

Children's Dental Health, School Performance, and Psychosocial Well-Being

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Objective To assess the effects of dental health on school performance and psychosocial well-being in a nationally representative sample of children in the US.

Study design We analyzed data from the 2007 National Survey of Children's Health for 40 752-41 988 children. The effects of dental problems and maternal-rated dental health on school performance and psychosocial well-being outcomes were evaluated using regression models adjusting for demographic, socioeconomic, and health characteristics.

Results Dental problems were significantly associated with reductions in school performance and psychosocial well-being. Children with dental problems were more likely to have problems at school (OR = 1.52; 95% CI: 1.37-1.72) and to miss school (OR = 1.42; 95% CI: 1.23-1.64) and were less likely to do all required homework (OR = 0.76; 95% CI: 0.68-0.85). Dental problems were associated with shyness, unhappiness, feeling of worthlessness, and reduced friendliness. The effects of dental problems on unhappiness and feeling of worthlessness were largest for adolescents between 15 and 17 years.

Conclusion Preventing and treating dental problems and improving dental health may benefit child academic achievement and cognitive and psychosocial development. (*J Pediatr* 2012;161:1153-9).

Although there has been general improvement in children's dental health over recent decades, dental problems are still highly prevalent during childhood. In the US, about 42% of children aged 2-11 years experienced caries between 1999 and 2004,¹ and 42% of children and adolescents aged 6-19 years have had dental caries in their permanent teeth.² The prevalence of dental caries in primary teeth of children between 2 and 4 years of age increased from 18% in 1988-1994 to 24% in 1999-2004.³

Dental health plays a key role in the overall health status and quality of life of both children and adults; dental health also may affect several domains of child development and growth. Good dental health enhances the child's ability to develop several physical and social functions such as feeding, breathing, speaking, smiling, and social adaptation. Consequences of dental diseases in children may include pain, discomfort, embarrassment, challenged cognitive development, reduced self-esteem, and impairments of daily life activities.⁴ Severe caries in young children is associated with underweight, poor growth, irritability, higher risk of hospitalization, disturbed sleeping, and diminished learning ability.^{5,6}

The relationships between children's dental health and their educational performance and psychosocial status have been investigated. Jackson et al⁷ analyzed 2008 data from North Carolina and found that poor oral health status was associated with increased parental report of low child school grades. In that study, low school performance was associated with school absence because of dental pain or infection and not with absences for routine dental care. A previous study using the same data source for 2005 reported that children who have both poor oral and general health had lower parent-rated school performance.⁸ However, when separated, oral health and general health had smaller and insignificant associations with school performance than when combined. Two other studies of US and other populations evaluated the relationship between child oral health and school attendance and found considerable decrease in school hours with dental problems and visits to dental care providers.^{9,10}

Several dental problems in children and adolescents also have been negatively associated with psychosocial well-being. Dental pain affects emotional stability of children and enrollment in social activities such as by preventing children from engaging in playing time.¹¹⁻¹³ Malocclusion has been associated with reduction in perceived attractiveness by others and social acceptance.¹⁴ Traumatic dental injury especially in the anterior teeth has been associated with reduced children's sociability including avoiding to smile, not enjoying contact with other people, and anxiety about others' perceptions of them.^{15,16}

Previous studies have not evaluated the potentially related schooling and psychosocial consequences of dental health problems simultaneously, using the same sample and analytical framework. Such an analysis allows for a more comprehensive assessment of several related developmental consequences of child dental problems.

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IE Incremental effect
NSCH National Survey of Children's Health

In this study, we evaluate the effects of child dental health on school performance and psychosocial well-being in a large nationally representative US sample of children aged 6-17 years controlling for several demographic, socioeconomic, and health confounding variables.

Methods

We employed the 2007 National Survey of Children's Health (NSCH), which is the most recent nationally representative survey of children's health in the US. The 2007 NSCH is a module of the State and Local Area Integrated Telephone Survey from the National Center for Health Statistics at the Centers for Disease Control and Prevention.¹⁷ The NSCH randomly selected a sample of households with children less than 18 years of age in all 50 states and the District of Columbia. One index child was randomly selected for the interview from all children in each identified household. Data were obtained through phone interviews with the parent or guardian who knew about the health and health care of the index child.

Because we sought to evaluate school performance, we included in the study sample only children between 6 and 17 years. This also is the age for which the NSCH included questions about psychosocial status. Of the total NSCH sample, 64 076 met inclusion criteria. Next, we limited the sample to children for whom their mothers were the respondents to the NSCH interview to reduce errors in self-reported maternal and child data. This reduced the eligible sample to 46 750 children. Because some observations have complete data on some but not all of the study variables, and because we include different dental health and outcome measures in multiple regressions, the final sample included in our study regressions ranges from 40 752-41 988 children. Children with complete data who were included in the study regressions had some differences from children with incomplete data on certain outcome and dental health measures and on some demographic and socioeconomic characteristics (Table I; available at www.jpeds.com). To evaluate the effects of missing data on our results, we re-estimated the main study regressions (described below) using 2 approaches: (1) a propensity score model to readjust sampling probability weights for excluding observations because of missing data; and (2) imputing outcome and continuous explanatory variables and adding as covariates binary 0/1 indicators for observations with missing data on categorical explanatory variables. We found similar dental effects in both of these approaches to those in the main models that exclude observations with missing data (additional information available upon request from the authors).

Outcome and Dental Health Measures

The main study outcomes were the child's school performance and psychosocial well-being, which we measured in several ways from the survey questions.¹⁸ We used 3 school performance measures: (1) having received school report of a problem that the child was having at school during the

last year based on the following question: "During the past 12 months, how many times has [the child's] school contacted you or another adult in your household about any problems [he/she] is having with school?"¹⁸; (2) homework completion based on a 5-item scale question about how often the child completed his/her homework; and (3) health-related missed school days during the last year, which we evaluated both as any missed days and number of missed days. Four psychosocial well-being outcomes were included: (1) shyness; (2) sociability/friendliness; (3) feelings of worthlessness/inferiority; and (4) unhappiness, all measured from maternal report on 5-item frequency scales of never, rarely, sometimes, usually, and always. Shyness was measured by the child being withdrawn and not involved with others. Sociability is measured by getting along well with other children. The 2 other psychosocial outcomes measured how often the child feels worthless or inferior, and is unhappy, sad, or depressed.

We used 2 separate measures for child dental health based on maternal report: (1) having specific dental health problems; and (2) rating of dental health. The first measure is a binary indicator for the child having experienced at least 1 of the following conditions over the past 6 months: toothache, decayed teeth or cavities, and bleeding gums, as reported by the mother in response to specific questions about these conditions. The second measure is based on maternal rating of the child's dental health status over a 5-item scale of excellent, very good, good, fair, or poor. We combined excellent and very good dental health into 1 binary indicator and fair and poor dental health into another indicator, and use "good" dental health as the reference category because of the low frequency of poor dental health (1.19%) and to avoid potential biases toward reporting extreme responses. Although parental report of their children's dental health is not an objective measure, it has been found to have a significant positive association with objective measures and is considered a valid proxy indicator of child dental health.¹⁹⁻²² In addition, parents' perceptions are highly relevant because they influence their decisions about child dental health and dental care use. In our sample, the Spearman correlation coefficient for maternal-rated dental health and reporting dental problems was 0.33 ($P < .001$). About 19% of mothers who rated their child's dental health as excellent/very good reported dental problems, compared with 42% and 65% of mothers who rated their child's dental health as good and fair/poor, respectively.

Empiric Model and Statistical Analysis

We evaluated the effects of the dental health measures on the schooling and psychosocial outcomes using multivariate regression models that adjust for several potential confounding variables. All models were weighted by the survey sampling probability weights to obtain population-based estimates. We estimated separate regressions for each outcome—3 measures of school performance and 4 measures of psychosocial well-being—and dental health measure. Binary logistic regression was used for binary outcomes and ordered logistic regression was used for the ordinal outcome measures. We used Poisson regression for the number of missed school

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