Self-Esteem and Socioeconomic Disparities in Self-Perceived Oral Health

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Abstract

Objective: To determine if psychosocial factors explain the socioeconomic disparities in self-perceived oral health that persist after controlling for oral status variables. Methods: Data came from the participants in the Canadian Community Health Survey 2003 who were residents in the city of Toronto. Oral health variables included self-rated oral health, a 13-item oral health scale, denture wearing, and having a tooth extracted in the previous year. The last two measures were regarded as proxy indicators of tooth loss. Psychosocial variables included a self-esteem scale, a depression scale, and single items measuring life satisfaction, life stress, and sense of cohesion. Socioeconomic status was assessed using total annual household income. Results: Interviews were completed with 2,754 dentate persons aged 20 years and over. Bivariate analyses confirmed that there were income gradients in self-rated oral health and scores on the oral health scale. Linear regression analyses confirmed that these persisted after controlling for age, gender, denture wearing, and having a tooth extracted in the previous year. In the model predicting self-rated oral health self-esteem, life satisfaction, stress, a sense of cohesion, and depression also contributed to the model, increased its explanatory power, and reduced the strength of but did not eliminate the association between income and self-rated oral health. Broadly, similar results were obtained when the oral health scale score was used as the dependent variable. In both analyses and all models, denture wearing had the strongest and most enduring effect. Conclusion: Psychosocial factors partly but do not wholly explain the socioeconomic disparities in self-perceived oral health in this population after controlling for tooth loss and denture wearing. Other variables need to be added to the models to increase their explanatory power.

Key Words: self-perceived oral health, disparities, self-esteem, psychosocial factors

Introduction

There is now a substantial evidence of socioeconomic disparities in oral health in most developed nations. In the UK, oral health surveys have revealed social class gradients with respect to indicators of dental health such as edentulism, decay experience, periodontal disease, and trauma (1). Socioeconomic differentials or disparities are consistently observed in North America and Australia where income and education, rather than social class, are used as indicators of socioeconomic position (2-7). In Canada, national health interview surveys and studies of local populations also provide evidence of disparities in oral health on the basis of household income (8-10). The studies of local populations have provided more detailed data on the extent of income disparities in both clinically assessed and self-perceived oral health (10). These were percent edentulous, number of missing teeth, number of functional units, number of decayed crown and root surfaces, mean periodontal attachment loss, percent with chewing problems, impact on the quality of life, and satisfaction

with oral health status. In all instances, low-income subjects had the worst oral health outcomes.

Moreover, evidence is emerging that suggests that those at the lower end of the socioeconomic scale experience more functional and psychosocial impacts than their more advantaged counterparts even after controlling for levels of oral disease and impairment. For example, in a study of older Canadians, income remained a significant predictor of Oral Health Impact Profile (OHIP) (11) scores after controlling for missing teeth, suggesting that tooth loss had a greater negative effect on the quality of life of low- than highincome subjects (12). Among highincome subjects, the OHIP scores of the edentulous were 68 percent higher than the scores of the dentate. For low-income subjects, the difference in scores was 85 percent.

Similar results were obtained in a study of Canadian children that used the Child Perceptions Questionnaire 11-14 (CPO11-14) to assess oral health-related quality of life (13). Mean CPQ11-14 scores showed a gradient across income categories with children from low-income households having poorer oral health-related quality of life. In both linear and logistic regression analyses, household income remained a significant predictor of CPQ11-14 scores after controlling for oral disease variables such as caries, trauma, and malocclusion. Further analyses suggested that oral disorders had little impact on the health-related quality of life of

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higher-income children but a marked impact on lower-income children. This raises the question of why socioeconomic disparities in selfperceived oral health may persist even when accounting for levels of oral disease.

The link between socioeconomic status and oral health outcomes have been explained in three ways (14.15). First, income has a direct effect on the ability to access goods, services, and other resources that promote health. Second, there is an indirect mechanism in terms of differential exposure to risk factors and health behaviors. Third, the relationship between socioeconomic status and health may be the outcome of differences in psychologic assets and psychosocial resources. Taylor and Seeman (16) suggested that traits and factors such as optimism, coping styles, social support, and personal control are related to health outcomes and appear to vary across socioeconomic groups. Evidence in support of this last explanation has been provided by Sanders and colleagues with respect to self-report indicators such as self-rated oral health and Oral Health Impact scores (15,17). Sense of control, social support, chronic stress, and life satisfaction were predictive of self-perceived oral health. It is not unreasonable to suggest that such factors may help to explain the socioeconomic disparities in selfperceived oral health and why these remain after controlling for levels of disease.

One psychosocial factor that has yet to be examined with respect to disparities in self-perceived oral health is self-esteem. Marmot (18) suggested that inequalities, including inequalities of opportunities, life chances, and achievement, are accompanied by inequalities of respect and self-esteem. In turn, low selfesteem and other psychosocial threats lead to health-damaging behaviors and the activation of biologic stress mechanisms that may increase the risk of a variety of physical and psychologic disorders. As these psychosocial threats are unequally distributed in society, they may contribute to disparities in health.

Preliminary evidence of a link between self-esteem and selfperceived oral health outcomes in children has been reported by Humphris et al. (19), Marques et al. (20), and Agou et al. (21). The last suggested that self-esteem is a determinant of the health outcomes rather than a consequence of oral disorders in children. Accordingly, the objective of the study reported here was to determine if self-esteem and other psychosocial factors contributed to socioeconomic disparities in the selfperceived oral health of a population of Canadian adults.

Methods

Survey Procedures. The data were obtained from cycle 2.1 of Statistics Canada's Canadian Community Health Survey 2003 (CCHS 2003), which provides a random sample of the noninstitutionalized household population aged 12 years and over in all provinces and territories, excluding people living on reserves and Canadian Armed Forces bases and some living in remote areas. The response rate was 80.6 percent, and the overall sample size was 135,573. Further information on the survey design can be obtained from a previously published report (22).

The survey had a modular format whereby there was a central core of questions completed by all health regions covered by the survey and a number of optional modules that were selected by each health region according to its own health information needs. Two of these optional modules were an expanded set of questions on oral health and a measure of self-esteem. Only one region, the city of Toronto, elected to subscribe to both of these components of the survey. Consequently, the analysis is limited to survey participants living in this geographic location.

Measures. The following variables and measures were included in the analysis.

Oral status. This was assessed by two questions, which asked partici-

pants whether or not they wore one or more dentures (no = 0; yes = 1) and whether or not they had had one or more teeth extracted in the previous year (no = 0; yes = 1). These were included as proxy measures of tooth loss.

Self-perceived oral health. This was assessed in two ways: first, by means of a self-rating of the health of the teeth and mouth scored on a five-point scale ranging from "excellent" = 1 to "poor" = 5; second, by means of an oral health scale constructed from 13 questions derived from the subjective oral health status indicators (23). The questions asked about oral symptoms in the past month (toothache, teeth sensitive to hot and cold, pain in jaw joints, other pain in the mouth or face, bleeding gums, dry mouth, bad breath), functional limitations (difficulty in chewing firm foods, difficulty in biting/chewing fresh apple, difficulty in chewing boiled vegetables, difficulty in speaking clearly), and the social impact of oral disorders (avoiding conversation, avoiding laughing or smiling). Each question, except for the last two, was scored using a dichotomous scale (no = 0;yes = 1), while the last two were scored using a Likert frequency scale ranging from "never" = 0 to "often" = 3. The response codes were summed so that higher scores on the scale indicated poorer oral health. The Spearman's rank correlation between the two measures of self-perceived oral health was 0.34 (*P* < 0.001).

Self-esteem. Self-esteem was assessed using items derived from Rosenberg's Self-Esteem Scale (24). The Rosenberg scale consists of 10 items, five positively worded and five negatively worded. The CCHS 2003 used the five positively worded items and one negatively worded item. For the analysis reported here, only the five positively worded items were used in order to assess the amount of positive feelings about himself/ herself. The five items were scored on a five-point Likert scale that ranged from "strongly agree" = 1 to "strongly disagree" = 5. When subject to factor analysis, all five items loaded on to one factor, confirming previous factor analyses of the 10-item self-esteem scale, which identified two factors: one positive (positive self-worth) and one negative (self-deprecation) (25). The alpha coefficient for the scale was 0.86. The items were reverse coded prior to being summed so that high scores indicate higher levels of self-esteem.

Other psychosocial variables. These included a 19-item scale measuring depression and single items measuring sense of belonging to a community, life satisfaction, and severity of life stress.

The items used to measure depression were based on the work of Kessler and colleagues (26). They selected a subset of items from the Composite International Diagnostic Interview (CIDI) that measure major depressive episode. The CIDI is a structured diagnostic interview designed to produce diagnoses according to the definitions and criteria of ICD-10 and DSM-III-R and is intended for epidemiologic studies and clinical research purposes. The 19-item short form used in the CCHS 2003 was developed to operationalize criteria A through C of the DSM-III-R diagnosis of major depressive episode. The items were scored and summed so that higher scores indicate higher levels of depression.

The single items used to assess sense of belonging to a community, life satisfaction, and severity of life stress were scored on four- and fivepoint Likert scales, with lower scores indicating more favorable life circumstances, i.e., very strong sense of belonging, very satisfied with life, and low levels of life stress. Sense of belonging to a community can be considered to be an indicator of social cohesion (27), while life satisfaction can be considered to be an indicator of an individual's cognitive evaluation of his or her life circumstances (15).

Spearman's rank correlations between pairs of the four psychosocial variables were all below 0.20, indicating that they were assessing different constructs. Their correlations with the self-esteem scale were -0.06 (depression), -0.31 (life satisfaction), 0.02 (stress), and -0.16 (sense of belonging).

Sociodemographic variables. These included total annual household income divided into five categories (<\$15K = 0 to \$80K or more = 4), sex ("female" = 0; "males" = 1), and age measured in 13 categories ranging from "20 to 24 years" = 1 to "80 years and over" = 13.

Data Analysis. First, a series of analyses using chi-square tests and one-way analysis of variance were undertaken to assess the associations between income and denture wearing, tooth loss in the previous year, self-rated oral health, and scores on the oral health scale. Spearman's rank correlation coefficients were to assess the associations between income, self-rated oral health, self-esteem, and the other four psychosocial variables.

Next, multiple linear regression analyses was undertaken with selfrated oral health and scores from the oral health scale as dependent variables. With respect to self-rated oral health, linear regression analysis is considered appropriate when the dependent variable is ordinal if its relationships with the independent variables conform to the assumptions of linear regression analysis (28). Normal probability plots of standardized residuals confirmed that these assumptions were met. The regression models were built in three stages. In model 1, income, denture wearing, tooth extracted in the previous year, sex, and age were entered. In model 2, self-esteem was added. The change in the beta coefficient from model 1 to model 2 was used to determine if the association between income and self-rated health was modified after the addition of this variable. Finally, the remaining psychosocial variables were added to see if they contributed to the explanatory power of the model as indicated by an increase in the R^2 statistic and further reduced the strength of the association between income and self-perceived oral health by further reductions in the beta coefficient.

Results

Data were abstracted from the public use data file for 2,754 dentate adults aged 20 years. Just over half were female and their age distribution was as follows: 20 to 39 years (44.7 percent); 50 to 59 years (37.2 percent); and 60 years and over (19.1 percent).

Almost one in five, 17.0 percent, wore one or more dentures and just over 1/10, 11.8 percent, had one or more teeth extracted over the past year. Low-income subjects were more likely than high-income subjects to report both tooth loss and denture wearing (Table 1). Half, 49.7 percent, of the subjects rated their oral health as excellent or very good, 31.8 percent as good, and 18.3 percent as only fair or poor. The mean score on the oral health scale was 1.2 (standard deviation = 1.6). As expected, there was an income gradient in the percentage of subjects

Table 1

Percent Wearing Dentures and Percent Having One or More Teeth Extracted in the Previous Year by Household Income

Income	Percent wearing denture	Percent having tooth extracted			
Less than \$15,000	27.1	21.8			
\$15,000-\$29,999	26.2	16.0			
\$30,000-\$49,999	20.5	11.9			
\$50,000-\$79,000	15.9	13.6			
\$80,000 or more	8.4	9.0			
P-value*	< 0.001	< 0.01			

* Obtained from the chi-square test.

reporting their oral health as only fair or poor. This ranged from 28.5 percent of those in the lowest income group to 10.4 percent of those in the highest income group (P < 0.001). A similar income gradient was observed with respect to scores on the oral health scale (P < 0.001) with those in the lowerincome group having worse oral health (Table 2).

Spearman's rank correlations indicated a positive association between income and self-esteem (r=0.21; P<0.001) and a negative association between self-esteem and self-rated oral health (r=-0.25; P<0.001). The correlation between the self-esteem score and the score on the oral health scale was also negative but weak (-0.07; P<0.01). Correlations between income and the selfperceived oral health variables and the four other psychosocial variables are shown in Table 3.

Table 4 shows the results of the linear regression analysis with selfrated oral health as the dependent variable. Model 1 of the analysis indicated that income remained a significant predictor of self-rated oral health (P < 0.001) after controlling for age, gender, denture wearing, and tooth loss. This confirms earlier observations that disparities in selfperceived oral health remain after controlling for oral status variables. When self-esteem was added to the model, it also had a significant independent effect (P < 0.001). Income remained significant but its beta coefficient fell from -0.13 to -0.09 (Table 4, model 2). Consequently, self-esteem weakened but did not eliminate the significant association

between income and self-rated oral health. In this model, self-esteem had the highest beta coefficient of all the variables.

When life satisfaction, stress, a sense of belonging, and depression were added to the model, they all had significant independent effects

Table 2 Percent Rating Oral Health as Fair/Poor and Mean Oral Health Scale Scores by Household Income

Income	Percent rating oral health fair/poor	Mean oral health scale score			
Less than \$15,000	28.5	1.45			
\$15,000-\$29,999	28.1	1.39			
\$30,000-\$49,999	18.9	1.07			
\$50,000-\$79,000	16.1	1.06			
\$80,000 or more	10.4	0.89			
<i>P</i> -value	<0.001*	<0.001†			

* Obtained from the chi-square test.

† Obtained from one-way analysis of variance.

Table 3
Spearman's Rank Correlations between Income, Self-Perceived Oral
Health, and the Psychosocial Variables

	Income	Self-rated health	Mean oral health scale score
Self-esteem	0.21*	-0.25*	-0.07*
Depression	-0.08*	0.03	0.15*
Life satisfaction	-0.27*	0.26*	0.13*
Stress	0.03	0.08*	0.17*
Sense of belonging	-0.09*	0.17*	0.09*

* P<0.001.

Table 4				
Results of the Linear Regression	Analysis	Predicting Self-Rated Oral Health		

	Model 1		Model 2		Model 3	
Independent variables	Beta	P	Beta	P	Beta	Р
Sex (female = 0, male = 1)	0.040	0.083	0.039	0.031	0.039	0.084
Age (13-point categorical variable)	0.018	0.461	0.010	0.667	0.054	0.027
Household income (lowest = 1, highest = 5)	-0.130	< 0.001	-0.095	< 0.001	-0.065	0.007
Wears denture(s) $(no = 0, yes = 1)$	0.196	< 0.001	0.191	< 0.001	0.191	< 0.001
Tooth lost in the last 12 months $(no = 0, yes = 1)$	0.183	< 0.001	0.170	< 0.001	0.155	< 0.001
Self-esteem (high scores indicate more positive self-worth)			-0.212	< 0.001	-0.154	< 0.001
Life satisfaction (low scores indicate higher levels of life satisfaction)					0.145	< 0.001
Life stress (low scores indicate low levels of life stress)					0.095	< 0.001
Sense of belonging (low scores indicate stronger sense of belonging)					0.085	< 0.001
Depression (high scores indicate higher levels of depression)					-0.044	0.042
Adjusted R^2	0.11		0.16		0.20	

Dependent variable: self-rated oral health (excellent = 1 to poor = 5).

and increased its explanatory power. In this final model, the R^2 was 0.20 (Table 4, model 3). The addition of these variables further reduced the coefficient for beta household income, which fell to -0.064. However, it remained a significant predictor of self-rated oral health after controlling for all other variables. The addition of these other psychosocial variables also reduced the beta coefficient for self-esteem from -0.212 to -0.154 but did not eliminate its independent effect. In this final model, the highest beta coefficient was for denture wearing. Of interest is the fact that its coefficient remained the same across all three models.

Broadly, similar results were obtained when the oral health scale score was used as the dependent variable. In model 1, income, denture wearing, and having lost a tooth had significant independent effects. In model 2, these variables remained significant along with selfesteem. The addition of self-esteem reduced the beta coefficient for income but only marginally, from -0.074 to -0.068. In model 3, income, denture wearing, having lost a tooth, stress, and depression had significant effects. Self-esteem was no longer significant after entering the four other psychosocial variables. The beta coefficient for income was further reduced but again only marginally to -0.065. The explanatory power of this final model was low with an R^2 of 0.10. As with the analysis of the predictors of self-rated oral health, denture wearing maintained its beta coefficient and, along with stress, showed the strongest association with the oral health scale score across the three models.

Discussion

The advantages of the secondary analysis of the data from the government-sponsored CCHS 2003 are random sampling of a general adult population, the high response rate, and the quality control of the data collection process. The main disadvantage was the limited number of oral health and psychosocial variables available for analysis and the fact that some of the latter are measured using single items rather than multi-item scales. For example, as no clinical data were collected, denture wearing and having one or more teeth extracted in the previous year were used as proxy indicators of tooth loss. Nevertheless, the data set provided an opportunity to replicate previous observations concerning socioeconomic disparities in oral health in Canadians and to determine if psychosocial variables explain all or part of the socioeconomic gradients in self-perceived oral health. Given the results of previous studies of the psychosocial correlates of selfperceived oral health (19-21), of particular interest here was self-esteem and its role in explaining the disparities that persist after controlling for oral disease/status variables (12,13).

The bivariate and multivariate analyses confirm that in this population of Canadian adults, there are socioeconomic disparities in selfrated oral health and scores on an oral health scale, and these disparities remained after controlling for denture wearing and having lost one or more teeth in the previous year. In both cases, lower-income subjects rated their oral health more poorly and had scale scores indicating poorer oral health outcomes.

The results of the analyses also suggest that all five psychosocial variables used are measuring different constructs, and their inclusion in linear regression models of the association between income and selfrated oral health substantially reduced the strength of but did not eliminate the association between household income and self-rated oral health after controlling for age, gender, and the two proxy indicators of tooth loss. Of the psychosocial variables, self-esteem had the strongest independent effect. The results of the analysis using the oral health scale score as the dependent variable were broadly similar. However, in the final model, the only two psychosocial variables to have independent effects were stress and depression. In addition, the reduction in the beta coefficient for income was more modest than in the analysis predicting self-rated oral health. The differences in the two final models may have arisen because self-rated oral health and the oral health scale are measuring different aspects of oral health. In the case of the former, the participants are being asked to evaluate their oral health, whereas with the latter measure, the participants are being asked to describe their oral health in terms of symptoms and functional problems. As all of the psychosocial variables, except for depression, are evaluative variables, this may account for their more consistent association with self-rated oral health.

The associations between life satisfaction, stress, and self-rated oral health have been reported previously. In this regard, the results of this study are broadly similar to those of Sanders and Spencer (15). They used logistic regression analysis and found that household income, life dissatisfaction, personal constraint, and chronic stress were independent predictors of poor self-rated oral health. The three psychosocial variables weakened but did not eliminate the effect of income. However, when self-reported number of teeth was added to the model, only personal constraint and chronic stress remained significant. This difference may be because their self-report measure of missing teeth was more accurate then the proxy indicators used here. Studies involving clinical examinations as well as personal interviews are needed to resolve the discrepancy in the two studies.

The results also confirm the findings of previous work showing an association between depression and oral health and social cohesion and health. Kressin et al. (29) found an association between depressive symptomatology and scores on the Geriatric Oral Health Assessment Index (GOHAI) (30) in two samples of older adults, and the association persisted after controlling for age, education, income, and marital status. A number of studies have also found that individual and area-level measures of social cohesion are associated with self-perceived health and health behaviors such as smoking (31,32). However, no studies have examined the contribution of selfesteem. Moreover, the association between self-esteem and socioeconomic status and the mediating role of self-esteem in the income–oral health relationship have not been previously reported (16).

The role of denture wearing and losing one or more teeth in the previous year deserves comment as they showed consistent and relatively strong association with selfperceived oral health across all regression models. If these variables are acceptable as proxy indicators of tooth loss, the findings suggest that, in this population at least, oral health disparities have their foundation in biologic variables and differences in levels of disease and impairment. This is consistent with theoretical models of disease and its outcomes, such as that proposed by Wilson and Cleary (33). Nevertheless, the results of this study suggest that eliminating these biologic differences may not wholly eliminate disparities in selfperceptions of oral health as these are also influenced by psychosocial factors.

Although most of the variables in the two final regression models were significant predictors of selfperceived oral health, the adjusted R^2 values were low at 0.20 and 0.10, respectively. Additional psychosocial variables such as sense of coherence (34,35), variables denoting differences in the material life circumstances of different socioeconomic groups, differences in access to care, and differences in health behaviors need to be added to the model to see if they increase its explanatory power and further modify the association between income and selfperceived oral health.

The study has some limitations, largely concerning the measurement of dependent and independent variables. For example, the oral health scale is essentially an ad hoc selection of items from the subjective oral health indicators measure rather than a standardized and validated scale. However, the item pool is broadly similar to measures such as the GOHAI (30) and the OHIP-14 (36). Moreover, scale scores were significantly associated with self-ratings of oral health, denture wearing, and having lost at least one tooth in the previous year (P < 0.001 for all analyses), providing some evidence of its validity. The internal consistency reliability as assessed by Cronbach's alpha was 0.65. This is a little lower than the conventional standard of 0.70 but to be expected with a multidimensional scale assessing symptoms, functional limitations, and social impacts. Consequently, it functions reasonably well as an indicator of self-perceived oral health.

A second limitation is the use of single-item measures of complex constructs such as life satisfaction, life stress, and sense of belonging. Work has been done on single-item global ratings, which suggest that they are adequate substitutes for multi-item scales, and for this reason, they are often used to assess the construct validity of multi-item scales. For example, self-rated oral health is frequently used to assess the construct validity of the GOHAI, the OHIP, and its short forms.

Because the survey included a life satisfaction scale as well as the global rating of life satisfaction, it was possible to assess the effect of using a single-item measure as a substitute for the multi-item scale. The life satisfaction scale is comprised of nine items that assess satisfaction with different dimensions of life and can be summed to give a scale score. This was completed by 13,000 participants from locations in Canada other than the city of Toronto. The rank correlation between the life satisfaction scale and the life satisfaction item was 0.52. A range of 0.3 to 0.5 is usually taken as evidence of construct validity when comparing a multi-item scale with an ordinal global rating given that the latter has a restricted range (37). The correlation between the satisfaction scale and self-rated oral health was 0.234. and the correlation between the single-item and self-rated oral health was 0.236. Two stepwise linear regression analyses were undertaken with self-rated oral health as the dependent variable and age, gender, income, stress, depression, sense of belonging, and life satisfaction as predictors (denture wearing and tooth loss were not included as the regions using the life satisfaction scale did not opt for the expanded oral health module). In the first model, the life satisfaction scale was employed. Life satisfaction was the first variable to enter the model, and all variables entered except depression. The adjusted R^2 value was 0.090. The beta coefficient for life satisfaction was 0.20. In the second model, the life satisfaction global item was employed. Again, life satisfaction was the first variable to enter the model, and all variables entered including depression. The adjusted R^2 value was 0.091. The beta coefficient for life satisfaction was 0.15. These results suggest that the single item is valid and performs as well as the scale. Similar evaluations could not be undertaken with the two other single-item ratings.

A final concern is with the direction of the link between self-esteem and self-perceived oral health. Does poor self-esteem "cause" poor selfperceived oral health or does poor self-perceived oral health contribute to low self-esteem? Theories of selfesteem and recently collected data suggest that the former is more likely. Self-esteem is generally considered to be a stable attribute in adults that is not readily amenable to change or experimental manipulation (38). Rather than being changed by life experiences such as tooth loss, it is more likely that it influences the response to such experiences. Further, a study of 220 children aged 11 to 14 years who presented for treatment for malocclusion (21) compared these children with normative populations on four measures; the Dental Aesthetic Index (DAI) (39), a clinical measure of malocclusion: the self-esteem and mental health subscales of the Child Health Questionnaire (CHQ) (40); and the CPQ11-14

(41), which measures the functional and psychosocial impacts of malocclusion. As anticipated, the clinical sample had higher scores on the DAI and CPQ11-14, indicating worse malocclusion and more impacts from the malalignment of teeth and lower scores on the mental health subscale of the CHQ, indicating worse psy-However, chological well-being. scores on the self-esteem subscale were identical to those of the normative population. This suggests that self-esteem as an attribute is fixed prior to the onset of malocclusion in the permanent dentition and is, more than likely, a determinant of the outcomes of malocclusion rather than an outcome itself. A follow-up of the children in this study is planned, which will assess self-esteem, mental well-being, and oral health-related quality of life after the completion of orthodontic treatment. This longitudinal component will allow the role of self-esteem to be clarified further in this child population.

As findings of studies from children may not apply to adults, additional work on self-esteem and oral health and the role of self-esteem in the generation of disparities in oral health in adults is necessary so that its contribution to disparities in oral health can be ascertained and its preventive potential identified. Notwithstanding the view that self-esteem in adults is a fixed attribute resistant to change, Marmot (18) suggested that it has potential for improving the outcomes of interventions designed to improve the health behaviors and health of marginalized groups. That is, health education/promotion strategies that enhance autonomy, selfrespect, and self-esteem are likely to be more successful than those that consist of educational and skills development interventions alone. Whether this applies to oral health promotion programs has yet to be ascertained.

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