# Factors related to severe untreated tooth decay in rural adolescents: a case-control study for public health planning

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**Summary.** *Objectives.* In this case-control study of rural adolescents we identified factors to discriminate those who have high levels of tooth decay and receive treatment from those with similar levels who receive no treatment.

*Methods.* The sample was drawn from all 12-20-year-olds (n = 439) in a rural high school in Washington State, U.S. The criterion for being included was 5 or more decayed, missing or filled teeth. The questionnaire included structure, history, cognition and expectation variables based on a model by Grembowski, Andersen and Chen.

*Results*. No structural variable was related to the dependent variable. Two of 10 history variables were related: perceived poor own dental health and perceived poor mother's dental health. Four of eight cognition variables were also predictive: negative beliefs about the dentist, not planning to go to a dentist even if having severe problems, not being in any club or playing on a sports team and not having a best friend. No relationship was found for the expectation variable 'usual source of care'.

*Conclusions.* These data are consistent with the hypothesis that untreated tooth decay is associated with avoidance of care and point to the importance of history and cognition variables in planning efforts to improve oral health of rural adolescents.

## Introduction

Rural health care can be characterized as having inadequate infrastructures, high prevalence rates for chronic disease and disability, socioeconomic hardships, and physical barriers such as distance and lack of transportation [1]. It is therefore not surprising that children from rural areas have a greater burden of dental disease than do children from urban areas [2]. The patient/dentist ratio in rural areas is generally high, and some places have neither fluoridated water nor alternative exposure to fluoride, increasing the risk of tooth decay [3]. Lack of dental treatment may lead to dental health problems and reduced quality of life [4].

Adolescents are an important target group as their dental attendance is often irregular [5,6], and they have been found to make decisions for themselves with regard to dental care [7], many since they were 12-14 years of age [8].

Untreated tooth decay in adolescents is a consequence of low utilization of preventive dental services and may be a result of limited access to dental care or dental avoidance by parents and their children. Various attempts have been made to increase utilization of these services through improved access to dental care. Lowering economic barriers, enhancing physical access, and providing publicity and education have been attempted without much success [9,10]. Moreover, there is low utilization of

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dental services when adolescents and young adults leave highly structured school or community-based programs in Scandinavia [11–13]. While access may be limited in the rural U.S., it appears that enhancing access alone is necessary but not sufficient to enhance utilization.

While factors influencing avoidance of dental care have been investigated [14], few studies have been done in North America and none in rural areas. Nonetheless, the effect of dental fear on avoidance is often cited in the literature. For example, Kleinknecht et al. in a large scale study, found that 21.4% of the adult respondents put off making dental appointments because of fear 'a few times' to 'every time' [15]. Evidence exists that caries rates are higher for irregular dental attenders and for those with higher levels of dental anxiety [16-23]. Klingberg and Berggren studied a group of Swedish children whose parents had been treated for severe dental fear and found a high frequency of missed appointments and high disease rates among the children, suggesting social learning of avoidance [24]. This positive relationship between avoidance of dental care and dental health problems makes severe untreated caries an indicator of dental avoidance and fear, when access to dental care exists. In recent studies of Norwegian adolescents, Skaret et al. found that 16.4% of those studied missed or cancelled more than 20% of their dental appointments between the ages of 12 and 18 in spite of having been regularly contacted and offered free dental care since birth [25]. The frequency of these missed and cancelled appointments increased with age. Studies have also shown that individuals in low utilizing populations often report no need for dental care even in the face of documented need or selfawareness of oral pathology. The report of no need for dental care persists, across cultures, in being the most frequent reason for dental avoidance [9,26]. Students and faculty of the University of Washington School of Dentistry have been providing dental care to under-served rural communities in Southwest Washington. A large number of serious dental emergencies involving adolescents led public health planners to investigate the situation further. This study, using a retrospective case-control design, was implemented to identify risk factors that discriminate between avoidant and non-avoidant adolescents and to plan for an intervention to gain information needed to identify and motivate avoidant adolescents with serious dental needs.

## Methods

## Setting

The study setting was the Winlock School District in Lewis County, South-west Washington State. Lewis County is rural with a population of 66 700 and a density of 27-persons/square mile. The district is relatively poor: 40% of children are eligible for federally sponsored free and reduced-price school lunches. The district is relatively well served by national standards with 27 dentists (population: dentist ratio 2470 : 1) [27].

## Subjects

The study population included all 439 students 12–20 years enrolled in the school district. All children were examined and a subset was surveyed. The inclusion criterion for the survey was a decayed, missing and filled teeth score (DMFT) of 5 or more. The subjects who were surveyed (high DMFT) were divided into cases and controls: The cases had a DMFT of 5 or more and one or more teeth with World Health Organization (WHO) code 3 (dentin caries to a level of fracturing of surrounding enamel undermined by carious dentin) or code 4 (deep cavity with probable pulp involvement) [28]. The controls had a DMFT of 5 or more but with no code 3 or 4 lesions. Subjects who had never been to the dentist were included in the case group.

## Conceptual model and measures

A conceptual model by Grembowski, Andersen and Chen [29], founded on social exchange theory, has been shown to be useful in the evaluation of factors related to utilization of care among lowincome children [30], and guided the development of the questionnaire given to students. The model has not been used previously, however, to identify mutable factors for public health planning. According to this model, four groups of variables are related to the probability of going to a dentist. The groups are structure (social class, race), history (past care behaviour and oral health), cognition (attitudes and beliefs about care) and expectations (rewards versus costs). Similar models have been used to examine the role of psychosocial and socioeconomic factors related to use of medical care.

The specific variables included in the questionnaire were: **1** Structure: Gender, race, ethnic background, and marital status of the parent/guardian.

**2** History: Perceived dental health, past care seeking behaviour and experiences, days missed from school or job and average grades in school.

**3** Cognition: Interpersonal relationships were measured with two questions modified from the Anxiety Disorders Interview Schedule for DSM-IV [31], Denial of having a dental problem was measured with a 7-item scale, with a 6-point Likert-like format (1 = Strongly agree to 6 = Strongly disagree). In addition, the following psychometric instruments were included: Dental Fear Survey [32], Dental Beliefs Survey [33], Beck's Depression Inventory Short Form (BDISF) [34], and The Five Scale Psychological General Well-Being Schedule [35].

**4** Expectation: Usual source of care was measured using a single question. ('Do you have a dental office to go to if you need dental treatment?')

## Procedure

*Consent*. The School contacted the parents and passive consent was requested for in-school examination. As an incentive, parents were offered assistance in finding dental care for children who needed it. A postcard was to be returned to the school if the parent did not wish their child examined. The study was reviewed and approved by the Institutional Review Board of the University of Washington.

*Clinical method.* Three screening sessions were included in an attempt to capture as many children as possible. The children were examined visually by six trained and calibrated examiners.

*Questionnaire*. Parents of cases and a randomized selection of controls were contacted a second time for consent. They were assured that non-participation would not influence the opportunity to receive care. The questionnaire was completed at school under supervision of two of the authors. Envelopes with a \$10 incentive were left in the School Principal's office and were given to the child when the consent card, a child assent form, and the questionnaire booklet were completed.

## Analysis

The data were analysed using SPSS (version 9.0) (SPSS Inc., Chicago, IL, USA). In the survey, subjects

with more than 20% missing items were excluded. Bivariate relationships between independent variables and the dependent variable case/control (case = 1, control = 0) were analysed using simple logistic regression. The independent variables were dichotomized, where score 1 indicated a hypothesized positive relationship to the dependent variable, based on previous research. Continuous variables were dichotomized with 1 SD or more above the mean as a cut-off. A multivariate stepwise regression model was used to determine the predictive power of the independent variables, and the variables were entered in blocks according to the conceptual model.

## Results

## **Demographics**

Of 439 enrolled students, 322 (73.3%) were examined in three screenings (52.5% male). Sixtyone parents and four children (14.8%) refused. No reason for refusal was given. The remainder (11.9%) was absent or did not present at the screening. The mean age of the children was 15.7 years with no differences in demographic characteristics between the three screening groups. However, only 64% of the cases were recruited in the first screening and these cases and those identified in the additional screening sessions differed in age, with the cases in the third screening being on average about two years older than those in the first two sessions.

# Caries

Approximately 35% (112/322) of the examined subjects had no decayed, filled or missing teeth. Mean DMFT was 2.9 (SD = 3.5). Mean D/DMFT, indicating the proportion of untreated decayed teeth, was 0.2 (SD = 0.4). Twenty-four children (7.5%) had severe caries (1 or more WHO score 3 or 4), and 17 of these 24 children had a DMFT of 5 or more. Twenty-two subjects met the criteria for cases. Five subjects had never been to a dentist. Sixty-two children (19.6%) met the criteria for controls, and 22 were chosen randomly to be included in the survey. Eighteen out of 22 cases and the 22 controls completed the questionnaire. Cases had a mean DMFT of 7.4 (SD = 4.3). Mean D/DMFT was 0.6 (SD = 0.3). If the five cases who had never been to the dentist were excluded, the mean DMFT for the case group was 9.1 [3,7]. Controls had a mean DMFT of 7.9 (SD = 2.7). Mean D/DMFT was 0.1 (SD = 0.3). No differences were found in age distribution and DMFT between the selected group of controls and the whole potential pool. No difference in average age was found between cases and controls.

## Dental attendance pattern

Fifty-eight per cent (180/317) of those screened had been to the dentist within the last year (6 cases and 19 of the randomly selected controls). For 17% (55/317), time since last appointment was between 1 and 2 years (1 case and 1 control). For 23% (73/ 317) it was more than 2 years since the last dental appointment (6 cases, 1 control), and 5 children had never been to a dentist (included as cases). For 87.9% (277/315), the last appointment was a regular check-up (11 cases, 19 controls); for 12.1% (38/ 315), the appointment was for a toothache or emergency (5 cases, 2 controls). Thirteen subjects (4.1%) reported that they had tried without success to find a dentist (no cases, 2 controls).

## Survey results

*Bivariate analyses.* The bivariate analyses are shown in Tables 1 and 2. None of the structure variables had a significant relationship to the dependent variable. Two of the 10 history variables were related: perceived poor dental health and perceived poor mother's dental health. Four of eight cognition variables were also predictive: negative beliefs about the dentist, not planning to go to a dentist even if having severe problems, not being in any club or playing on a sports team, and not having a best friend. No significant relationship was found for the expectation variable 'usual source of dental care'. The same analyses conducted with the 5 cases (never been to a dentist) excluded gave the same results qualitatively.

*Multivariate analyses.* The result of the multivariate analysis is shown in Table 3. Three of the four factors that were included in the multivariate model were history variables, but the highest predictive power was found for the cognition variable 'negative beliefs of the dentist'.

#### Discussion

The overall caries prevalence for the school population (2.9 DMFT) is greater than the US average. Almost 80% of respondents reported having a usual source of care; only 4.3% had tried to find dental treatment without success. These data are consistent with a population : dentist ratio of 2740 and support our belief that the untreated severe tooth decay found in this study is largely a consequence of avoidance, not access. Moreover, the need for three screenings to capture about three-quarters of the population may itself reflect a high rate of avoidance. Our clinical impression is that many of the adolescents had to be 'rounded up' by teachers, some trying to flee from the screening area. Only 64% of the cases were recruited in the first screening. A significant numbers of avoiders would have been missed without multiple screenings.

## The model

The results help establish the usefulness of the model in preparing an intervention in this rural population of adolescents, and are generally consistent with studies of other at-risk populations. The expectation variable 'usual source of care' had no predictive value.

The case-control data presented in this paper lend credence to the importance of understanding dental avoidance as a learned intergenerational behaviour. History and cognition variables are interrelated; that is, parental behaviours and beliefs appear to impact adolescent behaviours and beliefs. Forty-seven per cent of the cases reported that their parents only want to see the dentist when they have toothaches in contrast to only 19% of the controls. Similarly, 85% of the cases and 50% of the controls reported poor maternal dental health. While only 5% of controls had negative beliefs about the dentist, 42% of the cases indicated negative beliefs. It is also not surprising that children who are socially isolated (not in clubs, team sports; no best friend), have not performed well in school and missed many school days are dentally avoidant.

## Public health intervention

Given that there are disparities in oral health in North America, adolescent avoidance of dental care is itself part of the serious dental health problem in rural areas. Moreover, for potential parents, experiences during adolescence, as well as beliefs and attitudes about dental care will influence whether or not they will bring their own children to the dentist for regular dental care in future. Understanding and

Table 1.	Descriptive	statistics	and	bivariate	relationships	between	independent	variables	(structure	and	history	variables)	and	the
depender	it variable c	ase/control	l for	rural adol	escents in Le	wis Coun	ty, WA.							

Structure variables       Gender         Gender       1-0         Males (score 1)       27.8%       30.0%       1-1       0-88         Fennales (score 0)       1-0       1-0       1-0         Non-Hispanic (score 1)       83.3%       85.0%       0-9       0-89         Hispanic (score 0)       1-0       1-0       1-0         Race       1-0       1-0       1-0         Mile (score 0)       88.9%       80.0%       0.5       0-46         Non-white (score 0)       1-0       1-0       1-0         Mariad or living with a partner (score 0)       1-0       1-0       1-0         Perceived duratils health       1-0       1-0       1-0       1-0         Fair or poor (score 1)       56.3%       42.1%       1.8       0-40         Excellent, good or very good (score 0)       1-0       1-0       1-0       1-0         Perceived father's dental health       1-0       1-0       1-0       1-0         Fair or poor (score 1)       56.3%       42.1%       1.8       0-40         Laxt dental ysit       1-0       1-0       1-0       1-0         Variago or very good (score 0)       1-0       1-0       1-0<	Variables	Cases $(n = 18)$	Controls $(n = 22)$	Odds Ratio	Р
Gender         Second State         Second State         Second State           Males (score 1)         27.8% $30.0\%$ 1-1 $0.88$ Females (score 0)         1-0         1-0         1-0           Race         1-0         1-0         1-0           White (score 1)         83.3%         85.0%         0-5         0-46           Non-Hispanic (score 0)         1-0         1-0         1-0           Race         1-0         1-0         1-0           Marital status of the parents         1-0         1-0         1-0           Married or living with a partner (score 0)         1-0         1-0         1-0           History variables         1-0         1-0         1-0           Perceived dental health         1-0         1-0         1-0           Fair or poor (score 1)         61.1%         23.8%         5-0         0-02           Excellent, good or very good (score 0)         1-0         1-0         1-0           Perceived math health         1-0         1-0         1-0           Excellent, good or very good (score 0)         1-0         1-0         1-0           Perceived father's dental health         1-0         1-0         1-0	Structure variables				
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Ethnic background         83-3%         85-0%         0.9         0.89           Hispanic (score 1)         83-3%         85-0%         0.9         0.89           Race	Females (score 0)			1.0	
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Single, separated, divorced or widowed (score 1) $33.3\%$ $40.0\%$ $0.8$ $0.69$ Married or living with a partner (score 0)       1.0         Pistory variables       1.0         Perceived dental health       5.0       0.02         Excellent, good or very good (score 0)       1.0       1.0         Perceived mother's dental health       5.5       0.05         Excellent, good or very good (score 0)       1.0       1.0         Perceived father's dental health       56.3%       42.1%       1.8       0.40         Excellent, good or very good (score 0)       1.0       1.0       1.0       1.0         Perceived father's dental health       56.3%       42.1%       1.8       0.40         Excellent, good or very good (score 0)       1.0       1.0       1.0       1.0         Last dental visit       1.0       1.0       1.0       1.0       1.0         Was your last dental appointment painful?       1.0	Marital status of the parents				
Married or living with a partner (score 0)1-0History variablesPerceived dental healthFair or poor (score 1) $61 \cdot 1\%$ $23 \cdot 8\%$ $5 \cdot 0$ $0.02$ Excellent, good or very good (score 0) $1 - 0$ Perceived mother's dental healthFair or poor (score 1) $84 \cdot 6\%$ $50\%$ $5 \cdot 5$ $0.05$ Excellent, good or very good (score 0) $1 - 0$ Perceived father's dental healthFair or poor (score 1) $56 \cdot 3\%$ $42 \cdot 1\%$ $1 \cdot 8$ $0 \cdot 40$ Excellent, good or very good (score 0) $1 - 0$ $1 - 0$ $1 \cdot 0$ Last dental visit $1 - 0$ $1 \cdot 0$ $1 \cdot 0$ Toothache or emergency (score 1) $31 \cdot 3\%$ $9 \cdot 5\%$ $4 \cdot 3$ $0 \cdot 11$ Regular check-up appointment (score 0) $1 \cdot 0$ $1 \cdot 0$ $1 \cdot 0$ Was your last dental appointment painful? $3 \cdot 3\%$ $42 \cdot 9\%$ $1 \cdot 7$ $0 \cdot 42$ No pain at all (score 0) $1 \cdot 0$ $1 \cdot 0$ $1 \cdot 0$ $1 \cdot 0$ Previous experiences of pain $1 \cdot 0$ $1 \cdot 0$ $1 \cdot 0$ $1 \cdot 0$ More than once (score 1) $1 \cdot 2 \cdot 5\%$ $2 \cdot 3 \cdot 8\%$ $0 \cdot 5$ $0 \cdot 39$ Never (score 0) $1 \cdot 0$ $1 \cdot 0$ $1 \cdot 0$ $1 \cdot 0$ More than once (score 1) $77 \cdot 8\%$ $57 \cdot 1\%$ $2 \cdot 6$ $0 \cdot 18$ Never (score 0) $1 \cdot 0 \cdot 16$ $1 \cdot 0 \cdot 16$ $1 \cdot 0 \cdot 16$ More than once (score 1) $1 \cdot 6 \cdot 7\%$ $0 \cdot \%$ $0 \cdot 09$ Never (score 0) $1 \cdot 0 \cdot 16 \cdot 7\%$ $1 \cdot 0 \cdot 16$	Single, separated, divorced or widowed (score 1)	33.3%	40.0%	0.8	0.69
History variables Perceived dental health Fair or poor (score 1) $61\cdot1\%$ 23·8% 5·0 0·02 Excellent, good or very good (score 0) 1·0 Perceived mother's dental health Fair or poor (score 1) 84·6% 50% 5·5 0·05 Excellent, good or very good (score 0) 1·0 Perceived father's dental health Fair or poor (score 1) 56·3% 42·1% 1.8 0·40 Excellent, good or very good (score 0) 1·0 Last dental visit Toothache or emergency (score 1) 31·3% 9·5% 4·3 0·11 Regular check-up appointment (score 0) 1·0 Was your last dental appointment (score 0) 1·0 Previous experiences of pain More than once (score 1) 1·0 My parents only go to the dentist when they have toothache Agree (score 1) 1·0 How often do you in an average month miss school or job? Less than 5 days (score 1) 1·0 Missed school because of toothache More than once (score 1) 1·0 How often do you in an average month miss school or job? Less than 5 days (score 1) 1·0 Missed school because of toothache More than once (score 1) 1·0 Missed school because of toothache More than once (score 0) 1·0 How often do you in an average month miss school or job? Less than 5 days (score 1) 1·0 Missed school because of toothache More than once (score 0) 1·0 Missed school because of toothache More than once (score 0) 1·0 Missed school because of toothache More than once (score 0) 1·0 Never or once (score 0) 1·0 Missed school because of toothache More than once (score 0) 1·0 Never or once (score 0) 1·0 Never or once (score 0) 1·0 Never or once (score 0) 1·0 Missed school because of toothache More than once (score 0) 1·0 Never or on	Married or living with a partner (score 0)			1.0	
Perceived dental healthFair or poor (score 1) $61\cdot1\%$ $23\cdot8\%$ $5.0$ $0.02$ Excellent, good or very good (score 0) $1.0$ $1.0$ Perceived mother's dental health $1.0$ $1.0$ Fair or poor (score 1) $84\cdot6\%$ $50\%$ $5.5$ $0.05$ Excellent, good or very good (score 0) $1.0$ $1.0$ $1.0$ Perceived father's dental health $1.0$ $1.0$ $1.0$ Perceived father's dental health $1.0$ $1.0$ $1.0$ Last dental visit $1.0$ $1.0$ $1.0$ $1.0$ Last dental visit $1.0$ $1.0$ $1.0$ $1.0$ Was your last dental appointment (score 0) $1.0$ $1.0$ $1.0$ Was your last dental appointment (score 1) $56\cdot3\%$ $42\cdot9\%$ $1.7$ $0.42$ No pain at all (score 1) $56\cdot3\%$ $42\cdot9\%$ $1.7$ $0.42$ No pain at all (score 0) $1.0$ $1.0$ $1.0$ $1.0$ Previous experiences of pain $1.0$ $1.0$ $1.0$ $1.0$ More than once (score 1) $12\cdot5\%$ $23\cdot8\%$ $0.5$ $0.39$ Never or once (score 0) $1.0$ $1.0$ $1.0$ $1.0$ More than once (score 1) $77\cdot8\%$ $57\cdot1\%$ $2.6$ $0.18$ Never (score 0) $1.0$ $1.0$ $1.0$ $1.0$ Missed school because of toothache $1.0$ $1.0$ $1.0$ Missed school because of toothache $1.0$ $1.0$ $1.0$ More than once (score 1) $16\cdot7\%$ <td>History variables</td> <td></td> <td></td> <td></td> <td></td>	History variables				
Fair or poor (score 1) $61.1\%$ $23.8\%$ $5.0$ $0.02$ Excellent, good or very good (score 0)       1.0       1.0         Perceived mother's dental health       1.0         Fair or poor (score 1) $84.6\%$ $50\%$ $5.5$ $0.02$ Perceived father's dental health       1.0       1.0       1.0         Perceived father's dental health       1.0       1.0       1.0         Excellent, good or very good (score 0)       1.0       1.0       1.0         Last dental visit       56.3% $42.1\%$ 1.8       0.40         Excellent, good or very good (score 0)       1.0       1.0       1.0         Last dental visit       1.0       1.0       1.0       1.0         Last dental appointment (score 0)       1.0       1.0       1.0       1.0         Was your last dental appointment (score 0)       1.0       1.0       1.0       1.0         Some pain or very painful (score 1)       56.3% $42.9\%$ 1.7       0.42         No pain at all (score 0)       1.0       1.0       1.0       1.0         My parents only go to the dentist when they have toothache       1.0       1.0       1.0         Agree (score 1)	Perceived dental health				
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Derivative mother's dental healthInterview mother's dental healthFair or poor (score 1) $84.6\%$ $50\%$ $5.5$ $0.05$ Excellent, good or very good (score 0) $1.0$ $1.0$ $1.0$ Perceived father's dental health $56.3\%$ $42.1\%$ $1.8$ $0.40$ Excellent, good or very good (score 0) $1.0$ $1.0$ $1.0$ $1.0$ Last dental visit $1.0$ $1.0$ $1.0$ $1.0$ Toothache or emergency (score 1) $31.3\%$ $9.5\%$ $4.3$ $0.11$ Regular check-up appointment painful? $1.0$ $1.0$ $1.0$ Was your last dental appointment painful? $1.0$ $1.0$ $1.0$ Some pain or very painful (score 1) $56.3\%$ $42.9\%$ $1.7$ $0.42$ No pain at all (score 0) $1.0$ $1.0$ $1.0$ $1.0$ Previous experiences of pain $1.0$ $1.0$ $1.0$ $1.0$ More than once (score 1) $12.5\%$ $23.8\%$ $0.5$ $0.39$ Never or once (score 0) $1.0$ $1.0$ $1.0$ $1.0$ How often do you in an average month miss school or job? $1.0$ $1.0$ $1.0$ How often do you in an average month miss school or job? $1.0$ $1.0$ $1.0$ Missed school because of toothache $1.0$ $1.0$ $1.0$ Missed school because of toothache $1.0$ $1.0$ $1.0$ More than once (score 1) $16.7\%$ $0\%$ $*$ $0.09$ Never or once (score 0) $1.0$ $1.0$ $1.0$ <td>Excellent, good or very good (score 0)</td> <td></td> <td></td> <td>1.0</td> <td></td>	Excellent, good or very good (score 0)			1.0	
Fair or poor (score 1)       84-6%       50%       5-5       0.05         Excellent, good or very good (score 0)       1-0       1-0         Perceived father's dental health       1-0       1-0         Fair or poor (score 1)       56-3%       42-1%       1-8       0-40         Excellent, good or very good (score 0)       1-0       1-0       1-0         Last dental visit       1-0       1-0       1-0         Toothache or emergency (score 1)       31-3%       9.5%       4-3       0-11         Regular check-up appointment (score 0)       10       10       10       10         Was your last dental appointment painful?       56-3%       42-9%       1-7       0-42         No pain at all (score 0)       10       1-0       10       10         Previous experiences of pain       1-0       1-0       10       10         More than once (score 1)       12-5%       23-8%       0-5       0-39         Never or once (score 0)       1-0       1-0       10       10         My parents only go to the dentist when they have toothache       47-1%       19-0%       3.8       0-07         Disagree (score 1)       77-8%       57-1%       2-6       0-18       Never	Perceived mother's dental health				
Excellent, good or very good (score 0)1-0Perceived father's dental health1-0Fair or poor (score 1) $56.3\%$ $42.1\%$ $1.8$ Good or very good (score 0) $1.0$ Last dental visit $1.0$ Toothache or emergency (score 1) $31.3\%$ $9.5\%$ $4.3$ Regular check-up appointment (score 0) $1.0$ Was your last dental appointment painful? $1.0$ Some pain or very painful (score 1) $56.3\%$ $42.9\%$ $1.7$ O pain at all (score 0) $1.0$ Previous experiences of pain $1.0$ More than once (score 1) $12.5\%$ $23.8\%$ $0.5$ More than once (score 1) $12.5\%$ $23.8\%$ $0.5$ More than once (score 1) $10$ $1.0$ My parents only go to the dentist when they have toothache $1.0$ Agree (score 1) $17.1\%$ $19.0\%$ $3.8$ Oroften do you in an average month miss school or job? $1.0$ Less than 5 days (score 1) $77.8\%$ $57.1\%$ $2.6$ Never (score 0) $10$ $1.0$ Missed school because of toothache $1.0$ More than once (score 1) $16.7\%$ $0\%$ $*$ Never or once (score 0) $10.7\%$ $1.0$ More than once (score 1) $16.7\%$ $0\%$ $*$ Never or once (score 0) $1.0$ $1.0$ More than once (score 1) $16.7\%$ $0\%$ $*$ Never or once (score 0) $1.0$ $1.0$ More than once (score 1) $1.0$ $1.0$ Never or	Fair or poor (score 1)	84.6%	50%	5.5	0.05
Perceived father's dental health Fair or poor (score 1) 56-3% 42-1% 1-8 0-40 Excellent, good or very good (score 0) 1-0 Last dental visit Toothache or emergency (score 1) 31-3% 9-5% 4-3 0-11 Regular check-up appointment (score 0) 1-0 Was your last dental appointment painful? Some pain or very painful (score 1) 56-3% 42-9% 1-7 0-42 No pain at all (score 0) 1-0 Previous experiences of pain More than once (score 1) 12-5% 23-8% 0-5 0-39 Never or once (score 0) 1-0 My parents only go to the dentist when they have toothache Agree (score 1) 10 How often do you in an average month miss school or job? Less than 5 days (score 1) 77-8% 57-1% 2-6 0-18 Never (score 0) 1-0 Missed school because of toothache More than once (score 0) 1-0 Missed school because of toothache More than once (score 1) 16-7% 0% * 0-09 Never or once (score 0) 16-7% 0% * 0-09 Never or once (score 0) 10-10 Missed in school Low (score 1) 50-0% 28-6% 2-5 0-18 Moderate/high (score 0) 1-0	Excellent, good or very good (score 0)	/-		1.0	
Fair or poor (score 1) $56.3\%$ $42.1\%$ $1.8$ $0.40$ Excellent, good or very good (score 0) $1.0$ $1.0$ Last dental visit $1.0$ $1.0$ Toothache or emergency (score 1) $31.3\%$ $9.5\%$ $4.3$ $0.11$ Regular check-up appointment (score 0) $1.0$ $1.0$ $1.0$ Was your last dental appointment painful? $56.3\%$ $42.9\%$ $1.7$ $0.42$ No pain at all (score 0) $56.3\%$ $42.9\%$ $1.7$ $0.42$ No pain at all (score 0) $10$ $1.0$ $1.0$ Previous experiences of pain $1.0$ $1.0$ $1.0$ More than once (score 1) $12.5\%$ $23.8\%$ $0.5$ $0.39$ Never or once (score 0) $1.0$ $1.0$ $1.0$ $1.0$ How often do you in an average month miss school or job? $1.0$ $1.0$ $1.0$ Less than 5 days (score 1) $77.8\%$ $57.1\%$ $2.6$ $0.18$ Never (score 0) $1.0$ $1.0$ $1.0$ $1.0$ Missed school because of toothache $1.0$ $1.0$ <td>Perceived father's dental health</td> <td></td> <td></td> <td></td> <td></td>	Perceived father's dental health				
Last deplot (store 1)100100100Last dental visit100100Toothache or emergency (score 1) $31.3\%$ $9.5\%$ $4.3$ $0.11$ Regular check-up appointment (score 0)100100100Was your last dental appointment painful? $56.3\%$ $42.9\%$ $1.7$ $0.42$ No pain at all (score 0) $56.3\%$ $42.9\%$ $1.7$ $0.42$ No pain at all (score 0) $100$ $100$ 100Previous experiences of pain $100$ $100$ $100$ More than once (score 1) $12.5\%$ $23.8\%$ $0.5$ $0.39$ Never or once (score 0) $100$ $100$ $100$ $100$ My parents only go to the dentist when they have toothache $100$ $100$ How often do you in an average month miss school or job? $100$ $100$ $100$ Missed school because of toothache $100$ $100$ $100$ More than once (score 1) $16.7\%$ $0\%$ $*$ $0.09$ Never or once (score 0) $16.7\%$ $0\%$ $*$ $0.09$ Never or once (score 0) $16.7\%$ $0\%$ $*$ $0.09$ Never or once (score 0) $16.7\%$ $0\%$ $*$ $0.09$ Never or once (score 0) $16.7\%$ $0\%$ $*$ $0.09$ Never or once (score 0) $10.0$ $100$ $100$ Never or once (score 0) $10.0$ $100$ $100$ Never or once (score 0) $10.0$ $10.0$ $10.0$ Never or once (score 0) $10.0$ <td< td=""><td>Fair or poor (score 1)</td><td>56.3%</td><td>42.1%</td><td>1.8</td><td>0.40</td></td<>	Fair or poor (score 1)	56.3%	42.1%	1.8	0.40
Last dental visit Toothache or emergency (score 1) $31.3\%$ 9.5% 4.3 0.11 Regular check-up appointment (score 0) 1.0 Was your last dental appointment painful? Some pain or very painful (score 1) $56.3\%$ 42.9% 1.7 0.42 No pain at all (score 0) 1.0 Previous experiences of pain 1.0 More than once (score 1) 12.5% 23.8% 0.5 0.39 Never or once (score 0) 1.0 My parents only go to the dentist when they have toothache Agree (score 1) 1.0 How often do you in an average month miss school or job? Less than 5 days (score 1) 77.8% 57.1% 2.6 0.18 Never (score 0) 1.0 Missed school because of toothache More than once (score 1) 16.7% 0% * 0.09 Never or once (score 0) 1.0 Moderate/hieh (score 0) 1.0	Excellent, good or very good (score 0)			1.0	
Toothache or emergency (score 1) $31.3\%$ $9.5\%$ $4.3$ $0.11$ Regular check-up appointment (score 0) $1.0$ $1.0$ Was your last dental appointment painful? $56.3\%$ $42.9\%$ $1.7$ $0.42$ Some pain or very painful (score 1) $56.3\%$ $42.9\%$ $1.7$ $0.42$ No pain at all (score 0) $1.0$ $1.0$ $1.0$ Previous experiences of pain $1.0$ $1.0$ $1.0$ More than once (score 1) $12.5\%$ $23.8\%$ $0.5$ $0.39$ Never or once (score 0) $1.0$ $1.0$ $1.0$ My parents only go to the dentist when they have toothache $47.1\%$ $19.0\%$ $3.8$ $0.07$ Disagree (score 0) $1.0$ $1.0$ $1.0$ $1.0$ $1.0$ How often do you in an average month miss school or job? $1.0$ $1.0$ $1.0$ Missed school because of toothache $16.7\%$ $0\%$ $*$ $0.09$ Never or once (score 1) $16.7\%$ $0\%$ $*$ $0.09$ Never or once (score 0) $1.0$ $1.0$ $1.0$ More than once (score 0) $1.0$ $1.0$ $1.0$ Average grade in school $1.0$ $1.0$ $1.0$ Less than $50.0\%$ $28.6\%$ $2.5$ $0.18$ Moderate/high (score 0) $1.0$ $1.0$	Last dental visit				
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The prime (c) of the prime (	Regular check-up appointment (score 0)	01070	2010	1.0	0 11
Some pain or very painful (score 1) $56\cdot3\%$ $42\cdot9\%$ $1.7$ $0\cdot42$ No pain at all (score 0)1.0Previous experiences of painMore than once (score 1) $12\cdot5\%$ $23\cdot8\%$ $0.5$ $0.39$ Never or once (score 0) $1\cdot0$ $1\cdot0$ My parents only go to the dentist when they have toothacheAgree (score 1) $47\cdot1\%$ $19\cdot0\%$ $3\cdot8$ $0\cdot07$ Disagree (score 0) $1\cdot0$ How often do you in an average month miss school or job? $1\cdot0$ $1\cdot0$ Less than 5 days (score 1) $77\cdot8\%$ $57\cdot1\%$ $2\cdot6$ $0\cdot18$ Never (score 0) $1\cdot0$ $1\cdot0$ $1\cdot0$ Missed school because of toothache $16\cdot7\%$ $0\%$ $*$ $0\cdot09$ Never or once (score 0) $16\cdot7\%$ $0\%$ $*$ $0\cdot09$ Average grade in school $1\cdot0$ $1\cdot0$ $1\cdot0$ Low (score 1) $50\cdot0\%$ $28\cdot6\%$ $2\cdot5$ $0\cdot18$ Moderate/high (score 0) $1\cdot0$ $1\cdot0$ $1\cdot0$	Was your last dental appointment painful?				
No pain at all (score 0)1.0Previous experiences of pain1.0More than once (score 1)12.5%Never or once (score 0)1.0My parents only go to the dentist when they have toothache1.0Agree (score 1)47.1%Disagree (score 0)1.0How often do you in an average month miss school or job?1.0Less than 5 days (score 1)77.8%Never (score 0)1.0Missed school because of toothache1.0More than once (score 1)16.7%Never or once (score 0)1.0Missed school because of toothache1.0More than once (score 1)16.7%Never or once (score 0)1.0Average grade in school1.0Low (score 1)50.0%Never 1)1.0Moderate/high (score 0)1.0	Some pain or very painful (score 1)	56.3%	42.9%	1.7	0.42
Previous experiences of pain12.5%23.8%0.50.39More than once (score 1)12.5%23.8%0.50.39Never or once (score 0)1.01.0My parents only go to the dentist when they have toothache47.1%19.0%3.80.07Agree (score 1)47.1%19.0%3.80.07Disagree (score 0)1.01.01.0How often do you in an average month miss school or job?1.01.0Less than 5 days (score 1)77.8%57.1%2.60.18Never (score 0)1.01.01.0Missed school because of toothache16.7%0%*0.09More than once (score 1)16.7%0%*0.09Never age grade in school1.01.01.0Low (score 1)50.0%28.6%2.50.18Moderate/high (score 0)1.01.01.01.0	No pain at all (score 0)			1.0	
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Never or once (score 0)12.0%20.0%0.0%Never or once (score 0)1.0My parents only go to the dentist when they have toothache47.1%19.0%3.80.07Agree (score 1)47.1%19.0%3.80.07Disagree (score 0)1.01.01.0How often do you in an average month miss school or job?1.01.0Less than 5 days (score 1)77.8%57.1%2.60.18Never (score 0)1.01.01.0Missed school because of toothache16.7%0%*0.09More than once (score 1)16.7%0%*0.09Average grade in school101.01.01.0Low (score 1)50.0%28.6%2.50.18Moderate/high (score 0)1.01.01.01.0	More than once (score 1)	12.5%	23.8%	0.5	0.39
My parents only go to the dentist when they have toothache Agree (score 1)47.1%19.0%3.80.07Disagree (score 0)1.01.0How often do you in an average month miss school or job? Less than 5 days (score 1)77.8%57.1%2.60.18Never (score 0)1.01.01.01.0Missed school because of toothache More than once (score 1)16.7%0%*0.09Never or once (score 0)16.7%0%28.6%2.50.18Average grade in school Low (score 1)50.0%28.6%2.50.18Moderate/high (score 0)1.01.01.01.0	Never or once (score 0)	12070	20 0 /0	1.0	0.07
Agree (score 1) $47\cdot1\%$ $19\cdot0\%$ $3\cdot8$ $0\cdot07$ Disagree (score 0) $1\cdot0$ $1\cdot0$ How often do you in an average month miss school or job? $1\cdot0$ Less than 5 days (score 1) $77\cdot8\%$ $57\cdot1\%$ $2\cdot6$ Never (score 0) $1\cdot0$ Missed school because of toothache $1\cdot7\%$ $0\%$ $*$ More than once (score 1) $16\cdot7\%$ $0\%$ $*$ $0\cdot09$ Never age grade in school $100$ $100$ $100$ Low (score 1) $50\cdot0\%$ $28\cdot6\%$ $2\cdot5$ $0\cdot18$ Moderate/high (score 0) $1\cdot0$ $100$ $100$	My parents only go to the dentist when they have toothache				
In the11 the15 the16 theDisagree (score 0)1-0How often do you in an average month miss school or job?Less than 5 days (score 1)77.8%57.1%2.60.18Never (score 0)1-0Missed school because of toothache16.7%0%*0.09More than once (score 1)16.7%0%*0.09Average grade in school100100100Low (score 1)50.0%28.6%2.50.18Moderate/high (score 0)1.01.01.0	Agree (score 1)	47.1%	19.0%	3.8	0.07
How often do you in an average month miss school or job? Less than 5 days (score 1) 77.8% 57.1% 2.6 0.18 Never (score 0) 1.0 Missed school because of toothache More than once (score 1) 16.7% 0% * 0.09 Never or once (score 0) Average grade in school Low (score 1) 50.0% 28.6% 2.5 0.18 Moderate/high (score 0) 1.0	Disagree (score 0)	., .,	19 070	1.0	0 0 /
Less than 5 days (score 1)77.8%57.1%2.60.18Never (score 0)1.0Missed school because of toothache16.7%0%*0.09Never or once (score 1)16.7%0%*0.09Average grade in school28.6%2.50.18Low (score 1)50.0%28.6%2.50.18Moderate/high (score 0)1.01.01.0	How often do you in an average month miss school or job?				
Never (score 0)1.0Missed school because of toothache1.0More than once (score 1)16.7%Never or once (score 0)Average grade in schoolLow (score 1)50.0%Moderate/high (score 0)1.0	Less than 5 days (score 1)	77.8%	57.1%	2.6	0.18
Missed school because of toothache       16.7%       0%       *       0.09         More than once (score 1)       16.7%       0%       *       0.09         Average grade in school       28.6%       2.5       0.18         Low (score 1)       50.0%       28.6%       2.5       0.18         Moderate/high (score 0)       1.0       1.0       1.0	Never (score 0)	11 070	01110	1.0	0 10
More than once (score 1)16.7%0%*0.09Never or once (score 0)Average grade in schoolLow (score 1)50.0%28.6%2.50.18Moderate/high (score 0)	Missed school because of toothache			10	
Never or once (score 0)10 / 10 / 10 / 10 / 10 / 10 / 10 / 10 /	More than once (score 1)	16.7%	0%	*	0.09
Average grade in school Low (score 1)50.0%28.6%2.50.18Moderate/high (score 0)1.0	Never or once (score 0)	10 1 10	0,0		0.07
Low (score 1)         50.0%         28.6%         2.5         0.18           Moderate/high (score 0)         1.0	Average grade in school				
Moderate/high (score 0) 1.0	Low (score 1)	50.0%	28.6%	2.5	0.18
	Moderate/high (score 0)		_ ~ , *	1.0	

\*No odds ratio (lack of variation).

influencing the adolescent's avoidance will not only prove useful in the dental environment, but will also encourage other health care providers and theorists to perceive avoidance as an intergenerational problem and may lead to further investigation in this area.

In order to attempt to control serious dental disease among adolescents in rural Lewis County, it is important to target adolescents who are avoidant. Brief questionnaires focusing on dental history and variables related to cognition identified in this study could be developed as a screening tool to identify these adolescents. Once identified, motivating these adolescents to seek dental care remains the central public health challenge. Motivating people to accept dental and medical services is frequently an exercise in overt persuasion. What appears to be a convincing

Table 2.	Descriptive	statistics	and b	bivariate	relationships	between	independent	variables	(cognition	and	expectation	variables)	and	the
depender	nt variable c	ase/contro	l for	rural ad	olescents in I	Lewis Cou	unty, WA.							

	Cases	Controls	Odds	
Variables	(n = 18)	(n = 22)	Ratio	Р
Cognition variables				
Dental anxiety (DFS)				
High (score 1)	25.0%	5.0%	6.3	0.13
Low/moderate (score 0)			1.0	
Beliefs of the dentist (DBS)				
High (score 1)	41.7%	5.0%	13.6	0.03
Low/moderate (score 0)			1.0	
Denial of dental disease				
High denial (score 1)	27.8%	9.5%	3.7	0.15
Low/moderate (score 0)			1.0	
Planning to go to a dentist				
I have severe problems with my teeth, but I am not				
planning to go to a dentist (score 1)	66.7%	20%	8.0	0.05
I have no or minor problems with my teeth, and I				
plan to go to a dentist soon (score 0)			1.0	
Do you have a best friend?				
Yes (score 1)	76.5%	100%	*	0.03
No (score 0)				
Are you in any club or group or do you play on any				
sports team?				
No (score 1)	70.6%	33.2%	4.8	0.03
Yes (score 0)			1.0	
Social Well-being (WHO scale) (mean score)	15.4	14.1	1.0	0.36
Depression (BDISF) (mean score)	6.2	6.2	1.0	0.98
Expectation variables				
Do you have a dentist to go to if you need one?				
No (score 1)	27.3%	14.8%	2.3	0.31
Yes (score 0)			1.0	

\*No odds ratio (lack of variation).

Table 3. Multiple logistic regression model for assignment to the case group of rural adolescents in Lewis County, WA.

	Odds Ratio	95% CI	Р
Variables			
Negative beliefs of the dentist (DBS)			
High (score 1)	21.2	1.04 - 428.96	0.05
Low/Mod (score 0)			
Last dental visit			
Toothache or emergency (score 1)	15.1	0.99-229.63	0.05
Regular check-up appointment (score 0)			
My parents only go to the dentist when they have toothache			
Agree (score 1)			
Disagree (score 0)	6.3	0.45-88.63	0.17
Perceived dental health			
Fair or poor (score 1)	3.2	0.41 - 24.08	0.27
Excellent, good or very good (score 0)			

n = 18 cases and 22 controls.

line of reasoning to the health professional falls on deaf ears or results in reluctance to change. This is especially true for adolescents who commonly exhibit resistance to authority figures. A straightforward advicegiving approach is of limited value [36]. Moreover, many people have reservations about 'being told what to do' [37]. In fact, direct persuasion, whatever the degree of readiness to change behaviour, may push the person into a defensive position thus heightening their reluctance to change.

Some public health programs are using a new approach. Motivational interviewing (MI) is a type of counselling that does not suffer from the above problems. MI is a client-centred, directive counselling approach. MI counselling provides a developmentally appropriate model for addressing adolescent healthrelated interventions at a point at which healthcompromising behaviours are not yet fixed [38]. MI is especially useful in the early stages of change; that is, when adolescents are considering change [39]. MI provides personalized feedback and may be especially effective in overcoming resistance of adolescent ambivalence. A patient-centred approach that enhances the sense of personal control avoids the usual adolescent response to adult figures [40]. Brief counselling is also considered to be developmentally appropriate for adolescents [39]. While adolescent studies are limited, the MI approach, with its selfregulation theoretical framework, appears promising with regard to dental avoidance in the adolescent. Moreover, such an approach can be combined with a focus on reducing fear and enhancing the adolescent's control in the dental operatory.

Given what we have learned about the rural adolescent with untreated caries, we propose that once identified by a screening questionnaire, these individuals should be contacted and an MI approach be used to explore their perceptions of their dental health and their reasons for not seeking needed dental care. The goal would be to train lay counsellors in the MI approach who could work with these adolescents to explore dental treatment options and motivate specific steps to obtain appropriate care.

## Limitations

This survey had a relatively small sample size, and the results may not generalize to other populations. Nevertheless, by including three waves of screening, an attempt was made to include the more avoidant adolescents, and even if the initial rate was low we ended up with a satisfactory rate (73%). These results represent valuable information about avoidance behaviour in this age group, and will help sample size calculations for future intervention studies. We speculate that many of the children who did not participate were fearful and avoidant, underestimating the rate of avoidance and reducing the sample size. It is not surprising that some fearful children would choose not to present themselves to dental personnel, and for these subjects, some of the potential methods of reducing avoidance (e.g. marketing, incentives) are probably not effective. This is also supported by the strong predictive power found for the cognition variable DBS, in accordance with other studies showing that negative beliefs of the dentist, including aspects of low feeling of control during treatment and distrust, is an important factor related to avoidance of care in this age group [25,41]. Again, this supports our assumption about the MI approach as an appropriate model for addressing adolescent health-related interventions that can be combined with a focus on reducing fear and enhancing the adolescent's feeling of control during treatment.

A less restrictive criteria for inclusion as cases/ controls would have increased the sample size. However, these criteria were identified to assure that the subjects in the case condition not only had active caries, but were likely to be aware of their dental problem. The awareness of active caries without seeking treatment was defined as avoidant. We wanted the controls, who had been seeking treatment, to have the same caries experience as the cases.

The inclusion criteria for entering variables into the multivariate model were intentionally not restrictive [0.2] to avoid excluding important variables with potential utility in a public health interventions, and the results from the multivariate model should be interpreted cautiously. The variables identified have face validity, are mutable, and appear to have utility in a public health environment. The results based on the bivariate analyses are also useful as guidance for future explorative studies and also interventions aimed at bringing adolescents back to regular dental care.

This study shows the importance of comprehensive models of health care utilization in public health planning. It shows the relevance of history and cognition variables in understanding the presence of extensive tooth decay in rural adolescents even when services are available. Intergenerational learning is profoundly related to poor oral health, and the challenge must be to intervene prior to the time when these adolescents become parents.

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**Résumé.** *Objectifs.* Dans cette étude d'adolescents en milieu rural, avec population témoin, nous avons identifié les facteurs pour discriminer ceux qui ont un grand nombre de caries et reçoivent un traitement de ceux qui ont un niveau carieux similaire sans bénéficier de soins.

*Méthodes*. L'échantillon faisait partie des 12-20 ans (N = 439) d'un établissement rural dans l'état de Washington, U.S. Les critères d'inclusion étaient la présence d'au moins 5 dents cariées, manquantes ou obturées. Le questionnaire a inclus les variables *structure, histoire, cognition* et *les attentes* selon le modèle de Grembowski, Andersen et Chen.

*Résultats*. Aucune variable structurelle n'a été reliée à la variable dépendante. Deux des 10 variables *histoire* ont été reliées : perception de la mauvaise qualité de sa santé bucco-dentaire et perception de la mauvaise qualité de la santé bucco-dentaire de la mère. Quatre des 8 variables de cognition ont également été eu valeur prédictive : idées négatives concernant le dentiste, absence d'intention d'aller chez un dentiste même en cas de problème sévère, ne pas appartenir à un club ou jouer dans une équipe de sport et ne pas avoir un meilleur ami. Aucune relation n'a été mise en évidence pour la variable *source habituelle de soins*.

*Conclusions.* Ces données corroborent l'hypothèse selon laquelle l'absence de traitement des caries est associée à l'absence de soin et souligne l'importance des variables *histoire* et *cognition* lors de la mise en place de mesures visant à améliorer la santé buccale des adolescents en milieu rural.

**Zusammenfassung.** *Ziele.* In dieser Fall-Kontroll-Studie wurden Jugendliche aus einer ländlichen Umgebung auf Faktoren hin untersucht, welche geeignet sind, unter den Individuen mit hohem kariologischem Behandlungsbedarf zu unterscheiden zwischen denjenigen, welche eine Behandlung erhielten und solchen, denen keine Behandlung zuteil wurde. *Methoden.* Die Stichprobe wurde unter den 12–20 jährigen (n = 439) in einer ländlichen Highschool im Bundesstaat Washington, U.S.A. Einschlusskriterien waren 5 oder mehr kariöse, fehlende oder gefüllte Zähne. Ein Fragebogen erhob Variablen zu Struktur, Vorgeschichte, Kognitionen und Erwartungen, basierend auf einem Modell von Grembowski, Andersen und Chen.

*Ergebnisse*. Es ergab sich, dass keine der strukturellen Variablen korreliert war zu den abhängigen Variablen. Zwei der untersuchten 10 Variablen aus dem Komplex Vorgeschichte waren korreliert: Die wahrgenommene eigene schlechte Zahngesundheit und wahrgenommene schlechte Zahngesundheit der Mutter. Vier von acht Variablen aus dem Bereich Kognitionen waren ebenso prädiktiv: Negative Beliefs bezüglich des Zahnarztes, das Nichtplanen eines Zahnarztbesuchs selbst bei Vorliegen von schweren Problemen, das Fehlen einer Mitgliedschaft zu einem (wie auch immer gearteten) Verein oder einer Sportmannschaft sowie das Fehlen eines "besten Freundes".

Schlussfolgerungen. Diese Daten sind vereinbar mit der Hypothese, dass Unterversorgung assoziiert st mit Behandlungsvermeidung, sie weisen darauf hin, dass eine Beeinflussung der Mundgesundheit bei Jugendlichen aus einem ländlichen Umfeld deren Vorgeschichte und Kognitionen Rechnung tragen muss.

**Resumen.** *Objectivos*. En este estudio de casoscontrol de adolescentes rurales, identificamos los factores para discriminar aquellos quienes tenían altos niveles de caries dental y recibían tratamiento de aquellos con niveles similares que no recibían tratamiento.

*Métodos.* La muestra estaba formada por todos los chicos entre 12 y 20 años (N = 439) de un instituto rural en el estado de Washington, EEUU. El criterio de inclusión fue 5 o más dientes cariados, perdidos u obturados. El cuestionario incluía las variables estructura, historia, conocimientos y expectativas basadas en un modelo de Grembowski, Andersen and Chen.

*Resultados*. No se relacionó ninguna variable estructural con la variable dependiente. Se relacionaron dos de las 10 variables de historia: Percepción pobre de la propia salud dental y percepción pobre de la salud dental materna. Cuatro de las ocho variables de conocimiento fueron también predictivas: Creencias negativas sobre el dentista, no planificar ir al dentista aun teniendo problemas severos, no formar parte de un club o jugar en un grupo deportivo y no tener un mejor amigo. No se encontró relación para la variable expectativa: Fuente de cuidado usual. asociados con el rechazo a los cuidados y puntualiza la importancia de las variables historia y conocimientos al planificar los esfuerzos para mejorar la salud oral de los adolescentes rurales.

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