents in the oral screening survey was given a telephone-administered

questionnaire 7–30 days after the adolescent's clinical examination. This questionnaire addressed the following as they related to the participating adolescent.

Parent's perception of adolescent's global oral health status

A single item asked each parent to rate the overall health of their adolescent's teeth, gums, and inside of the mouth (excellent, good, fair, and poor). This was analogous to the adolescent (child) questionnaire item (see above), and likewise, was used as the dependent variable for parent ratings of adolescent's oral health status.

Parent's perception of adolescent's need for treatment

A single yes/no item asked each parent to respond to the question, 'Do you think your child currently needs dental treatment.' This was analogous to the adolescent rating and was used as the dependent variable for parent assessment of adolescent's need for treatment.

Adolescent's oral symptoms

Parents were asked to respond to a series of questions on whether their adolescent had (i) complained of oral pain, (ii) missed school because of (nonorthodontic) oral problems, (iii) been awakened at night with oral problems, (iv) expressed concern over problems or appearance of their mouth, teeth, or gums, and (v) ever reported having been teased by other children because of the appearance of their mouth, teeth, or gums.

Parent's concerns regarding adolescent's oral status

Parents were asked two items addressing their concern that problems with their adolescent's oral health might have a negative impact on their adolescent's well-being (i) now or (ii) in the future.

Data entry and processing

All data were entered into Epi Info database software on laptop computers either via direct data entry at the time of the clinical screening examinations or transferred later from paper collection forms. After checking data for accuracy, data were transferred to SAS software (SAS Institute, Cary, NC, USA) for statistical analysis.

Statistical analysis

For the purposes of this analysis, the data from this survey sample were analyzed as a simple random sample from an infinite population and no sample weights were used, as the intent of the study was to explore associations between parent and adolescents and not to make inferences to any specific population. Descriptive statistics were calculated for the adolescent's questionnaires, clinical measures of oral health, and from the parent's questionnaire. Mean and standard errors were calculated for continuous variables, including each of the five clinical oral health measures. Cross-sectional differences between groups were determined with Student's t-test. Categorical variables were summarized by frequencies, and statistically significant associations were determined with chi-square tests.

Models of factors associated with oral health status and treatment need were made using both simple and multiple logistic regressions. Results are reported as odds ratios with 95% confidence intervals.

Exploratory factor analysis was performed to identify underlying factors that could be created from the independent variables using a principal components factor analysis with VARIMAX rotation. Factors so identified were employed in a path analysis to test a hypothesized association between these factors, global oral health rating, and perceived need for dental treatment.

Results

Selected demographic and oral-health-related variables describing the 530 sampled parents and adolescents are presented in Table 1.

Comparisons of parent and adolescent perceptions with normative need

Both the parent's and adolescent's perceptions of the adolescent's oral health status and need for treatment were compared with the three levels of normative treatment need. These comparisons are summarized in Table 2, where it can be seen that all comparisons are highly statistically significant and that they all demonstrate the expected gradient across the three levels of normative need.

We extended the analysis by calculating the sensitivity and specificity of the adolescent's and parent's perceived need for treatment with the objectively defined need for treatment (as described earlier in Methods section). For adolescents, perceived treatment need was only 48.1% sensitive and 80.5% specific in predicting objective treatment

Table 1. Frequencies and percentages for selected variables

Variable	n	%
Adolescents by grade		
9th	298	56.2
11th	232	43.8
Adolescents by race		
White	434	81.9
Nonwhite	96	18.1
Adolescent's rating of oral health status (self-report)		
Excellent	105	20.0
Good	328	62.4
Fair	88	16.7
Poor	8	1.0
Parent's rating of adolescent's oral health status		
Excellent	268	49.6
Good	205	38.8
Fair	49	9.3
Poor	12	2.3
Adolescent's perceived need for dental treatment		
Yes	124	25.6
Parent's perceived need for dental treatment for adolescent		
Yes	179	34.0
Adolescent missed school because of pain in mouth, teeth or gums (parent questionnaire)		
Yes	28	5.3
Adolescent visited school nurse because of pain in mouth, teeth or gums (parent questionnaire)		
Yes	27	5.1
Oral pain last 30 days (child questionnaire)		
Always	3	0.6
Often	13	2.5
Sometimes	43	8.1
Seldom	148	28.0
Never	321	60.8
Chewing problems last 30 days (child questionnaire)		
Always	2	0.4
Often	12	2.3
Sometimes	35	6.7
Seldom	95	18.1
Never	382	72.6
Concern or nervousness about teeth last 30 days (child questionnaire)		
Always	16	3.0
Often	21	4.0
Sometimes	53	10.1
Seldom	93	17.6
Never	344	65.3
Parent ever worried adolescent's problems with teeth or mouth may have negative impact on his/her life now		
Yes	53	10.0
Parent ever worried adolescent's problems with teeth or mouth may have negative impact on his/her life in the future		
Yes	62	11.8
Family income		
Less than 20,000	63	13.5
20,000 to <50,000	213	45.7
50,000 to <100,000	152	32.6
>100,000	38	8.2

Table 1. Continued

Variable	n	%
Parent's (respondent) education		
<High school	37	7.1
HS/GED	198	38.2
Some college	146	28.1
College	94	17.7
Advanced	44	8.5
Occlusion		
No treatment need	222	41.9
Minor treatment need	100	18.9
Significant treatment need	65	12.3
Current/past treatment	143	26.9
DMFT > 0	278	52.5
DT > 0	79	14.9
Prevalent missing teeth	17	3.2
Mean DT (SD)	0.69 (±1.62)	

need. For parents, perceived treatment need was 62.4% sensitive and 74.1% specific in predicting objective (normative) need.

Concordance of parent and adolescent perceptions

The proportion of agreement was determined for parents and adolescents with regard to both global rating and perceived need. Using the dichotomized global health rating, the percentage agreement between parents and adolescents with regard to the adolescent's global oral health was 81% ($\kappa = 0.278$). When discordance occurred, adolescents were more likely to rate their oral health as poor (67% of discordant pairs), resulting in a bias index of 0.06 (13).

The proportion of agreement with regard to treatment need was 67% ($\kappa = 0.233$). When discordance occurred, parents favored treatment 60% of the time (bias index = 0.06) (13).

Finally, we examined the association between adolescent's global self-rating and perceived need for treatment, and the parent's rating of adolescent's global health and perceived need for treatment. When adolescents rated their global oral health as fair or poor, they were more likely to also indicate that they needed dental treatment (OR = 4.0; 95% CI: 2.4–6.8). Likewise, parents who rated their adolescent's oral health as fair or poor also were more likely to indicate that their adolescent needed dental treatment (OR = 3.5; 95% CI: 2.1–6.3).

Logistic regression

Logistic regression analysis was used to determine the associations of the clinical findings and ques-

Table 2. Relationship between parent and adolescent perceptions on oral health status and findings of treatment need from clinical assessments by dental examiner

Variables	Dental treatment need (measured by dental screening)		
	Not needed n (%)	Need appointment n (%)	Need immediate care n (%)
Parent's perception of adolescent's need for dental treatment now			
Yes	106 (25.9)	57 (58.7)	16 (80.0)
No	303 (74.1)	40 (41.3)	4 (20.0)
$\chi^2 = 57.25$, d.f. $= 2$, $P < 0.0005$			
Adolescent's perception that he/she needs treatment now			
Yes	74 (19.5)	37 (44.0)	13 (65.0)
No	306 (80.5)	47 (56.0)	7 (35.0)
$\chi^2 = 38.78$, d.f. $= 2$, $P < 0.0005$			
Parent's classification of adolescent's oral health status			
Excellent/good	388 (94.8)	68 (69.9)	11 (52.4)
Fair/poor	21 (5.2)	30 (30.1)	10 (47.6)
$\chi^2 = 78.1$, d.f. $= 2$, $P = 0.0005$			
Adolescent's self-rating of oral health status			
Excellent/good	356 (87.0)	71 (72.4)	6 (31.6)
Fair/poor	53 (13.0)	27 (27.6)	13 (68.4)
$\chi^2 = 46.44$, d.f. $= 2$, $P < 0.0005$			

tionnaire items with perceptions of oral health status and treatment need. The initial results of the individual (simple) logistic regressions, wherein we examined each clinical and questionnaire variable as a separate independent variable, are provided in Table 3. In Table 4, the results of a multiple logistic regression are provided, wherein all variables are considered concurrently. Variables from the simple regression were screened and when variables did not add substantially to the explan-

atory power of the model, they were excluded from the multiple regression model. Once main effects were established, all pairwise interaction effects were examined in the multiple regression model; however, no significant interactions were found.

For adolescents, the joint predictors of global oral health status were factors related to clinical oral signs and symptoms measures (i.e., untreated decay, occlusal discrepancies, and recent oral symptoms) (Table 4). The parent's ratings were

Table 3. Odds ratios (95% confidence intervals) from simple logistic regression models predicting adolescents' and parents' perceptions of adolescent's global health rating (as 'fair' or 'poor') and adolescent's need for dental treatment

Predictor variables	Dependent variables			
	Poor oral health status		Treatment needed	
	Adolescent's rating of oral health status	Parent's rating of adolescent's oral health status	Adolescent's rating of need for treatment	Parent's rating of adolescent's need for treatment
DMFT > 3	2.3 (1.5–3.8)*	3.5 (2.1–6.1)*	1.7 (1.1–2.8)**	1.8 (1.2–2.6)*
Prevalent untreated decay	4.2 (2.5–7.1)*	9.0 (5.0–16.2)*	4.4 (2.6–7.4)*	4.7 (2.8–7.9)*
Prevalent missing permanent teeth	NS	5.9 (2.1–16.1)*	NS	NS
Occlusion score >1	2.2 (1.4–3.5)*	4.4 (2.6–7.8)*	3.4 (2.5–5.6)*	2.8 (1.9–4.1)*
Mouth symptom present (child questionnaire)	4.3 (2.5–7.8)*	1.6 (0.94–3.0)	2.7 (1.5–4.9)*	NS
Parent concern oral health have negative impact now (parent questionnaire)	NS	3.8 (1.9–7.4)*	1.8 (1.0–3.3)**	2.7 (1.5–4.9)*
Parent concern oral health have negative impact later (parent questionnaire)	2.4 (1.3–4.4)*	7.6 (4.1–14.2)*	NS	3.5 (2.0–6.2)*
Adolescent black race	2.1 (1.2–3.6)*	2.6 (1.4–4.9)**	3.2 (1.9–5.5)*	2.3 (1.4–3.8)**
Adolescent female gender	NS	NS	NS	NS
Parent had no post-HS education	NS	2.5 (1.4–4.4)**	NS	NS

NS, not significant.
*$P < 0.05$; **$P < 0.10$.

Table 4. Odds ratios (95% confidence intervals) from multiple logistic regression models predicting adolescents' and parents' perceptions of adolescent's global health rating (as 'fair' or 'poor') and adolescent's need for dental treatment

	Dependent variables			
	Poor oral health status		Treatment needed	
Predictor variables	Adolescent's rating of oral health status	Parent's rating of adolescent's oral health status	Adolescent's rating of need for treatment	Parent's Rating of adolescent's need for treatment
DMFT > 3	NS	2.2 (1.1–4.4)*	NS	1.8 (1.2–2.7)**
Prevalent untreated decay	3.5 (2.0–6.1)**	3.6 (1.7–7.4)**	2.6 (1.5–4.7)**	4.7 (2.8–7.9)**
Prevalent missing permanent teeth	NS	NS	NS	NS
Occlusion score >1	1.9 (1.2–3.1)**	4.0 (2.2–8.0)**	1.8 (1.1–2.8)*	2.8 (1.9–4.1)**
Mouth symptom present (child questionnaire)	3.7 (2.1–6.9)**	NS	3.2 (1.9–5.3)**	NS
Parent concern oral health have negative impact now (parent questionnaire)	NS	NS	2.6 (1.6–5.2)**	2.7 (1.6–5.0)**
Parent concern oral health have negative impact later (parent questionnaire)	NS	5.8 (2.8–12.2)**	NS	3.5 (2.1–6.2)**
Adolescent black race	NS	2.2 (1.0–4.7)*	NS	2.3 (1.4–3.8)**
Adolescent female gender	NS	NS	NS	NS
Parent had no post-HS education	NS	1.8 (0.96–3.7)	NS	NS

NS, not significant.
*$P < 0.10$; **$P < 0.05$.

related to oral signs as well, but also included broader concerns for their children related to oral health as well as demographic factors (i.e., race and education).

A perception of treatment need by adolescents was related to the same three oral signs and symptoms as well as their parent's 'concerns.' Parents showed similar results associated with perceived treatment need, but race again was an important correlate.

Factor analysis
To determine whether the clinical and psychometric variables could be reduced to a smaller number of factors that, ideally, represented interpretable underlying constructs (latent traits), we conducted an exploratory factor analysis. We selected four factors based on the Scree plot, and limited variables to those that loaded after VARIMAX rotation at 0.4 or higher.

Table 5 summarizes the identified factors. Three items loaded to create factor 1 (oral symptoms). These are all related to symptoms experienced by the adolescent. Factor 2 (treatment need) was related to two items describing normatively defined need as measured by the clinical examiner. Factor 3 (oral consequences) consisted of variables that related to parental concern over how oral health may impact the adolescent, both now and in the future. Factor 4 (esthetic concerns) contained

items related to both parental concerns and normatively assessed measures related to oral esthetics and occlusion.

Path analysis
The hypothesized relationship between these four factors and perceived oral health status and treatment need is represented in the exploratory path model we tested, with the significant paths displayed in Fig. 1. Here, it can be seen that only factor 2 (treatment need) had a direct association with both adolescent- and parent-perceived need for treatment and an indirect (mediated) path through adolescent and parent global oral health rating. Factor 1 (oral symptoms) was uniquely associated with adolescent-perceived need via direct and indirect paths.

Factor 3 (oral consequences) and factor 4 (esthetic concerns) were both associated with parent's perceived need via direct and indirect paths. However, neither of these factors had an association with adolescent's perceived need.

Overall, the direct effect on adolescent's perceived need (from factors 1 and 2) was 0.52 and the indirect effect was 0.043. The direct effect for the parent's perceived need (from factors 2, 3, and 4) was 0.49 and the indirect effect was 0.161. No path was found between the adolescent's perceived need for treatment and the parent's perceptions.

Table 5. Factor loading after VARIMAX rotation for a four-factor solution

Item	Factor 1 (oral symptoms)	Factor 2 (treatment need)	Factor 3 (oral consequences)	Factor 4 (esthetic concerns)
Recent history of oral pain (child report)	0.838	–	–	–
Recent history of chewing problems (child report)	0.778	–	–	–
Recent history of reported nervousness about oral conditions (child report)	0.567	–	–	–
Need for urgent treatment (clinical assessment)	–	0.837	–	–
Decayed permanent (clinical assessment)	–	0.782	–	–
Parent concerned over negative impact of child's oral conditions on his/her life now (parent questionnaire)	–	–	0.815	–
Parent concerned over negative impact of child's oral conditions on his/her life in the future (parent questionnaire)	–	–	0.791	–
Parent reports child self conscious about condition of mouth (parent questionnaire)	–	–	–	0.701
Parent reports adolescent teased about oral condition (parent questionnaire)	–	–	–	0.696
Occlusion (clinical assessment)				0.469
% Total variance explained by factor	21.4	14.6	11.1	9.6

A factor loading of at least 0.4 was used as criteria for inclusion in factor.
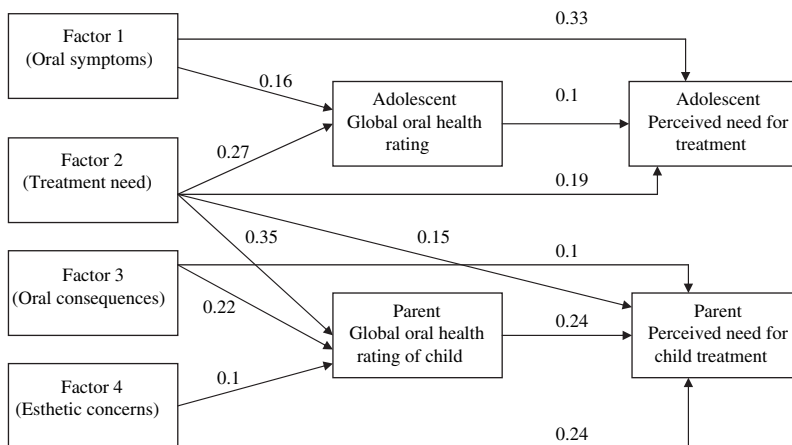

Fig. 1. Results showing significant path coefficients for hypothesized (exploratory) path model for testing association between exogenous factors with oral health ratings and perceived need for treatment.

Discussion

These results of the logistic regressions show that an adolescent's clinical signs (e.g., unfilled decay) are indeed related to both the adolescent's and parent's perceptions of the adolescent's oral health status and need for treatment. Importantly, untreated decay, total decay, and occlusal problems, all seem to be significant predictors of perceptions of oral health and treatment need.

For the adolescents, it is perhaps not surprising that their perceptions of oral status and treatment need are more related to the oral signs and symptoms that they are experiencing, as reflected in the fact that their perceptions of their oral health and need for treatment co-vary with measures of normative need and oral symptoms. This is con-

sistent with findings from previous studies (14–17). It seems that parents were also able to perceive oral signs, particularly occlusal status and untreated decay. However, parents did not seem to be in touch with oral symptoms of their children. The results of both the regression (Table 4) and path analysis (Fig. 1) found no association between the adolescent's history of oral symptoms (pain, difficulty in chewing) and the parent's perception of adolescent's oral health status and treatment need.

Parents, on the contrary, seemed more concerned with the social or esthetic consequences of the adolescent's oral status. As is evident from the path analysis, concerns over the appearance of the adolescent's mouth and teeth and the consequences of the oral–facial status on the adolescent's 'life' seemed to be very important with regard to

how the parents perceived the adolescent's oral health and need for treatment. Given the importance of parental perceptions in accessing care for children, it may merit more focused studies.

Although the parents tended to rate oral health status more favorably than the adolescents, when adolescents and parents disagreed on whether the adolescent needed dental treatment, the majority of disagreements had parents indicating treatment need when the adolescent did not. This paradoxical finding, that parents rate their adolescent's oral health better than the adolescent, but are more likely than the adolescent to indicate a treatment need, suggests several explanations. Certainly, adolescents may have some fear of dental treatment that would prevent them from endorsing a 'need' for treatment, possibly even more so when symptoms are present. Parents, on the contrary, may be providing the 'expected' or socially desirable answer that certainly the adolescent 'needs' treatment. But, this response might be more likely to occur if the parent also indicated that the adolescent's oral health status was reasonable. Otherwise, acknowledging a adolescent's poor oral health and need for treatment would approach an acknowledgment of poor parenting bordering on neglect.

Another possibility lies in the interpretation of the definition of 'treatment need.' It is not clear whether parents or adolescents may have interpreted periodic routine cleaning and oral examination as treatment need. Parents might have been more likely to include routine checkups as part of standard dental care and therefore their adolescent 'needed treatment,' if their adolescent was overdue for such an appointment. This interpretation could also account for the apparent discrepant data, for example, where oral health was judged to be good or excellent, yet treatment need was still indicated.

The path coefficients for the direct effects for both the adolescent's and parent's perceived needs for treatment could be considered as indicating a 'medium' effect size, whereas the indirect (mediated) paths indicated a 'small' effect size (18). The lack of substantial mediation of perceived treatment need via changes in perceived oral health status is counterintuitive; however, this is consistent with other research in this area (7, 14, 19). With regard to parent's perceptions, the lack of a strong mediating path may reflect the fact that occlusion issues, something that demonstrates a large effect size for parents with regard to treatment need, may not be considered when the parent evaluates the oral 'health' status of the adolescent. This is another area that may benefit from more focused research, as this study did not explore these concepts in depth.

Although a significant association was found between oral symptoms and both parent and adolescent perceptions (Tables 2–4), a more important question is, how will this translate into care seeking for those children and adolescents in need? This question is not addressed directly by this study; however, for those with an objective treatment need, the predictive value of that finding resulting in a perception of treatment need appears to be no better than about 50%. If we posit that parent's perception of treatment need is a necessary prerequisite of the adolescent obtaining needed treatment, then the results of this study may suggest a partial explanation of why certain children are not receiving needed treatment.

The two sociodemographic predictors that emerged as significant, black race, and low educational attainment of the parent, are important findings. It is unclear why these social measures persisted in the model after controlling for actual treatment needs. We plan to explore the role of sociodemographic factors as they relate to perceptions of oral health in another study, but these types of analyses are beyond the scope of the present study. Thus, a significant limitation of this study is the absence in the model of any contextual variables beyond family-level income.

Factor analysis is a useful data reduction technique that allows for construction of a simpler path model. Moreover, interpretable factors suggest some underlying, unmeasured construct often referred to as a latent trait. The four factors found here are each interpretable in that way and suggest that there may be value in pursuing further refinement in future studies of ways to measure these traits, as these may be important dimensions of oral health perceptions, and potential targets for interventions aimed at improving utilization and access to care.

These findings suggest a need for further understanding of the role of family dynamics, parent–adolescent communication, and the role of the family as it relates to the perception of adolescent treatment need, as these may be important contributors to oral health disparities.

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