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Parental psychosocial factors and childhood caries prevention: Data from an American Indian Population

Judith Albino¹, Tamanna Tiwari², William G. Henderson¹, Jacob F. Thomas³, Patricia A. Braun³, and Terrence S. Batliner¹

¹Center for Native Oral Health Research (CNOHR), University of Colorado Anschutz Medical Campus, Aurora, Colorado

²School of Dental Medicine, University of Colorado Anschutz Medical Campus, Aurora, Colorado

³Adult and Child Consortium of Research and Delivery Science, University of Colorado Anschutz Medical Campus, CO

Abstract

Objectives—The objective of this study was to examine the association among psychological and social variables reported by American Indian parents/caregivers of preschool children and changes in their Oral Health Knowledge and Behaviors related to care of their children's teeth. We also investigated the relationship of these factors with progression of caries, as reflected by changes in their children's dmfs.

Methods—The data used for this study were collected at baseline in a clinical trial of an oral health promotion intervention comprising behavioral and clinical interventions for caries prevention delivered by tribal members on a large Southwestern American Indian reservation. Linear regression analyses were performed for changes (baseline to Year 1) in dmfs, Oral Health Knowledge, and Oral Health Behavior scores, with baseline psychosocial measures, taken individually, as the independent variables.

Results—Parents' attitudes and beliefs were associated with increases in their Oral Health Knowledge and Behavior and also with the progression of caries for their children. When all participants were considered together, increases in children's dmfs were smaller when the caregiver had higher Internal Oral Health Locus of Control ($\beta = -1.33$, $p = 0.004$), higher Health Literacy ($\beta = -1.55$, $p < 0.01$), and higher Financial Stability ($\beta = -4.46$, $p = 0.03$), and lower scores for the Barriers Subscale ($\beta = 1.57$, $p < 0.01$) of the Health Beliefs Model. For parents in the Intervention group, higher scores on Locus of Control, reflecting beliefs that chance, or other people determine their children's oral health, were associated with larger increases in Oral Health Knowledge ($\beta = 1.73$, $p = 0.04$), and Behaviors ($\beta = 4.00$, $p = 0.005$).

Conclusions—Prevention of Early Childhood Caries in American Indian children has proved to be especially challenging. Some of the measures identified in this report may suggest promising

Corresponding author: tamanna.tiwari@ucdenver.edu.
DR TAMANNA TIWARI (Orcid ID : 0000-0001-9334-4440)

Conflict of Interest

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directions to prevention through approaches that build on competencies and skills to be learned and used within a context more broadly focused on parenting and management of health and family challenges.

Keywords

Oral Health Knowledge; Oral Health Behavior; Oral Health Locus of Control; Dental Caries

INTRODUCTION

The prevention of Early Childhood Caries (ECC) in high-risk populations is a critical concern for oral health, and it is increasingly clear that ethnic minority children and children from lower income families suffer from a disproportionate burden of ECC.¹ The formidable nature of these challenges are nowhere more striking than in the work that has been carried out with American Indian population.² The rates and severity of caries among children in some U.S. tribal populations are among the highest that have been reported anywhere in the world.^{3,4} Moreover, in these populations, ECC often seems virtually impervious to interventions that have proven successful when implemented elsewhere.⁵

In this report, we examine data reflecting the effects of previously unreported psychological and social variables collected in the trial described above, which was focused on children of a large Southwestern Tribe who were enrolled in Head Start.⁶ Using a community-based participatory approach, that trial involved extensive efforts to train tribal lay oral health specialists who, in turn, provided oral health education and support for improving children's oral health. They also provided toothbrushes and fluoride toothpaste for families, quarterly fluoride varnish applications in the Head Start Centers, and referrals for dental care, as well as community outreach and education. The fact that this program did not demonstrate significant slowing of the typically rampant progression of caries among 3 to 5-year-old American Indian children suggests that the caries experience may be different in this population. In an earlier report of the main effects of the intervention employed in that trial, we speculated that beginning an intervention at age 3 may be too late, that the disease among these children may already be so advanced at that point as to be beyond the usual prevention strategies. More promisingly, however, we found that, for those parents who actually participated in the educational activities offered, their children's caries increments were lower than for those in the "usual treatment" condition.

The difficulties of achieving parental participation in the intervention were described earlier,⁷ and reflection on that aspect of the work has led to our speculation that there might be parental characteristics that would give us clues about how best to support family efforts to ensure better oral health for their children. In an examination of baseline data on this American Indian population, we found that only 10.7% of the children were caries-free at baseline. This startling fact prompted us to look for differences in characteristics of the parents of caries-free and caries-active children. The resulting report⁸ identified no differences in socio-demographic variables (e.g., no differences in education or income), although parents of children with no caries experience believed oral health to be more important and reported more Oral Health Knowledge and higher adherence to caries-

preventing behaviors. These parents also were more likely to have Internal Oral Health Locus of Control, to perceive their children as less susceptible to caries, and to perceive fewer barriers to prevention; they had higher Sense of Coherence scores and reported lower levels of Personal Distress and community-related stress.⁸ Although the final outcomes data¹ showed that caries prevalence for children in the study had advanced to approach 100% (96.6% in the Intervention group and 98.2% in the control group), we speculated that those same parental characteristics that had seemed to provide some protection in the form of delaying the onset of caries, might also be related to the primary outcome measure of increases in caries, and the secondary outcome measures of Oral Health Behaviors and Knowledge. This report describes the results of our further investigation of an array of psychological and social variables, including those that had previously been associated with caries-free status at baseline, and their association with caries progression over the course of the clinical trial.

METHODS

The data used for this study were gathered in the course of a clinical trial funded by the National Institute of Dental and Craniofacial Research entitled “Preventing Caries in Preschoolers: Testing a Unique Service Delivery Model in American Indian Head Start Programs.” Because detailed descriptions of the trial design and protocol⁹ and outcomes⁶ have been published, only salient features will be described here. The trial was approved by the Navajo Nation Human Research Review Board; governing bodies at the tribal, agency, and local chapter levels; Navajo Departments of Head Start and Education; Head Start parent councils; and the Colorado Multiple Institutional Review Board. The trial is registered on ClinicalTrials.gov (NCT01116739).

The primary purpose of the clinical trial was to test an intervention applied in Navajo Nation Head Start (HS) classrooms to reduce the incidence of ECC. Twenty-six HS classrooms were randomized to the Intervention and 26 to Usual care group. Eligible participants were HS children ages 3–5 years and their primary parent or caregiver, most of whom were the child’s mother (79%). The intervention consisted of up to four fluoride varnish (FV) applications, five child oral health promotion (OHP) events, and four caregiver OHP events delivered over the course of the school year; these were delivered by eight trained tribal community members, called a Community Oral Health Specialists (COHS). The Usual Care group did not receive the FV or OHP events, but both Intervention and Usual Care groups received free toothbrushes and toothpaste at enrollment and all data collection occasions.

Data collection occurred at baseline and after Years 1, 2, and 3 of follow-up. The primary outcome measure was decayed, missing, and filled tooth surfaces (dmfs), measured in examinations conducted by calibrated dental hygienists who were blinded to group assignment.⁹ Secondary outcome measures included validated survey items assessing caregiver Oral Health Knowledge (14 items) and caregiver Oral Health Behaviors on behalf of their children (13 items).¹¹ Overall Knowledge and Behavior scores were calculated as percentages of correct answers (knowledge) or adherence to recommended oral health practices related to the children (behavior).

Caregiver socio-demographic characteristics and oral health psychosocial measures were collected at baseline and annually for three years as using the 190-item Basic Research Factors Questionnaire (BRFQ) that had been designed for use in such clinical trials.¹² Psychosocial measures included Oral Health Locus of Control (OHLOC) measures, constructs from the Health Beliefs Model (HBM), Self-Efficacy, Oral Health Importance, Sense of Coherence (SOC), Distress, Chronic Stress, Perceived Discrimination, Alcohol Use, Social Support, Financial Stability, and Oral Health Literacy (Table 1). Table 1 presents the names of each of the scales and subscales, the number of questions that go into each scale/subscale, a brief description of what each scale/subscale measures, and the range of scores for each scale/subscale. Validation studies have been published for the measures of Sense of Coherence,¹³ Health Literacy,¹⁴ and Oral Health Knowledge and Behavior,¹¹ and are currently underway for the measures of the Health Belief Model and Self-Efficacy.

Statistical Analyses

Statistical analyses were limited to those caregiver-child dyads who completed both baseline and Year 1 data collections because they represented the largest subgroup enrolled in the trial. Other subgroups had follow-up observations at Years 2 and/or 3, but sample sizes were reduced in these later data collections, yielding data sets too small for meaningful analysis of the numerous measures. Data were analyzed for all participants and then separately for those in the Intervention and Usual care groups.

Linear regression analyses were performed for changes (baseline to Year 1) in dmfs, Oral Health Knowledge, and Oral Health Behavior scores as the dependent variables, with each baseline psychosocial measure, taken individually, as the independent variables. Change scores for the dependent variables were calculated. A positive change score indicated an increase (or worsening caries) in dmfs. However, a positive score indicated an improvement in Oral Health Knowledge scores and Oral Health Behavior scores over time. We chose to use change scores as the dependent variable in the regression analyses because we were interested in the associations between the psychosocial variables and changes over time in dmfs, and oral health knowledge and behavior scores, and not the association of these variables and the outcomes at only one point in time¹⁵. All models were also adjusted for baseline child age, gender, and caregiver education and income levels. A p-value of 0.05 was considered to be statistically significant. Analyses were performed using SAS, Version 9.4.

RESULTS

Out of a total of 897 caregiver-child dyads in the study, 474 dyads (52.8%) had baseline and Year 1 observations, thereby constituting the analytic cohort for this paper. We compared sociodemographic characteristics of the included and excluded dyads. The children in the analytic cohort were slightly younger than the children in the excluded dyads (mean age = 3.6 years, sd = 0.5 vs. mean = 3.7 years, sd = 0.5, $p < 0.01$), and included more males (53.2% vs. 46.3%, $p = 0.04$). Caregiver age, household income, employment status, and relationship to the children were not different in the analytic cohort vs. the excluded dyads.

The baseline dmfs of the children and the baseline caregiver scores on Oral Health Knowledge and Behavior were also not different between the included and excluded dyads.

Table 2 presents baseline socio-demographic characteristics of the caregiver-child dyads, as well as baseline reported caregiver Oral Health Knowledge and Behavior scores, and the psychosocial measures. Most of the caregivers enrolled in the study were female; 79% were mothers of the children, with average age of 32.5 years. About half the participants had some college or a college degree (49.1%) and total of 37.4% had completed high school. A total of 32.8% were unemployed, and household income was fairly low, with 44.1% reporting incomes of less than \$10,000 per year. The children had an average age of 3.6; 46.8% were female. The children had very high baseline dmfs (21.0). Scores on dmfs ranged from 0 to 88.

The caregivers had fairly high baseline Oral Health Knowledge (74.8%), but lower reported adherence to recommended Oral Health Behaviors in relation to their children's oral health (51.0% adherence). The caregivers had relatively high mean scores (4.0 on a 5-point scale) for Internal Oral Health Locus of Control (OHLOC-I), perceived seriousness of Oral Health Problems and benefits of Oral Health Practices (subscales of Health Beliefs Model), Self-Efficacy in dealing with oral health issues, perceived Importance of oral health, and general Health Literacy. They also had a moderately high mean score (5.3 on a 7-point scale) for overall Sense of Coherence (SOC), and high mean scores (above 5.0) on the SOC subscales. The caregivers reported lower mean scores (generally < 3 on a 5-point scale, or < 2 on a 4-point scale) for External Oral Health Locus of Control - Others (OHLOC-EO) and External Oral Health Locus of Control- external chance (OHLOC-EC), perceived barriers to Oral Health Practices, Kessler's measure of personal Distress, and perceived discrimination. The baseline mean scores for Community Stressors were above average, particularly for Community Economic Distress. Baseline scores for Alcohol Use were low, and for Social Support and Financial Stability were high, in spite of low household incomes (Table 2).

Mean increase of dmfs from baseline to the end of Year 1 was 4.3 tooth surfaces. The interquartile range was IQR = 0 to 7. Mean increase of Oral Health Knowledge was 3.8 percentage points. The IQR was = -7.14 to 14.3. Mean increase of Oral Health Behavior was 3.9 percentage points. The IQR was = -9.7 to 15.3. The IQR is a measure of variability of the observations, and represents the range of the middle 50% of the observations. We report IQR because it is less affected by extreme outliers in the observations, compared to the simple range.

Table 3 presents the association between baseline caregiver psychosocial measures and changes in the child's dmfs and caregivers' scores on the Oral Health Knowledge and Behavior variables from baseline to Year 1, for all participants (Intervention and Usual care) in the trial. The estimate for each psychosocial measure can be interpreted as the mean change in dmfs per one unit increase in the psychosocial measure. For example, for the OHLOC - internal measure, for each one unit increase in the psychosocial measure, there was a 1.33 surface decrease in the dmfs from baseline to Year 1. The increases in the child's dmfs were smaller when the caregiver had higher OHLOC-I at baseline and higher Health Literacy, and Financial Stability, and lower scores for the Barriers Subscale of the Health

Belief Model. In contrast to this finding, caregivers who had higher scores on OHLOC-EO and OHLOC-EC, and lower scores for Self-Efficacy, experienced larger increases in Oral Health Knowledge scores. Caregivers who had higher baseline scores for the Benefits Subscale of the Health Belief Model had larger increases in their Oral Health Behavior scores.

Table 4 presents the findings for participants in the Intervention group. Mean increases in dmfs scores were smaller when caregivers had higher OHLOC-I at baseline and higher Health Literacy ($p = 0.06$ of borderline significance for Health Literacy) and lower scores for Perceived Barriers HBM subscale. Caregivers who had higher scores on OHLOC-EO and OHLOC-EC, higher scores on the Perceived Barriers HBM subscale, on Alcohol Use, and lower scores for the SOC-Meaningfulness subscale and Health Literacy experienced larger increases in Oral Health Knowledge. Caregivers who had higher scores on OHLOC-EO and OHLOC-EC, the HBM-Benefits subscale, and lower scores for the HBM Seriousness subscale, overall SOC, and Social Support experienced larger increases in their Oral Health Behavior score.

The increases in the child's dmfs were smaller if their caregivers' scores were lower for Alcohol Use and higher for the SOC-Meaningfulness and for Financial Stability (Table 5). Caregivers who had higher scores for OHLOC-I, OHLOC-EC, SOC, Health Literacy, and lower scores for Self-Efficacy experienced larger increases in Oral Health Knowledge. There were no statistically significant relationships between any of the baseline psychosocial measures and changes in the Oral Health Behavior score.

DISCUSSION

The findings presented here provide indications of how parents' beliefs, attitudes or perceptions, and social circumstances can affect the progression of dental caries in their children, as well as effect improvements in their own Oral Health Knowledge and Behaviors, variables that, in turn, appear to influence their children's oral health. In interpreting the results of the relationships that we have seen, it is important to keep in mind the context of very poor oral health across the entire tribal population. The fact that virtually all of the children in our study experienced caries at very young ages and that their parents had the same experiences as children, may create an attitude of fatalism, or a sense of the inevitability of poor oral health. If that is the case, it stands to reason that it requires something unusual in the way of parental understanding, beliefs, or behaviors to make a difference in these patterns.

When participants in the Intervention and Usual care groups were considered together, children had smaller increases in dmfs over the course of the program when their parents had a greater sense of control over their children's oral health outcomes, as evidenced by their higher scores on Internal OHLOC. Greater increases in Oral Health Knowledge, on the other hand, were associated with External OHLOC in parents; that is, when parents perceived their children's oral health to be a matter of chance, or something that professionals (but not they, as parents) could control, then their knowledge about the topic seemed to increase. Although we might hope that this would mean they were trusting and

assimilating the knowledge that they were receiving from the Community Oral Health Specialists or from the community oral health messages that were a part of the program, we did not see similar relationships with Oral Health Behaviors, which apparently were not impacted by perceptions of control. Perceptions of fewer Barriers to Prevention (a subscale of the HBM) were associated with smaller increases in dmfs, and perceptions of greater benefits in preventive action with increases in positive Oral Health Behaviors. In addition, both Financial Stability and Health Literacy seemed to be related to lower increases in caries. Both knowing about oral health and having a sense of control that presumably would come with a sense of Financial Stability seem consistent with the ability to make a difference in children's oral health. Finally, higher Self-Efficacy was related to improvements in Oral Health Knowledge, but not to better dmfs patterns or improved Oral Health Behaviors. The more people understand about caries development, the more likely they are to feel that they can do something about it. Improvements in knowledge may be the first step to improvements in behavior, and from that perspective this relationship fits with a model that describes parents as needing information on which to act before actions can make a difference. Because parents in the Usual care group were exposed to increased community messaging about oral health, but did not have access to instructional activities of the Intervention, any effect on behavior may have been diluted in the analyses of all study participants. Lending support to this perspective, the separate group analyses described below demonstrate this stronger relationship between External OHLOC and Knowledge for the Usual care group, but a relationship between External OHLOC and Behavior only for the Intervention group.

Continuing to look separately at the findings in the Intervention group and in the Usual care group, it needs to be noted that sample sizes were markedly reduced for these analyses, and this may account for some results that do not seem to support the picture that emerges when the larger group of all participants are considered. These groups were different, however, in that results for the Intervention group must be considered in terms of their exposure to information and activities that were intended to change Oral Health Knowledge and Behaviors, as well as the progression of disease. With that in mind, it makes sense that lower increases in caries were associated with higher OHLOC-I in the Intervention group, but not in the Usual care group, and that higher OHLOC-O and OHLOC-C scores were associated with increases in both Oral Health Knowledge and Behaviors. Those who had not thought of themselves as having control over oral health issues may have had more room for growth in the area of Oral Health Knowledge when they were exposed to the program. Similarly, parents in the Intervention Group showed a relationship between lower Oral Health Literacy and greater growth in Oral Health Knowledge. Although there was a significant relationship between increases in Oral Health Knowledge and OHLOC-O in the Usual care group, we reiterate that "Usual care" involved general exposure to increased community oral health education activities, and so there were opportunities for those individuals also to experience an increase in Oral Health Knowledge.

The Intervention and Usual care groups differed in several other respects as well. The children of parents in the Intervention Group who perceived fewer Barriers to Prevention also tended to have lower increases in caries. Increases in parental Oral Health Knowledge also were associated with lower increases in caries, and the more seriously parents viewed

the problem of caries, the lower were their increases in caries scores. These relationships were not seen in the Usual care group, suggesting that these may, indeed, have been effects that were manifested in response to exposure to a solution, in the form of the prevention program. Several relationships with increases in Oral Health Knowledge (lower Meaningfulness SOC, and Health Literacy), suggested that parents with these characteristics were more able to learn about oral health from the prevention program. Perhaps the most striking pattern in the Usual care group, striking because of the contrast with the Intervention group, was that none of the parent characteristics were related to changes in Oral Health Behaviors. Moreover, only SOC Meaningfulness and Financial Stability were positively related to smaller increases in caries, while increased use of alcohol was related to higher increases in caries. These results suggest that when parents are able to view their children's oral health as part of a meaningfully organized life, and when Financial Stability is great enough to support their efforts, they are able to ensure their children's oral health to a greater degree. With respect to the strong negative association of children's oral health (lower caries) with Alcohol Use, we do not have enough information to adequately interpret these results and can only suggest the possibility that this measure may reflect the absence of more supportive environmental factors manifested, for example, as diminished quality of parenting as an effect of Alcohol Use

The differential patterns of parent variables and their relationships to study outcomes for their children underscore the importance of understanding not just what parents know, but also how their individual psychosocial characteristics may interact with opportunities to support their children's oral health. Because of the different patterns we saw for the Intervention and Usual care groups, we also looked at the relationship between Knowledge and Behavior scores and dmfs changes. Parental strengths in terms of Oral Health Knowledge and Behavior made a more important difference for children's oral health (dmfs scores) when parents were exposed to an intervention program. In spite of the fact that the program did not significantly moderate caries increases overall, these results suggest that we may be able to identify those who are most likely to benefit from the program and, moreover, that we may be able to tailor programs to focus on developing some of the skills and perspectives that may increase response to preventive interventions.

Developing effective approaches to prevention of childhood caries in American Indian children represents one of the most challenging scenarios uncovered by recent investigations into oral health disparities. American Indian children appear to develop caries earlier than the general population, and the disease progresses at an alarming rate. Even at the age of three, the application of four fluoride varnishes a year does little to ameliorate this situation.⁶ While the key may lie in tapping the significant strengths of parents who are motivated to help their children avoid the experiences that they have known personally, problems related to high poverty levels, barriers to accessing dental care, and lack of a variety of environmental supports has appeared to render the best of efforts only minimally effective.

Still more careful study will be required to determine how the psychosocial factors that manifested as supportive in our work can be tapped to design still more successful efforts. Those characteristics in parents that proved most powerful with respect to improving their children's oral health reflected competencies and perspectives that we would also expect to

support healthy and productive lives more generally. Looking carefully at these data, we are inclined to speculate that the strengths reflected in measures of Locus of Control, aspects of the Health Beliefs Model and Sense of Coherence, might be stimulated to an even greater degree in a context of broader parenting and health and family challenges. Whatever clinical preventive strategies are offered, behavioral factors will remain essential to ensuring their optimal use. Recent work increasingly points us in the direction of developing approaches that will draw on and further develop human psychosocial strengths that support parents in achieving optimal oral health, as well as more general health and well-being for their children. This may be the only answer for overcoming the upstream variables that have seemed to dampen the response to prevention programs for many underserved groups. For American Indians, these approaches will need to be developed within the context of the tribal environment and its values related to health, family, and community support.

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Table 1**Caregiver Oral Health Knowledge, Behavior, and Psychosocial Measures**

<u>Measure*</u>	<u>Description</u>	<u>Range of Scores</u>
Oral Health Locus of Control (3 Subscales) Internal LOC (3) External LOC Powerful Others (3) External LOC Chance (3)	A person's attitudes about who or what has control over their child's oral health (parent themselves, other people, or chance)	1–5, 1=strongly disagree, 5=strongly agree
Health Belief Model (4 Subscales) Perceived Susceptibility (3) Perceived Seriousness (3) Perceived Barriers (5) Perceived Benefits (5)	One of the major models intended to explain health behavior. The model predicts that behavior is a function of the subscales—how susceptible is the child to caries, how serious is caries, barriers to following recommended practices, and benefits to following these practices	1–5, 1=strongly disagree, 5=strongly agree
Self-Efficacy (14)	Measures a person's confidence that she/he can successfully engage in specific oral health behaviors.	1–5, 1=not at all sure, 5=extremely sure
Importance (14)	Measures how important it is to participants that they engage in specific oral health behaviors (same behaviors as measured in self-efficacy).	1–5, 1= not at all important, 5=extremely important
Sense of Coherence (3 Subscales and Overall Score) Comprehensibility (5) Meaningfulness (4) Manageability (4) Overall Score (13)	SOC is a construct intended to assess the degree to which participants feel the world makes sense and has meaning.	1–7, higher numbers indicate stronger sense of coherence
Distress (6)	Measures the amount of distress participants have experienced in the last 30 days.	1–5, 1=none of the time, 5=all of the time
Chronic Stress (5 Subscales) Expectations (3) Location Hassles (5) Community Family Dysfunction (2) Community Risky Behaviors (5) Community Economic Distress (2)	Captures ongoing stress related to personal expectations, hassles associated with the local community, and community dysfunction.	1–4, 1=strongly disagree, 4=strongly agree
Perceived Discrimination (9)	Measures the amount of discrimination participants feel they are subject to on account of being American Indian.	1–4, 1=never, 4=often
Alcohol Use (3)	Measure is called the AUDIT-C. Provides an indication of the degree to which a participant drinks excessively.	0–12, large numbers represent greater alcohol use
Social Support (4)	Measure indicates the degree to which participants believe that they have others available to help them when needed.	0–1, 0=no available support, 1=support available for 4 types of social support
Financial Stability (4)	Measure of the degree to which participants feel that they have adequate access to the basic things people need, such as food and clothing.	0–1, 0=financially unstable, 1=financially stable for 4 items
Health Literacy (3)	Measure of the degree to which participant is confident in processing medical information	1–5, higher score represents more confidence
Oral Health Knowledge (14)	Overall knowledge score is the percentage of oral health knowledge items related to the child's oral health answered correctly.	0–100%
Oral Health Behavior (9)	Percentage of oral health behaviors related to the child's oral health that are adhered to by the caregiver.	0–100%

* The numbers in parentheses are the number of items in each measure. Scores for the subscales or overall measures are computed as the average score across all items in the subscale or overall measure.

Table 2

Descriptive Characteristics of the sample (n = 474)

<u>Parent Characteristics</u>	<u>Mean ± SD or %</u>
Age	32.5 ± 9.7
Gender	
Female	85.0%
Male	15.0%
Highest Grade Completed	
< High School	13.5%
High School Grad/GED	37.4%
Some College/Vocational	36.2%
College Degree or More	12.9%
Household Income	
<\$10K	51.1%
\$10K – <\$20K	22.5%
\$20K – <\$30K	9.3%
\$30K – <\$40K	6.8%
\$40K	10.3%
Employment Status	
Employed Full or Part Time	29.6%
Full or Part Time Student	10.4%
Homemaker	24.4%
Unemployed	32.8%
Other	2.8%
Relationship to Child	
Mother	78.7%
Father	14.3%
Grandmother	5.1%
Other	1.9%
Child Characteristics	
Age	3.6 ± 0.5
Gender	
Female	46.8%
Male	53.2%
Decayed, Missing, or Filled Tooth Surfaces (dmfs)	21.0 ± 19.6
Caregiver Knowledge, Behavior, and Psychosocial Measures	Mean ± SD
LOC—Internal	4.0 ± 1.0
LOC—Other	2.2 ± 1.0
LOC—Chance	2.4 ± 1.1
HBM—Perceived Susceptibility	3.4 ± 0.9
HBM—Perceived Seriousness	4.3 ± 0.8
HBM—Perceived Barriers	2.2 ± 0.7

<u>Parent Characteristics</u>	<u>Mean $\pm$ SD or %</u>
HBM—Perceived Benefits	4.2 $\pm$ 0.8
Self-Efficacy	4.4 $\pm$ 0.6
Importance	4.7 $\pm$ 0.4
SOC Overall	5.3 $\pm$ 1.1
Distress	1.6 $\pm$ 0.7
Chronic Stress—Expectations	2.3 $\pm$ 0.9
Chronic Stress—Location Hassles	2.0 $\pm$ 0.7
Chronic Stress—Community Family Dysfunction	2.5 $\pm$ 1.1
Chronic Stress—Community Risky Behavior	2.3 $\pm$ 1.1
Chronic Stress—Community Economic Distress	3.1 $\pm$ 1.0
Perceived Discrimination	1.8 $\pm$ 0.6
Alcohol Use	0.7 $\pm$ 1.6
Social Support	0.8 $\pm$ 0.3
Financial Stability	0.9 $\pm$ 0.2
Health Literacy	4.0 $\pm$ 0.8
Oral Health Knowledge	74.8 $\pm$ 13.2
Oral Health Behavior	51.0 $\pm$ 21.7

LOC—Locus of Control; HBM—Health Belief Model; SOC—Sense of Coherence; SD—Standard Deviation

Association Between Caregiver Baseline Oral Health Attitudinal Measures and One- Year Changes in Child dmfs, and Caregiver Oral Health Knowledge, and Oral Health Behaviors in All Participants (n = 405–430) *

Attitudinal Measure	Change in dmfs			Change in OHK			Change in OHB		
	Estimate	SE	p-value	Estimate	SE	p-value	Estimate	SE	p-value
LOC—Internal	-1.33	0.46	0.004	0.89	0.68	0.19	-0.38	0.97	0.69
LOC—Other	-0.07	0.46	0.87	1.81	0.65	0.01	1.39	0.93	0.14
LOC—Chance	-0.44	0.44	0.32	1.96	0.62	0.002	1.19	0.89	0.18
HBM—Susceptibility	0.39	0.54	0.47	0.63	0.77	0.42	0.75	1.11	0.50
HBM—Seriousness	-0.48	0.58	0.41	-0.03	0.83	0.97	-1.54	1.18	0.19
HBM—Barriers	1.57	0.64	0.01	1.52	0.94	0.11	-0.14	1.34	0.91
HBM—Benefits	-0.08	0.57	0.88	0.62	0.82	0.45	2.91	1.16	0.01
Self-Efficacy	-0.70	0.85	0.42	-3.25	1.23	0.01	-0.99	1.77	0.58
Importance	-0.63	1.09	0.57	-1.42	1.52	0.35	2.33	2.18	0.28
SOC Overall	0.01	0.43	0.98	0.46	0.64	0.47	-1.51	0.90	0.09
Distress	0.18	0.70	0.80	-0.40	1.00	0.69	1.39	1.42	0.33
Chronic Stress—Expectations	-0.29	0.52	0.58	0.36	0.76	0.64	1.87	1.07	0.08
Chronic Stress—Location Hassles	0.58	0.70	0.40	-0.37	0.99	0.71	2.12	1.39	0.13
Chronic Stress—Community Family Dysfunction	0.00	0.41	1.00	-0.96	0.59	0.11	-0.55	0.84	0.52
Chronic Stress—Community Risky Behavior	-0.09	0.44	0.84	-0.50	0.64	0.44	-1.39	0.91	0.13
Chronic Stress—Community Economic Distress	-0.13	0.47	0.78	-0.23	0.68	0.74	-0.26	0.96	0.78
Perceived Discrimination	0.86	0.74	0.25	1.06	1.07	0.32	1.91	1.50	0.20
Alcohol Use	0.45	0.29	0.12	0.83	0.44	0.06	0.03	0.63	0.96
Social Support	0.30	1.40	0.83	1.44	2.02	0.48	-2.71	2.86	0.34
Financial Stability	-4.46	1.99	0.03	-0.23	2.91	0.94	-2.83	4.16	0.50
Health Literacy	-1.55	0.63	0.01	-0.62	0.93	0.50	0.17	1.33	0.90

OHK – oral health knowledge; OHB - Oral health behavior; LOC—Locus of Control; HBM—Health Belief Model; SOC—Sense of Coherence; SE—Standard Error

* Linear regression results were adjusted for caregiver age, gender, education, and income

Association Between Caregiver Baseline Oral Health Attitudinal Measures and One- Year Changes in Child dmfs, and Caregiver Oral Health Knowledge, and Oral Health Behavior in Intervention Participants (n = 189–207) *

Attitudinal Measure	Change in dmfs			Change in OHK			Change in OHB		
	Estimate	SE	p-value	Estimate	SE	p-value	Estimate	SE	p-value
LOC—Internal	-2.12	0.71	0.003	-0.41	0.90	0.65	-0.71	1.51	0.64
LOC—Other	-0.16	0.75	0.83	2.87	0.88	0.001	4.52	1.49	0.003
LOC—Chance	-0.69	0.70	0.33	1.73	0.84	0.04	4.00	1.41	0.005
HBM—Susceptibility	-0.07	0.80	0.93	1.07	0.98	0.28	1.18	1.66	0.48
HBM—Seriousness	-0.74	0.94	0.43	-0.43	1.14	0.71	-3.68	1.90	0.05
HBM—Barriers	2.64	0.96	0.01	3.00	1.18	0.01	0.57	2.03	0.78
HBM—Benefits	0.17	0.93	0.86	0.55	1.14	0.63	3.73	1.92	0.05
Self-Efficacy	-1.46	1.27	0.25	-1.98	1.52	0.19	0.68	2.58	0.79
Importance	-1.21	1.63	0.46	-3.59	1.88	0.06	0.87	3.21	0.79
SOC Overall	0.21	0.71	0.77	-1.41	0.88	0.11	-3.62	1.43	0.01
Distress	0.52	1.07	0.63	1.65	1.26	0.19	1.28	2.09	0.54
Chronic Stress—Expectations	-0.53	0.85	0.54	1.49	1.04	0.16	2.78	1.71	0.11
Chronic Stress—Location Hassles	1.59	1.12	0.16	-0.71	1.34	0.60	3.49	2.22	0.12
Chronic Stress—Community Family Dysfunction	0.66	0.64	0.30	-0.33	0.80	0.68	-0.20	1.33	0.88
Chronic Stress—Community Risky Behavior	0.31	0.67	0.64	-0.21	0.85	0.80	-0.99	1.43	0.49
Chronic Stress—Community Economic Distress	0.29	0.72	0.69	0.28	0.88	0.75	-0.42	1.45	0.77
Perceived Discrimination	1.31	1.19	0.27	1.94	1.43	0.18	3.47	2.36	0.14
Alcohol Use	-0.22	0.55	0.69	2.00	0.72	0.01	0.64	1.23	0.60
Social Support	0.93	2.32	0.69	-1.31	2.82	0.64	-10.34	4.62	0.03
Financial Stability	-2.34	3.62	0.52	-5.06	4.43	0.25	-12.74	7.48	0.09
Health Literacy	-1.90	1.02	0.06	-3.85	1.21	0.002	-2.30	2.10	0.27

OHK – oral health knowledge; OHB - Oral health behavior; LOC—Locus of Control; HBM—Health Belief Model; SOC—Sense of Coherence; SE—Standard Error

* Linear regression results were adjusted for caregiver age, gender, education, and income

Association Between Caregiver Baseline Oral Health Attitudinal Measures and One- Year Changes in Child dmfs, and Caregiver Oral Health Knowledge, and Oral Health Behavior in Usual Care Participants (n =215–223) *

Table 5

Attitudinal Measure	Change in dmfs			Change in OHK			Change in OHB		
	Estimate	SE	p-value	Estimate	SE	p-value	Estimate	SE	p-value
LOC—Internal	-0.37	0.61	0.55	2.43	1.02	0.02	0.07	1.25	0.96
LOC—Other	-0.01	0.57	0.99	0.74	0.95	0.44	-1.24	1.15	0.28
LOC—Chance	0.05	0.56	0.93	1.82	0.91	0.05	-1.19	1.11	0.28
HBM—Susceptibility	0.59	0.75	0.43	0.54	1.22	0.66	0.68	1.48	0.65
HBM—Seriousness	-0.17	0.71	0.81	0.22	1.21	0.86	0.64	1.46	0.66
HBM—Barriers	0.05	0.88	0.96	0.11	1.49	0.94	-1.39	1.79	0.44
HBN—Benefits	-0.18	0.69	0.79	1.31	1.17	0.26	2.23	1.41	0.11
Self-Efficacy	0.25	1.15	0.83	-4.30	1.99	0.03	-2.93	2.42	0.23
Importance	0.25	1.48	0.87	2.66	2.49	0.29	5.44	2.99	0.07
SOC Overall	-0.46	0.54	0.39	1.89	0.92	0.04	0.83	1.12	0.46
Distress	0.21	0.93	0.82	-2.98	1.55	0.06	1.54	1.89	0.42
Chronic Stress—Expectations	0.13	0.66	0.84	-0.25	1.12	0.82	0.77	1.34	0.57
Chronic Stress—Local Hassles	-0.02	0.90	0.98	-0.33	1.45	0.82	1.04	1.75	0.55
Chronic Stress—Community Family Dysfunction	-0.67	0.53	0.21	-1.03	0.89	0.25	-0.71	1.06	0.51
Chronic Stress—Community Risky Behavior	-0.38	0.59	0.52	-0.98	0.98	0.32	-2.05	1.17	0.08
Chronic Stress—Community Economic Distress	-0.51	0.65	0.43	-0.64	1.09	0.56	-0.80	1.32	0.54
Perceived Discrimination	0.79	0.97	0.42	-0.73	1.63	0.65	-0.47	1.95	0.81
Alcohol Use	0.82	0.34	0.02	0.36	0.58	0.54	-0.12	0.69	0.86
Social Support	-0.27	1.76	0.88	3.89	2.94	0.19	4.59	3.56	0.20
Financial Stability	-6.48	2.31	0.01	2.87	4.00	0.47	0.41	4.84	0.93
Health Literacy	-1.06	0.80	0.19	2.79	1.40	0.05	2.92	1.69	0.09

OHK – oral health knowledge; OHB - Oral health behavior; LOC—Locus of Control; HBM—Health Belief Model; SOC—Sense of Coherence; SE—Standard Error

* Linear regression results were adjusted for caregiver age, gender, education, and income