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Health Literacy and Parental Oral Health Knowledge, Beliefs, Behavior, and Status among Parents of American Indian Newborns

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Abstract

Objective: To examine the relationship between health literacy (HL) and parental oral health knowledge, beliefs, behavior, and self-reported oral health status (OHS) among parents of American Indian (AI) children.

Methods: This analysis used baseline data from a randomized controlled trial that tested an oral health intervention with parents of AI newborns. Participants were recruited in parent-child dyads (N=579). Parents completed items assessing sociodemographic characteristics, HL, and parental oral health knowledge, beliefs, behavior, and self-reported OHS. We examined the correlation of HL with each oral health construct, controlling for parent age and income.

Results: On average, parents felt quite confident in their HL skills, performed well on questions assessing parental oral health knowledge, and endorsed beliefs likely to encourage positive parental oral health behaviors (e.g., confidence that one can successfully engage in such behaviors). Parents with more limited HL had significantly less knowledge, perceived cavities to

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Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflicts of interest.

Ethical approval: All procedures performed were in accordance with the ethical standards of the relevant institutional and tribal research review boards and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

Informed Consent: As part of the original study that was the source of the data for this secondary analysis, informed consent was obtained from all adult participants included in the study.

be less severe, perceived more barriers and fewer benefits to recommended oral health behaviors, were less confident they could engage in these behaviors, and were more likely to believe their children's oral health was under the control of the dentist or a matter of chance (*Ps*<0.001). Limited HL was not associated with behavior (*P*>0.05) but was linked to worse self-reported OHS (*P*=0.040).

Conclusions: HL was associated with parental oral health knowledge, beliefs, and self-reported OHS. Oral health education interventions targeting AI families should facilitate development of knowledge and positive oral health beliefs among parents with more limited HL skills.

Keywords

Health literacy; American Indians; dental caries; health behavior; pediatric

Introduction

Early Childhood Caries (ECC) is dental decay in children <72 months of age [1]. It is the most common chronic disease among children in the USA [2]. American Indian and Alaska Native (AI/AN) children develop ECC at a higher rate than other children [3–7]. Seventy-one percent of AI/AN children age 3–5 have ECC, a rate nearly three times that of 3–5 year old non-Hispanic White children nationally [7]. Compared to their counterparts in the general population, Native children also have decay that is more severe and more likely to go untreated [3, 5–7].

To reduce the chances that children will develop ECC, parents must engage in recommended parental oral health behaviors, such as brushing children's teeth with fluoride toothpaste, taking children to the dentist for preventive care, and limiting sugar consumption [8, 9]. Active parental management may be especially crucial in AI/AN communities, where dental services are limited [3, 6]. Although the US government has a trust responsibility that includes provision of health care services to members of federally recognized tribes, care provided through the Indian Health Service (IHS) is limited as a result of funding and staffing shortages. Despite vast oral health needs [4–6], expenditures on oral health in Fiscal Year 2011 were $99 per capita for IHS versus $272 nationally [6]. In 2010, 15–20% of IHS dentist positions were unfilled, resulting in a poor dentist-to-patient ratio in Native communities (1:2,800 vs. 1:1,500 nationally) [6]. These data provide a valuable glimpse into the limitations of the dental care system available to Native families in 2011, when enrollment and baseline data collection began for the clinical trial that is the source of the data used in this secondary analysis.

Given high rates of ECC and limited access to dental care, parents play a crucial role in promoting the oral health of Native children. Yet, limitations in health literacy (HL) may compromise the ability of some parents to manage their children's oral health. HL is defined as "the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" [10]. It comprises specific skills, including the ability to read and write, understand and use numbers, and participate effectively in verbal exchanges related to health [11]. Limited educational and economic opportunities in many Native communities [12] increase the risk for poor HL skills [13]. Indeed, 48% of AI/AN

adults are estimated to experience significant HL limitations [13]. Although there is a separate definition of oral HL, we use the general definition here, as the HL measure used in the reported analysis assesses the capacity to understand and use general health information, not oral health information, specifically.

HL is associated with oral health. Adults with limited HL have lower levels of oral health knowledge [14–26], have less confidence they can engage in recommended oral health behaviors (i.e., self-efficacy) [27–29], engage in suboptimal oral health behaviors (e.g., limited use of preventive care) [21, 30, 17, 19, 31–33, 20, 34, 18, 35–38], and experience negative oral health outcomes [39, 40, 33, 41, 17, 42, 43, 29, 15, 21, 20, 44, 31, 45–48].

Although there is evidence that the HL skills of parents are linked to children's health outcomes [49–53], few studies have examined the relationship of parental HL with pediatric oral health. Available data suggest that low-literate parents have poor parental oral health knowledge [19, 54, 55], lack confidence in their ability to manage their children's oral health [54], hold oral health beliefs that are not conducive to healthy behavior (e.g., heightened perceptions of barriers to recommended oral health practices) [54], are less adherent to recommended behaviors [54, 19, 55], and have children with poor oral health outcomes [54, 56, 16, 19, 57–59]. Data on Native populations, which are at high risk for HL limitations and poor oral health, are scarce [54].

The objective of this analysis was to clarify whether limitations in parental HL may put Native children at risk for poor oral health outcomes. Using baseline data from a randomized controlled trial aimed at reducing ECC among AI children [60, 61], we assessed the relationship of HL with parental oral health knowledge, beliefs, behavior, and self-reported oral health status (OHS). This analysis provides a broad assessment of the association of parental HL with constructs likely to influence pediatric oral health and represents the first step in a comprehensive research program designed to clarify the mechanisms through which parental HL may influence children's oral health over time.

Methods

Participants and Procedures.

Secondary analyses were conducted using baseline data from the randomized controlled trial entitled "Promoting Behavioral Change for Oral Health in American Indian Mothers and Children" (PBC). As previously reported [60, 61], the PBC study was designed to test an oral health intervention using motivational interviewing (MI) to reduce ECC among Native children age 0–3 living on or near a specific reservation in the Northern Plains. One of the largest reservations in the USA, the reservation on which the PBC study was conducted is home to ≈32,000 people, most of whom are members of a single Northern Plains tribe [62]. Recent assessments of pediatric oral health on reservations in the Northern Plains show substantial oral health problems among children. In one study, 84% of children had caries, with 40% having a moderate or urgent need for dental care [63]. Two reports of oral health among 3-year-old Native children from the Northern Plains reported that 55–80% of children had caries, having, on average, 10 tooth surfaces that were decayed, missing, or filled [60, 64].

For the PBC study, parent-child dyads were recruited at the IHS hospital on the reservation, through social service agencies in a city just off the reservation, and at community events (e.g., powwows) [60, 61]. Children were eligible if they were AI, lived on or near the reservation, were 0–3 months of age, and were without medical conditions affecting development of the primary teeth. The participating adult – referred to as the "parent" throughout – was required to be the child's mother or primary caregiver, 15–65 years of age, able to understand and sign the consent form, and willing and able to follow the study protocol.

Between July 2011 and March 2014, 579 parent-child dyads were enrolled. As previously reported [60, 61], dyads were randomly assigned to one of two treatment arms: (1) MI intervention plus enhanced community services (n=290) or (2) enhanced community services alone (n=289). MI is a behavioral method that focuses on identifying and resolving barriers to behavior change [65, 66]. Enhanced community services included dissemination of public service announcements throughout the reservation via billboards and tribal radio. Culturally appropriate educational brochures that highlighted behavioral risk factors for ECC were developed with extensive community input and distributed at local events (e.g., powwows). On six occasions, participating parents received toothpaste and toothbrushes for all family members.

Approval for this secondary analysis as well as the original PBC study was obtained from the research review board of the participating tribe and the Colorado Multiple Institutional Review Board of the University of Colorado Anschutz Medical Campus. Parents provided written informed consent and Health Insurance Portability and Accountability Act authorization prior to study participation. For parents under 18 years of age, consent also was obtained from their parents/legal guardians. All research activities were conducted in accordance with accepted ethical standards governing human subjects research.

Measures.

At baseline and annually for three years, parents completed the Basic Research Factors Questionnaire (BRFQ) [67]. The BRFQ included questions assessing HL; parental oral health knowledge, beliefs, and behavior; and self-reported oral health status of the parent. The survey also collected sociodemographic information for parents (e.g., age, sex, race, tribal affiliation, ethnicity, highest grade completed, household income for prior year, employment status) and children (e.g., age, sex, race, ethnicity). The survey was administered via computer. Questions and response options were presented on the screen and were accompanied by audio narration, which was recorded by a member of the tribe.

HL was measured as the mean of three items assessing confidence in reading or completing medical forms ("How often do you have a hard time understanding written information about your health that you get from your clinic? [This might include information from a doctor or nurse.];" "How confident are you in filling out medical forms by yourself?;" "How often do you prefer that someone [like a family member or someone else] help you read medical materials?"). These questions were adapted from items shown to accurately identify patients with inadequate HL [68–73], have been validated in AI/ANs [74], and are

associated with health-related knowledge, behavior, and outcomes in Native people [74, 75, 54, 76]. The HL score ranged from 1–5, with larger numbers representing stronger HL skills.

Parental oral health knowledge was assessed using 17 items examining knowledge of pediatric oral health and recommended parental oral health behaviors (e.g., “Cavities are caused by germs in the mouth”). Responses were coded as correct or incorrect. The knowledge score was computed as the percentage of questions answered correctly. The knowledge items have been validated in Native people and are associated with oral health beliefs and behavior [77, 78].

The BRFQ contained items assessing several constructs related to parents’ beliefs about pediatric oral health and recommended parental oral health behaviors, including five constructs from the extended Health Belief Model (HBM) [79, 80] and three measures of locus of control (LOC) [81]. According to the HBM [79, 80], parents are more likely to engage in recommended parental oral health behaviors if they believe their children are *susceptible* to caries, that caries is a *severe* outcome, that there are few *barriers* and many *benefits* to recommended parental oral health behaviors, and that they are capable of engaging in these behaviors (i.e., *self-efficacy*). Three items each measured perceived susceptibility and severity; five items each measured perceived benefits and perceived barriers. Although three items measured perceived susceptibility, one item was poorly correlated with the others (rs=0.035 and 0.054) and was excluded from the susceptibility score. The average of the items associated with each construct was computed. The overall scores used a 1–5 scale, with larger numbers reflecting a greater level of the construct. The HBM items have been validated and are significantly associated with parental oral health knowledge, behavior, and outcomes in Native people [77, 78].

Fourteen items measured self-efficacy. Because a large percentage of participants selected the highest score for many items (i.e., 5 on the 1–5 scale), we did not compute the overall self-efficacy score as the mean of these ratings. Instead, we dichotomized each item (i.e., rating was 1–4 vs. 5) and computed the number of items for which the response was 5. As the distribution of this score was less skewed than the mean, we used the sum of the 14 dichotomized items as the overall self-efficacy score, which had a possible range from 0–14.

Social learning theory suggests that individuals have expectations about the source of control over specific outcomes and that these expectations influence behavior [81]. For instance, parents may believe they have control over their children’s oral health or that control rests with outside forces, such as the dentist or sheer luck. Parents who feel greater control over their children’s oral health are likely to engage in behaviors that lead to better pediatric outcomes [82]. Oral health LOC was assessed using nine items adapted from existing measures [83, 84] and reflected the extent to which parents agreed with statements indicating that they themselves were in control of their children’s oral health (internal LOC), the dentist was in control (powerful others LOC), or their children’s oral health was a matter of chance (chance LOC). Parents responded to items on a scale of 1–5, with larger numbers indicating greater endorsement. For each type of LOC, the average of the three items assessing that domain was computed. The LOC measures have been shown to be associated with parental oral health knowledge among Native parents [78].

Although the BRFQ contained 13 items related to parental oral health behavior, we limited the behavior score to the six items appropriate for parents of newborn babies. We excluded items targeting behaviors unlikely to be relevant to parents of newborns (e.g., "How often does your child eat sweet or sugary foods [for example, candy, cookies, donuts, ice cream]?"). For each item, responses were coded as adherent or non-adherent with the recommended behavior [8, 9]. The behavioral adherence score was computed as the percentage of behaviors for which a parent was adherent. The full set of BRFQ behavior items has been validated in Native people, showing an association with parental oral health knowledge, beliefs, and outcomes [77, 78].

Because pediatric oral health outcomes were not available at baseline, when participating children were newborns, we examined the association of HL with self-reported parental OHS. The BRFQ included one item, adapted from the National Survey of Children's Health [85], asking parents to rate their own OHS as excellent (1), very good (2), good (3), fair (4) or poor (5). This item – which was analyzed as a continuous variable – has been shown to be associated with HL, parental oral health beliefs, behavior, and pediatric outcomes in Native communities [86, 87, 54, 78, 88].

Data Analysis.

Data were analyzed using SAS software, version 9.4 [89]. We computed means (standard deviations) for continuous variables and frequencies (percentages) for categorical variables. Partial Spearman's correlations were used to examine the relationship of HL with parental oral health knowledge, beliefs, behavior, and OHS. Analyses were adjusted for parent age and income. To avoid concerns regarding over-adjustment, parental educational attainment was not included as a covariate [90, 91].

Results

Table 1 presents sample characteristics. The average age of parents was 25, with a range of 15–49. Nearly all adults were women (97%) and were the mothers of participating children (96%). The vast majority of parents were AI (95%), with 74% self-identifying as members of the specific tribe to which the participating reservation is home. Only a small percentage of parents (5%) reported being Hispanic/Latino. Forty percent of parents reported not having completed high school, with only 7% having a college or more advanced degree. About half of parents reported being unemployed (50%) and having a household income <$10,000 for the prior year (51%). The average age of the children at baseline was 0.7 months (i.e., about three weeks old). Half of the children (51%) were female and all were AI. About 9% of the children were identified as Hispanic/Latino. As reported previously [60], the baseline characteristics of parents and children did not differ significantly between treatment arms.

Table 2 presents performance on HL and the oral health constructs. Parents had an average HL score of 3.9 on a scale of 1–5, indicating that most felt relatively confident in their ability to understand and complete medical forms. On average, parents answered 76% of knowledge items correctly, suggesting they had a fairly high level of baseline knowledge. The oral health beliefs of parents were quite positive. On average, parents rated 9 of 14 self-efficacy items at the maximum score (5), suggesting parents were confident in their ability to

engage in most recommended parental oral health behaviors. Likewise, parents typically perceived recommended behaviors to be beneficial in preventing cavities (mean=4.4 on a scale of 1–5) and perceived relatively few barriers to engaging in these behaviors (mean=2.1 on a scale of 1–5). Although parents did not feel that their children were highly susceptible to cavities (mean=2.9 on a scale of 1–5), they did perceive cavities to be a severe outcome (mean=4.4 on a scale of 1–5). Results related to the LOC measures, all of which had a range of 1–5, suggested that parents largely believed their children's oral health was under their own control (mean=4.1), rather than being up to the dentist (mean=2.2) or a matter of chance (mean=2.4).

Although parents had relatively strong knowledge and generally positive beliefs, measures of parental oral health behavior and self-reported OHS were not optimal (Table 2). Parents reported adhering to only about half (49%) of recommended behaviors. Parents typically rated their OHS as fair or poor (mean=3.4 on a scale of 1–5). Only 22% reported their OHS to be very good or excellent.

HL was associated with most oral health constructs (Table 3). After adjusting for age and income, parents with more limited HL had lower levels of knowledge (r=0.25, $P<0.001$). Although lower-literate parents perceived cavities to be a less severe outcome than did parents with higher HL levels (r=0.16, $P<0.001$), they believed their children were more susceptible to cavities (r=−0.19, $P<0.001$). Likewise, parents with more limited HL perceived fewer benefits of (r=0.17, $P<0.001$) and more barriers to (r=-0.26, $P<0.001$) recommended parental oral health behaviors, were less confident they could successfully engage in those behaviors (r=0.27, $P<0.001$), and were more likely to believe their children's oral health was up to the dentist (r=-0.20, $P<0.001$) or to chance (r=−0.23, $P<0.001$). HL was not significantly associated with internal LOC. Although there was not a significant relationship between HL and behavioral adherence (r=0.06, $P=0.174$), parents with more limited HL rated their own OHS more negatively than did higher-literate parents (r=−0.09, $P=0.040$).

Discussion

Our results indicate that the sample of parents enrolled in the PBC project performed well on many of the constructs under investigation. On average, parents felt quite confident in their HL skills, answered the majority of parental oral health knowledge questions correctly, and endorsed a number of beliefs that would be expected to encourage positive parental oral health behavior. For instance, parents perceived themselves to have a good degree of control over their children's oral health outcomes, felt confident in their ability to successfully engage in recommended parental oral health behaviors, and perceived few barriers and many benefits to these behaviors. Despite having adequate HL skills, strong knowledge, and positive beliefs, behavioral adherence was limited, with parents only engaging in half of behaviors recommended for ensuring the health of children's teeth. Self-reported OHS was also poor, with less than a quarter of participating parents reporting their own oral health to be very good or excellent.

Our findings suggest that parental HL is associated with oral health in important ways. Parents with more limited HL had lower levels of parental oral health knowledge and held beliefs that are unlikely to be associated with positive parental oral health behaviors. Although HL was not associated with adherence to these behaviors, parents with limited HL reported having worse OHS than did parents with stronger HL skills.

The study corroborates prior evidence that parental HL is associated with knowledge of pediatric oral health [19, 54, 55], a construct previously shown to predict parental oral health beliefs [78, 88] and behavior [78] among Native parents. What is less clear is how HL may influence parents' ability to *gain* knowledge that can help them care for their children's teeth. We know of only one study that has examined the association of HL with acquisition of parental oral health knowledge. Although women with limited HL had significantly lower knowledge scores before and after intervention, compared to higher-literate participants, they were able to gain knowledge as a result of an educational intervention [26]. In fact, when information was delivered verbally (as opposed to in writing), women with limited HL showed greater improvement in knowledge than did higher-literate participants. In future work, the overarching project for which the current analysis was conducted will seek to clarify the association of HL with change over time in parental oral health knowledge.

This analysis contributes important insight into the association of HL with parental oral health beliefs, a topic that has received minimal attention [54]. Our findings suggest that limited HL is associated with beliefs unlikely to lead to positive parental oral health behaviors. In comparison with higher-literate participants, parents with more limited HL perceived caries to be less severe, perceived more barriers and fewer benefits to recommended behaviors, had less confidence they could successfully engage in these behaviors, and were more likely to believe their children's oral health was under the control of the dentist or a matter of chance. Although lower-literate parents had significantly higher scores for perceived susceptibility – which, theoretically, should enhance behavioral adherence – this overall pattern of beliefs would be expected to result in worse adherence to recommended parental oral health behaviors and, ultimately, worse pediatric outcomes. Indeed, more negative parental oral health beliefs such as these have been shown to be linked to poor adherence to recommended oral health behaviors among Native parents and worse oral health outcomes among Native parents and children [88].

Although more limited HL was associated with lower levels of knowledge and suboptimal oral health beliefs, the relationship of HL with behavior was not significant. We believe there are three reasons HL may not have shown an association with behavior. First, the link between HL and behavior may be more distal and indirect than the relationship of HL with knowledge and beliefs. Indeed, a number of studies provide evidence that knowledge and beliefs may mediate the relationship of HL with behavior [92, 75, 93, 94]. For instance, analyses seeking to clarify the pathways through which HL is associated with glycemic control among AI/ANs with diabetes showed that, when knowledge was controlled, the significant association of HL with self-care behavior was eliminated [75]. Other research has suggested a similar mediating role for self-efficacy [92]. These studies suggest that HL may not have a direct relationship with behavior but may be related to it through its association with knowledge and beliefs. As such, it may be reasonable to expect a smaller correlation of

HL with behavior than with knowledge and beliefs. Future analyses examining the pathways through which HL is associated with parental oral health knowledge, beliefs, behavior, and outcomes will help to clarify whether HL has a direct association with behavior, or only an indirect effect, through other variables.

Second, our failure to find a strong relationship between HL and behavior may suggest that our behavioral adherence measure may not fully capture the variation in parental behavior. Indeed, it may be difficult to measure parental oral health behavior for parents whose children are only a few weeks old. Parents may feel that taking care of their children's mouths and teeth is a component of parenting that will begin after their children's teeth erupt (typically beginning around 6 months of age). Hence, variables often thought to be predictors of behavior, such as HL or health beliefs, may not be well associated with self-reported behavior at baseline, when enrolled children were just a few weeks old.

Finally, in Native communities, HL limitations may be one of many barriers that have potential to be associated with oral health behavior. In the current sample, economic and educational challenges were widespread. More than half of parents reported a household income <$10,000, half were unemployed, and 40% had not completed high school. These indicators of economic hardship are consistent with the reservation as a whole, where poverty, unemployment, and limited educational opportunities are common [62, 95]. The literature suggests that economic challenges such as these have a negative effect on adherence to recommended parental oral health behaviors and are strongly associated with a heightened risk of ECC [96].

Access to dental providers and services also is limited [7]. On the reservation – which is nearly the size of Connecticut – there are only three dental clinics and a dentist to population ratio of 1:4000 [60]. Lack of transportation is a common barrier complicating access to the few sites offering dental care [63]. Under these circumstances, even parents with adequate HL skills as well as strong oral health knowledge and positive beliefs may have difficulty accessing the resources and services needed to promote their children's oral health.

Although HL was not associated with behavior, it was significantly linked to self-reported parental OHS. Parents with lower levels of HL reported their own OHS to be worse than did higher-literate parents. This result is consistent with prior work indicating that limitations in HL are linked to poor oral health in adults [43, 47, 33, 15, 45, 44, 17, 46, 54]. The clear association between HL and OHS in this sample might lead one to hypothesize that HL could be a major contributor to oral health disparities in Native communities. The strong level of HL in this sample suggests otherwise, however. Indeed, participating parents felt quite confident in their ability to understand and use health information. Therefore, although limited HL may serve to weaken the outcomes of affected adults, it may not play a major role in producing the vast disparities that impact AI/ANs nationally.

Because the current analysis was conducted using data collected when the pediatric participants were just a few weeks old (when the vast majority of children have no teeth), we were not able to examine the association of parental HL with the pediatric outcomes. Prior work suggests that oral health is worse among children of lower-literate parents [54, 57, 56,

16, 19]. Given that these prior investigations have used cross-sectional data, however, it is unclear whether there may a causal link between parental HL and pediatric outcomes and what mechanisms might explain that association. Future work should examine the longitudinal association of parental HL with pediatric oral health.

The work reported here has several strengths. First, our analysis, which examined the association of HL with a wide array of oral health constructs, was guided by accepted health behavior theories [79–81] and prior HL research. Second, this work utilized a large sample, ensuring adequate power to examine the relationships under investigation. Third, this analysis provides insight regarding two topics about which minimal research has been done: (1) the association of HL with parental oral health beliefs and (2) the link between HL and oral health constructs among parents of Native children.

This work also has limitations. First, this analysis was based on cross-sectional data, limiting our ability to determine whether HL influences the development of parental oral health knowledge, beliefs, behavior, and OHS. However, this work represents the first step in a planned series of analyses that will examine the association of HL with change over time in these constructs. The present analysis, thus, provides a critical foundation for the next steps in our inquiry. Second, the HL items included in the BRFQ are not specific to oral health, but instead capture general HL skills. These items were included in the BRFQ for three reasons. First, few oral health-specific measures of HL existed at the time the PBC study began [40, 41, 97] and these measures did not show strong correlations with accepted HL measures [40] and/or with oral health status [40, 41, 97]. Second, most research uses HL measures that are not condition specific [98, 90]. Use of such measures is well accepted and may enhance the ability to compare results across conditions. Finally, the HL items selected for use in the PBC study were adapted from items that are well tested [68, 70, 69, 71, 72] and have shown validity in Native people [75, 54, 76, 74].

Our findings have important implications for development of oral health education interventions aimed at improving the outcomes of Native children. Although parents felt quite confident in their HL skills, on average, those with more limited HL were at risk for poor oral health knowledge. As such, it is likely to be crucial for programs designed to enhance parents' knowledge of how to care for their children's teeth to consider parental HL in intervention design. Health care providers and public health professionals seeking to improve the oral health of Native children should ensure that their educational interventions are delivered in a manner that is sensitive to the needs to parents of all HL levels (e.g., written materials are easy to read and avoid medical jargon). A number of resources have been developed to guide development of HL-sensitive educational programs [99–101].

Our results also highlight the strong association of HL with health-related beliefs that are hypothesized to influence behavior. Although adults participating in the PBC sample felt quite confident in their HL skills, on average, parents reporting more limited HL endorsed beliefs likely to be less conducive to recommended parental oral health behaviors. In developing oral health education programs, it may be important to directly target these beliefs. Specifically, it may be crucial to ensure that parents understand the severity of oral health problems for children and the benefits that recommended oral health behaviors can

have. Likewise, working with families to find solutions to the barriers they face and to help them develop self-efficacy could help lower-literate parents successfully care for their children's teeth.

Although the findings reported here can provide valuable guidance for development of oral health education interventions, such efforts cannot solve the vast oral health disparities that Native people face. Indeed, that participating parents expressed substantial confidence in their HL skills suggests that this construct is unlikely to be a major driver of disparities in Native communities. Eliminating disparities in oral health outcomes is likely to require significant investment in Native communities and their dental care systems. Efforts to address poverty, transportation barriers, and to increase the number of available clinics and providers are likely to improve oral health outcomes for Native adults and children. In the face of ongoing limitations in the funding for IHS health care services [102], innovative efforts, such as the use of mid-level providers to conduct common dental procedures, have the potential to create greater access to care [103, 104].

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Table 1:

Sample Characteristics (N=579)

	Mean (SD) or N (%)
Parent Characteristics	
Age (years)	25.0 (5.5)
Gender: Female	563 (97.2%)
Race and Ethnicity	
American Indian	551 (95.2%)
Hispanic or Latino	31 (5.4%)
Member of the Participating Tribe	427 (73.9%)
Highest Grade Completed	
<High school graduate	232 (40.1%)
High school grad or GED	143 (24.7%)
Some college or vocational	163 (28.2%)
College degree or more	41 (7.1%)
Income	
<$10K	296 (51.1%)
$10–<$20K	57 (9.8%)
$20–<$30K	47 (8.1%)
$30–<$40K	17 (2.9%)
>=$40K	22 (3.8%)
Income Missing	140 (24.2%)
Employment Status	
Full- or part-time employment	105 (18.1%)
Full- or part-time student	48 (8.3%)
Homemaker	69 (11.9%)
Unemployed	291 (50.3%)
Other (retired, disabled, medical leave)	39 (6.7%)
Relationship to Child	
Mother	555 (95.9%)
Father	14 (2.4%)
Other	7 (1.2%)
Child Characteristics	
Age (months)	0.7 (0.9)
Gender: Female	296 (51.1%)
Race and Ethnicity	
American Indian	579 (100.0%)
Hispanic or Latino	51 (8.8%)

Table 2:

Baseline Performance on Oral Health Constructs (N=579)[a]

	Mean (SD)
Health Literacy	3.9 (0.8)
Oral Health Knowledge	75.7 (12.9)
Oral Health Beliefs	
Extended Health Belief Model	
Perceived Susceptibility	2.9 (1.0)
Perceived Severity	4.4 (0.8)
Perceived Barriers	2.1 (0.9)
Perceived Benefits	4.4 (0.8)
Self-Efficacy	9.1 (4.1)
Locus of Control	
Internal Locus of Control	4.1 (0.9)
External Locus of Control – Powerful Others	2.2 (1.1)
External Locus of Control – Chance	2.4 (1.1)
Behavioral Adherence	49.2 (23.3)
Oral Health Status	3.4 (1.1)

[a]The range for each variable is as follows: the health literacy score as well as perceived susceptibility, severity, barriers, benefits, and the locus of control measures ranged from 1–5, with higher numbers reflecting a higher level of the construct; Self-efficacy had a potential range of 0–14, with larger numbers reflecting stronger self-efficacy; knowledge and behavior represented the % of items answered correctly or % of behaviors endorsed, respectively, and ranged from 0–100%; oral health status ranged from 1–5, with lower numbers reflecting better outcomes.

Table 3:

Association of Health Literacy with Oral Health Constructs (N = 548)[a]

	Adjusted Correlation	P value
Oral Health Knowledge	0.25	<0.001
Oral Health Beliefs		
Extended Health Belief Model		
Perceived Susceptibility	−0.19	<0.001
Perceived Severity	0.16	<0.001
Perceived Barriers	−0.26	<0.001
Perceived Benefits	0.17	<0.001
Self-Efficacy	0.27	<0.001
Locus of Control		
Internal Locus of Control	0.06	0.154
External Locus of Control – Powerful Others	−0.20	<0.001
External Locus of Control – Chance	−0.23	<0.001
Behavioral Adherence	0.06	0.174
Oral Health Status	−0.09	0.040

[a]Models controlled for parent age and income.