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A Community-Based Oral Health Intervention in Navajo Nation Head Start: Participation Factors and Contextual Challenges

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Abstract

Successful interventions require consistent participation by intended recipients. We utilized mixed methods to describe participation of 518 parent-child dyads enrolled in a randomized cluster trial of a 2-year oral health intervention for Head Start (HS) families across Navajo Nation delivered by native Community Oral Health Specialists (COHS). We quantitatively assessed factors that contributed to participation and qualitatively examined barriers and strategies. The intervention offered fluoride varnish (FV) and oral health promotion (OHP) activities for two cohorts (enrolled in 2011, N=286, or 2012, N=232) of children in the HS classrooms and OHP for parents outside the classroom. Child participation was good: FV: 79.7% (Cohort 1) and 85.3% (Cohort 2) received at least 3 of 4 applications; OHP: 74.5% (Cohort 1) and 78.4% (Cohort 2) attended at least 3 of 5 events. Parent participation was low: 10.5% (Cohort 1) and 29.8% (Cohort 2) attended at least 3 of 4 events. Analysis of survey data found significant effects on parent participation from fewer people in the household, Cohort 2 membership, greater external-locus of control, and a greater perception that barriers existed to following recommended oral health behaviors. Qualitative analysis of reports from native field staff, COHS, community members, and the research team identified barriers (e.g., geographic expanse, constraints of a research trial) and suggested strategies to improve parent participation (e.g., improve communication between COHS and parents/community).

Many challenges to participation exist when conducting interventions in rural areas with underserved populations. Working with community partners to inform the development and delivery of interventions is critical.

Keywords

American Indian; Child; Participation; Community; Dental Caries

Background

Health disparities – disproportionate risks of poor outcomes – often appear in racial/ethnic minority groups and low-income rural settings. Although dental caries is largely preventable, it is the most prevalent chronic infectious disease in children in the United States (United States Department of Health and Human Services. National Institute of

Dental and Craniofacial Research NIOH, 2000). Marked differences exist among ethnic groups (Dye & Thornton-Evans, 2007; Kawashita, Kitamura, & Saito, 2011), but the disease levels seen in American Indian (AI) children are by far the highest (Phipps, Ricks, Manz, & Blahut, 2012; United States Department of Health and Human Services Centers for Disease Control, 1985; United States Department of Health and Human Services Indian Health Service, 2002). In the Navajo population, dental decay among preschool children is especially severe; a recent survey reported a mean prevalence of 21 decayed, missing and filled tooth surfaces (dmfs) for 3-5 year olds (Batliner T, 2014; Phipps et al., 2012) with 70% of children experiencing untreated decay.

The literature exploring compliance and retention of minorities in intervention research is in its infancy and growing but much smaller than that surrounding recruitment (Yancey, Ortega, & Kumanyika, 2006). As Prinz et al. (2001) have pointed out, “Family engagement and dropout from preventive interventions is so important that it should be, if it is not already, an area of inquiry in its own right . . . prevention and treatment researchers can enhance the field by focusing extensively on the challenge and influences for engagement and attrition” (p.35) (Prinz et al., 2001). Researchers often refer to “compliance” or “adherence” by participants to study protocol specifications. The intent of this paper is rather to analyze and discuss barriers and challenges to participation in community-based interventions whether or not part of a research study, so we will speak of “participation” or “engagement” rather than “compliance.”

In response to the discouraging rates of dental disease in Navajo children, researchers at the Center for Native Oral Health Research (CNOHR) at the University of Colorado Anschutz Medical Campus and their AI partners in Navajo Nation (NN) developed and implemented an innovative intervention that delivered fluoride varnish (FV) to NN Head Start (HS) children and oral health promotion (OHP) activities to the children and their parents or primary caregivers (henceforth referred to as “parents”) using trained native lay health workers called Community Health Oral Specialists (COHS). The goal of the intervention was to reduce caries. A cluster randomized clinical trial is evaluating the intervention using up to three years of follow-up data.

This paper describes retention of NN Head Start families in the community-based intervention, assesses multi-level challenges related to implementation and engagement in this very rural AI setting, and discusses strategies to increase participation and the degree to which they were successful.

Methods

Setting

The NN is home to more than 170,000 Navajo tribal members (also called Diné). Encompassing over 27,000 square miles (approximately the size of West Virginia), it is the largest reservation in the US. Community Chapters provide local administrative structure for the tribal government, and five agencies (similar to counties) serve as organizational units for service delivery. The Division of Health oversees HS activities throughout the NN, with 100 classrooms in 82 HS Centers across the reservation at the beginning of the study.

Study Design

Details of the study design and intervention have been described elsewhere (Quissell et al., 2014) and are summarized here. Both the Navajo Nation Human Research Review Board and the Colorado Multiple Institutional Review Board (COMIRB) approved the study. The cluster-randomized clinical trial provided an oral health promotion intervention structured to be delivered by COHS, in the Head Start communities across the NN, over each academic school year. The intervention was delivered for two consecutive school years (2011-12 and 2012-13). A total of 1016 Head Start children-parent dyads were recruited at the beginning of the school year (561 in the 2011-12 school year (Cohort 1) and 455 in the 2012-13 school year (Cohort 2)) from 52 HS classrooms across NN. Dyads were cluster-randomized at the classroom level; 26 classrooms received the intervention (286 dyads in Cohort 1 and 232 in Cohort 2) and 26 classrooms served as control/comparison groups and received usual community and HS care and education. Enrollment reached 97.7% of the intended sample of 1,040 child-parent dyads.

COHS launched each school-year intervention with a kick-off OHP classroom event. COHS invited and reminded parents with fliers sent home with the child and follow-up phone calls (restricted to three by COMIRB). Over the course of the school year, COHS provided up to four fluoride varnish applications (FV) to children in each intervention classroom. They returned to each classroom within 21 days to reach children who were previously absent. COHS also provided five classroom OHP events to the HS children and four parent OHP events, spread across the course of the school year. The child OHP events occurred during the HS school day, and the parent-OHP events were held in various locations and times that included but not restricted to after school drop-off, before school pick-up, or during HS community events (e.g. Thanksgiving celebration or Parent Night). Children received the child OHP if they were attending school on the day of the event. Parents were personally invited to each OHP parent event. Anticipating that parents would be unlikely to attend all parent events, we deliberately repeated content across events. Trained field staff not involved in the intervention conducted quality assurance checks of child and parent OHP events to monitor fidelity to the intervention.

Quantitative Measures and Analyses of Individual-level Factors Related to Participation

The quantitative outcome measures for this paper are the number of FV applications and OHP events received by the children, and the number of OHP events attended by the parents during the first academic school year in which they were enrolled in the study. To examine the effects of individual-level characteristics on these outcomes, we drew from data collected at baseline using the Basic Research Factors Questionnaire (BRFQ; Appendix), which was developed with support from U54DE019285, U54DE019275, and U54DE019259 by the Early Childhood Caries Consortium of which CNOHR is a member. The BRFQ assesses good oral health care practices in caring for the child's teeth (14 questions; an overall oral health knowledge score was derived by calculating the percentage of correct answers); oral health behaviors in caring for the child's teeth (9 questions; an overall oral health behavior score was derived by calculating the percentage of recommended behaviors that are adhered to by the parent); and also a number of psychosocial measures from the parents that include locus of control, four subscales of the health belief model, self-efficacy,

importance of engaging in certain oral health behaviors, sense of coherence, distress, chronic stress, perceived discrimination, alcohol use, social support, and financial stability. To assess the impact of the individual-level variables on intervention participation, we used data from the baseline assessment of the 518 intervention dyads.

We first analyzed the distributions of the number of FV applications, OHP-child events, and OHP-parent events. To gain potential insight into effects of changes implemented after the first year of the intervention based on assessment of challenges and strategies, we used a chi-square test to compare Cohorts 1 and 2.

Bivariable analyses assessed associations between specific child- or parent- factors and number of intervention activities received. We used one-way analysis of variance to compare mean number of events completed in each category for categorical factors and Pearson correlations between number of events completed and the values of the factors for quantitative factors. Those factors that had a bivariable association with p-values ≤ 0.20 were then entered into a Poisson regression analysis, with the number of events completed as the dependent variable and the child and parent factors as the independent variables. All analyses used SAS version 9.3.

Contextual Factors Related to Participation

Qualitative sources enriched our understanding of challenges faced in delivery of the intervention and suggested strategies to overcome these challenges. The research team, including both University investigators and Navajo field staff and COHS, documented challenges as they arose and met regularly to brainstorm, evaluate, and implement alterations and enhancements. A meeting of the NN Community Advisory Board (CAB) focused on strategies to improve parent engagement, as did a meeting of the CNOHR Community Advisory Committee. HS administration and school personnel contributed substantially to discussions about potential solutions. We also collected event evaluations from attending parents. At the end of the second (final) year of the intervention, the research team collected written descriptions of barriers and responses from the COHS and conducted a semi-structured debriefing conversation with them.

Results

Characteristics of the Study Participants

Table 1 presents baseline characteristics of the 518 child-parent intervention dyads. Mean age of the parents was 32.4 years (sd 9.6); 84.4% were female. Mean age of the children was 3.6 years (sd 0.5); 53.5% were female. Eighty-five percent of the parents had at least a high school education, but family annual income was low, with 50.1% below \$10,000. Only 27.4% were employed. About 85% of the parents had access to a working vehicle.

The children had a high mean number of decayed, missing, or filled tooth surfaces, 19.9 (sd 19.9), although 70.6% of the parents rated the oral health of their children as good to excellent. The parents rated their own oral health somewhat lower than that of their children, with 58.0% rating it as good to excellent. Average score on the pediatric oral health quality of life scale (POQL) was 4.0 (sd 9.4) on a scale of 0-100 where a lower score implies better

POQL. The parents' oral health knowledge was moderately high (mean 74.8%, sd 13.8%), but reported adherence to recommended oral health behaviors was less than desirable (mean 50.1%, sd 22.1%). Scores on the psychosocial measures indicated relatively high (over 4.0 on a scale of 1-5) internal locus of control, self-efficacy, and sense of coherence, and attitudes related to oral health (perceived seriousness, benefits, and importance), and relatively low (under 3.0) negative factors, including barriers, distress, perceived discrimination, and stress measures (but not community economic stress).

Participation in Intervention Activities

Table 2 provides information regarding participation in all intervention activities.

Children: Fluoride Varnish—Across the four opportunities to receive FV during the school year, 178 (62.2%) of the Cohort 1 children and 159 (68.5%) of those in Cohort 2 received the full four-application dose. Two hundred twenty-eight (79.7%) of the Cohort 1 children and 198 (85.3%) of those in Cohort 2 received at least three FV applications. The total number of FV applications received did not differ between Cohorts 1 and 2 ($p = 0.25$).

Children: OHP Events—Across the five opportunities to attend events, 58 (20.3%) of the 286 children in Cohort 1 and 58 (25.0%) of the 232 children in Cohort 2 attended all five events. A total of 213 (74.5%) of the 286 children in Cohort 1 and 182 (78.4%) of the 232 children in Cohort 2 attended at least three OHP events. The total number of OHP events received did not differ between Cohorts 1 and 2 ($p = 0.44$).

Parents: OHP Events—In general, attendance at events by the parents was considerably lower than attendance at events by the children. Across the four opportunities to attend OHP events, only 7 (2.5%) of the 286 parents in Cohort 1 and 19 (8.2%) of the 232 parents in Cohort 2 attended all four events. A total of 30 (10.5%) of the 286 parents in Cohort 1 and 69 (29.8%) of the 232 parents in Cohort 2 attended three or more of the OHP events. The mean number of events attended per parent was 1.3 (sd 1.0). Although parent attendance at the OHP events was generally low, there was evidence of improvement in number of events attended from Cohort 1 to Cohort 2 ($p < 0.0001$).

The correlation between the number of child FV and OHP events completed was 0.72 and between the number of child FV and OHP events combined and parent OHP events was 0.36, indicating much less correlation between child and parent events than between different types of child events. On the basis of these correlations, we decided to combine child FV and OHP events and keep parent/caregiver OHP events separate in further analyses of factors associated with child and parent participation.

Individual-Level Factors Associated with Child Participation

Table 3 presents results of bivariable and multivariable analyses of factors associated with child participation in FV and OHP events. The table shows only those variables whose bivariable association with participation has a p -value ≤ 0.20 . In bivariable analyses, child participation in FV and OHP events increased with parent employment ($p = 0.03$), parent-reported better child oral health status ($p = 0.01$), POQL ($p = 0.002$), higher sense of

coherence ($p = 0.002$), and less personal distress ($p = 0.004$). There were also some significant differences in child participation rates by geographic area as defined by the five Navajo Nation Agencies, ranging from means of 5.94 to 7.22 events/child. In the multivariable Poisson regression analysis, only better parent-reported child oral health status and POQL remained significant ($p = 0.01$ and $p = 0.04$, respectively), while child gender became significant ($p = 0.04$).

Individual-Level Factors Associated with Parent Participation

Table 4 presents bivariable and multivariable analyses of factors associated with parent participation in OHP events. In bivariable analyses of factors associated with parent participation with OHP events, participation increased with fewer people in the household ($p = 0.01$), higher sense of coherence ($p = 0.03$), better child oral health status ($p = 0.01$), better POQL ($p = 0.04$), and lower dmfs (child) ($p = 0.01$). Cohort 2 parent participation (mean 1.65 events) was better than that of Cohort 1 (mean 0.93 events; $p < 0.0001$). In the multivariable Poisson regression analysis, fewer people in the household and cohort effect remained significant, as well as greater external-others locus of control and a greater perception that barriers exist to following recommended oral health behaviors. Factors not found to be associated with parent participation included oral health knowledge, beliefs, and behaviors.

Contextual Factors Associated with Parent Participation

In an effort to improve parent participation, the research team held a brainstorming session with the NN CAB between intervention academic years. The CAB generated suggestions to improve parent participation, which we then prioritized by feasibility based on practicality of suggestion, available personnel and budget. Suggestions generally concerned direct interaction between the COHS and parents or community. Recommendations that we implemented at least minimally included: meeting with local parent committees at the beginning of the school year, encouraging parents who attend to remind other parents, continuing reminder calls and adding texting, adding “best way of contacting” to (re)enrollment forms, clarifying with parents what they should expect from COHS, requesting input concerning time preferences for events, and reinforcing importance of parent events. Some recommendations such as engaging agency-level Community Health Representatives could not be implemented within the available timeframe.

Of recommendations deemed by the CAB likely to be successful but perhaps less feasible, we implemented commending teacher support and involvement (certificates of appreciation, ongoing partnerships with COHS) and continuing to leave messages with back-up contacts. This paper responds to the recommendation to analyze existing data on an ongoing basis to identify new strategies and barriers to parent involvement and look at parent characteristics. Timing again made some of the recommendations such as asking Agency- and Nation-level leadership and committees to act as champions impossible to implement. Research-related concern about cross-study-arm contamination during implementation of the intervention restricted us from sharing results at professional development meetings for HS teachers and staff or providing information about the study on local radio and in *Navajo Times*.

At the end of the two years of intervention, COHS offered observations and recommendations that would benefit future implementations. They reported that problems primarily related to the geographic expanse in the field strained organizational capacity. They generally found our training informative, useful, and delivered by professionals with knowledge of oral health, work experience, education, and professionalism. They had the highest regard for HS staff and their flexibility, helpfulness, accommodation, and outreach to parents, and they wished they had been able to reward the HS staff tangibly, not just with certificates. The greatest difficulty was coordinating schedules around the delivery of the intervention.

As we have noted consistently, the greatest barriers concerned communication with parents. The ability to text eased the problems, but poor cellphone reception, lack of cellphone minutes, disconnected phones, and changing phone numbers made reaching parents a formidable, ongoing challenge. The COHS reported, however, that parents who did attend were very interested in all that the COHS shared.

Discussion

Success of an intervention depends on the receipt of the “dose” delivered with fidelity and adherence to core components of the intervention by participants. Community-level factors, provider characteristics, characteristics of the innovation/intervention, and organizational climate all may affect participation (Durlak & DuPre, 2008). Contextual fit between the innovation/intervention and the culture matters, including relevant packaging, language, community engagement in decision making, and normative attitudes, values and practices (Kreuter, Lukwago, Bucholtz, Clark, & Sanders-Thompson, 2003). Many factors that may contribute to the disparate caries risk in NN also may affect the delivery of an intervention in the community: individual (e.g., physiological, functional), socioeconomic and sociocultural (e.g., attitudes and beliefs about oral health and childhood caries), community and environmental (e.g., rural setting, geographic expanse and sparse population, limited oral health care resources), and political/historical (e.g., multiple governmental and regulatory institutions, discrimination). Community attributes also may suggest remediating strategies.

Community-based participation served as an underlying principle for this intervention — engaging community members in the development and actual delivery of the intervention in a community setting—but was perhaps not sufficiently implemented. Input from community partners who are sensitive to these multi-level influences is invaluable.

Child Participation

In this community-based oral health promotion intervention within Head Start classrooms in a resource-poor, sparsely populated, large, rural community delivered by trained community lay health workers (COHS), we learned that participation in the intervention components was better when the intervention was brought to the participants (i.e. by providing the FV and OHP events to children in the HS classroom) but suboptimal if it required participants to travel to intervention activities without compensation. Delivery of the intervention during the school day in the school setting facilitated participation. The children received bus

transportation to school and were a “captive audience” in the classroom. Application of FV was more successful than attendance at child events because the COHS returned to the classroom up to three times within the “dose-window” to provide FV but did not repeat child OHP events. COHS reported failure of transportation by school bus or car and inclement weather as barriers to attendance. In addition, various schools closed intermittently due to lack of heat, non-availability of HS staff, funding challenges for some schools, and other issues such as needing to bring a building ‘up to code’. Of factors measured by the BRFQ, only parent-reported better child oral health status and POQL and male gender of the child had an association (positive) with attendance in the fully adjusted model.

Teachers and other HS staff played an increasingly important role over time as they became invested in the intervention in their classrooms. We heard anecdotally of many instances of extra communications with families and some tweaking of bus schedules to accommodate intervention activities.

Parent Participation

Although the original research design had called for personalized one-on-one contacts with parents by the COHS including going to their homes, requirements related to reframing the originally proposed study as a clinical trial eliminated this possibility due to concerns about intervention fidelity. Nonetheless, a number of factors were associated with improved parent participation for Cohort 2, e.g., incorporation of ideas from the community (CAB, CAC, COHS, HS teachers and staff) such as using text-messaging to communicate with families.

Participation in parent OHP events proved to be challenging. Few parents attended more than one event and even fewer attended all events. We speculate that parents were less likely to attend intervention events than their children because parents had more schedule conflicts, couldn't take time from their day's responsibilities, and needed to find their own transportation. Additionally, parents could choose not to attend, but their children could not. Specific parent characteristics associated with poorer attendance included larger household, lower external parental oral health locus of control (powerful others) (i.e. the parent disagrees that it is the dentist's job to prevent cavities or keep his/her child's mouth healthy), fewer barriers to following recommended oral health behaviors, and being a member of Cohort 1. Living in a larger household may make it more difficult for a parent to get away. A lower external oral health locus of control may reflect that parents feel less dependent on dentists to prevent dental disease in their children but rather see dentists as providers who treat dental disease once developed. Better engagement by parent members of Cohort 2 may reflect the new strategies implemented after Cohort 1's experience.

Barriers, Strategies and Effectiveness

We learned of various challenges to parent participation from all sources (COHS, study staff, HS personnel). Communication dominated the list of challenges; others included the geography, weather, scheduling, demands on the COHS, and institutional issues. Specific strategies implemented after year 1 may have increased parent attendance in Cohort 2. We implemented many strategies suggested by our NN CAB. As noted earlier, we began texting families after Year 1, having learned that cellphone calls “cost” minutes, while texting does

not. Subsequent use of text messaging improved and increased communication with study participants (as recommended by *Prinz et al. 2001*, *Cruz et al. 2014*, *Yancey 2006* (Cruz, Davis, FitzGerald, Canaca, & Keane, 2014; Prinz et al., 2001; Yancey et al., 2006). Because COHS came from the communities in which they were working (Durlak & DuPre, 2008; Kreuter et al., 2003; Yancey et al., 2006), they were able to readily identify with parents and had knowledge regarding the culture and infrastructure on the NN. After a year's experience, COHS addressed parent letters individually to parent and child dyads to remind parents that the study was still being conducted and to provide dates and locations. Beginning with the second year, staff increased the number of back-up contacts' information. COHS made parent events more accessible and convenient (Jurkowski et al., 2013; Yancey et al., 2006) by working with HS staff to schedule events that coincided with other community events. Organizational capacity increased by using dedicated staff for contacting parents (Cruz et al., 2014), and HS staff strengthened relationships as they increasingly became invested in the intervention in their classrooms, serving as community liaisons and encouraging parent attendance (Jurkowski, Lawson, Mills, Wilner III, & Davison, 2014). The study team built positive relationships with HS staff by maintaining contact in the summer between intervention years and recognizing their efforts with certificates of appreciation. Many of these strategies were greatly informed by our CAB members and feedback from COHS (Cruz et al., 2014; Durlak & DuPre, 2008; Jurkowski et al., 2014; Kreuter et al., 2003).

Other strategies that we anticipated would be useful were less successful, or their impact was difficult to measure. Despite tweaks to the organizational structure to facilitate scheduling of parent events such as strategically timed make-up events (Jurkowski et al., 2013; Yancey et al., 2006), this complex process revolved around both the availability of the HS building and staff members as well as the availability of the limited staff in the field responsible for fidelity monitoring of those events. We sent additional flyers and letters home to parents that emphasized the importance of parent involvement (Cruz et al., 2014; Yancey et al., 2006), but it is unclear how many parents found these reminders useful. While some parents found our increased phone contacts helpful (Cruz et al., 2014; Yancey et al., 2006), others were annoyed with the increased contact, which may have influenced their participation.

Some strategies were more difficult or impossible to implement. Many barriers were related to challenges of working in a rural and low-income setting. [While there are known difficulties in maintaining a high level of parent attendance in HS classroom activities, few other options exist regarding accessible and convenient locations on the reservation (Yancey et al., 2006) for engaging both parents and children]. Contacting parents remained a constant issue despite our efforts to reach out with a variety of methods.

This intervention occurred within the constraints of a randomized clinical trial, which restricted the types of changes we could make mid-project. The intervention was designed to be culturally acceptable to participants at the start of the project (Kreuter et al., 2003), but we could not incorporate ongoing suggestions made by staff members and parents. Greater incentives to participate such as having food available at parent events, more tangible incentives for HS staff, or assisting with transportation (Cruz et al., 2014; Durlak & DuPre, 2008; Yancey et al., 2006) would likely have increased participation, but providing them

would have threatened fidelity of the intervention, which was intended to operate in the setting that would be available without research funding. Using broad, reservation wide contact methods such as advertisements in local newspapers and radio (Durlak & DuPre, 2008) would have created the possibility of study arm cross-contamination an issue. Limits to time and funding prevented engaging Community Health Representatives or other agency level professionals, maintaining a greater community presence beyond the school year, or spending more time involving HS parents and community champions (Cruz et al., 2014; Jurkowski et al., 2013; Prinz et al., 2001).

This research has many strengths. Foremost, we examined the characteristics of a very large Native American cohort living across much of NN and utilized both quantitative (a large, comprehensive questionnaire) and qualitative data to inform our work. Our research has limitations. Our experiences may not be generalizable to others working in different settings or with different populations ; however, use of community partners to inform intervention implementation is always relevant. While our BRFQ quantitatively measured a broad number of factors, there are likely other factors, perhaps more important, that are related to participation. Additionally, self-report of BRFQ parent characteristics may carry a reporting bias.

Conclusions

Many challenges to participation exist when conducting interventions in rural areas with underserved populations – at individual and community levels. Working with community partners to inform the development and delivery of interventions is critical. These community partners include lay health workers, community experts, and community advisory board members to name a few. Our experience is not unique. Others conducting community interventions that depend on parent engagement have had similar experiences and have offered recommendations (as cited earlier).

We discovered that characteristics of individual parents influenced participation in the intervention. Factors associated with improved parent participation include having a smaller household size, higher external oral health locus of control, and increased perception of barriers to following recommended behaviors.

Community level factors (e.g., local politics), provider characteristics (e.g., understanding of need and benefits), characteristics of the innovation (e.g. adaptability and compatibility), and organizational climate (e.g., leadership and administrative support) inform strategies that influence the implementation of a program (Durlak & DuPre, 2008).

Implementation of a detailed and complex intervention will never be perfect, nor does it necessarily need to be to see positive outcomes from the intervention (Durlak & DuPre, 2008). However certain steps can be taken while planning programs to insure that implementation goes as smoothly as possible. Particularly when working with tribal communities in rural and underserved areas, extra time should be set aside for consulting with community members and leaders to make sure that programs are accessible and culturally relevant (Jamieson et al., 2012). Time spent disseminating information to

communities and strengthening community ties will help increase the probability of success for future projects. With any large-scale intervention, unanticipated problems inevitably will arise, and therefore flexibility will greatly increase the probability of successful implementation as well.

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Appendix

Appendix

Description of Measures in the Basic Research Factors Questionnaire

Measure ^a	Description	Range ^b
Oral Health Locus of Control 3 Subscales Internal Locus of Control (3) External Locus of Control -Powerful Others (3) External Locus of Control – Chance (3)	Locus of Control (LOC) measure captures a person's attitudes about who or what has control over their child's oral health outcomes (i.e., the parent themselves, other people, or chance). Each subscale represents the average score for all items within the subscale and represents the extent to which participants believes control for their child's oral health outcomes lies with the parent (internal LOC), the dentist (powerful other LOC), or is up to chance (chance LOC).	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)	The Health Belief Model is one of the major models intended to explain health behavior. The model predicts that behavior is a function of the subscales. Perceived susceptibility – How susceptible does a parent feel his/her child is to poor oral health outcomes? Perceived severity – How severe does the parent think developing caries would be? Perceived barriers – Does the parent perceive many barriers to following recommended oral health behavior? Perceived benefits – Does the parent perceive many benefits to following recommended oral health behavior?	1-5 1= strongly disagree 5= strongly agree
Self-Efficacy (14)	Self-efficacy represents a person's confidence that he/she can successfully engage in a specific health behavior. The overall self-efficacy score represents how sure participants are that they can engage in recommended behavior to take care of their children's teeth.	1-5 1= Not sure at all 5= extremely sure
Importance (14)	The overall importance score represents how important it is to participants that they engage in specific oral health behaviors (the same behaviors as mentioned above, for 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 Sense of Coherence (13)	Sense of Coherence (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 coherence
Distress (6)	The overall distress score represents the amount of distress participants have experienced in the last 30 days.	1-5 1= none of the time

Measure ^a	Description	Range ^b
		5= all the time
Chronic Stress 5 Subscales Expectations (3) Location Hassles (5) Community Family Dysfunction (2) Community Risky Behaviors (5) Community Economic Distress (2)	Chronic Stress captured 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)	The perceived discrimination measure represents the amount of discrimination participants feel they are subject to, on account of being American Indian.	1-4 1= never 4= often
Oral Health-Related Quality of Life (10)	This is a measure of impact of dental disease on oral health-related quality of life and has been validated in NN children (Braun et al., 2015).	Score of 1-100 Higher score indicates worse oral health-related quality of life.
Oral Health Behavior (9)	The overall behavior score represents the percentage of oral health behavior items that were answered with an "adherent" response. Adherent means the participant is following the recommended oral health behavior.	0-100%
Oral Health Knowledge (14)	The overall knowledge score represents the percentage of oral health knowledge items answered correctly.	0-100%
Alcohol Use (3)	A shortened version of the Alcohol Use Disorders Identification Test (AUDIT). Because the shortened version includes only the three consumption items, it is referred to as the AUDIT-C. The alcohol score provides an indication of the degree to which a participant drinks excessively.	0-12 Large numbers represent greater alcohol use
Social Support (4)	The Social Support score represents the average score for items within the Instrumental Social Support section of the Oral Health Survey. This overall score indicates the degree to which participants believe they have others available to help them when needed.	0-1 0= no available support 1= support available
Financial Stability (4)	The Financial Stability score is a measure of the degree to which participants feel they have adequate access to the basic things people need, such as food and clothing.	0-1 0= financially unstable 1= financially stable

Note:

^a In the first column, numbers in parentheses represent the number of items in the scale/subscale.

^b "Range" indicates the range of the computed scale/subscale.

References

- Batliner T QD, Wilson A, Tiwari T, Glueck D, Henderson W, Thomas J, Braun PA, Diana Cudeii, Albino J. Oral Health Status of Navajo Nation Head Start Children. *J Public Health Dent*. 2014 In press.
- Cruz TH, Davis SM, FitzGerald CA, Canaca GF, Keane PC. Engagement, Recruitment, and Retention in a Trans-Community, Randomized Controlled Trial for the Prevention of Obesity in Rural American Indian and Hispanic Children. *The journal of primary prevention*. 2014; 35(3):135–149. [PubMed: 24549525]
- Durlak J, DuPre E. Implementation Matters: A Review of Research on the Influence of Implementation on Program Outcomes and the Factors Affecting Implementation. *American Journal of Community Psychology*. 2008; 41(3-4):327–350. doi: 10.1007/s10464-008-9165-0. [PubMed: 18322790]
- Dye BA, Thornton-Evans G. A brief history of national surveillance efforts for periodontal disease in the United States. *Journal of Periodontology*. 2007; 78(7 Suppl):1373–1379. [PubMed: 17608609]

- Jamieson LM, Paradies YC, Eades S, Chong A, Maple-Brown L, Morris P, Brown A. Ten principles relevant to health research among Indigenous Australian populations. *Medical Journal of Australia*. 2012; 197(1):16. [PubMed: 22762218]
- Jurkowski JM, Lawson HA, Mills LLG, Wilner PG III, Davison KK. The Empowerment of Low-Income Parents Engaged in a Childhood Obesity Intervention. *Family and Community Health*. 2014; 37(2):104–118. [PubMed: 24569157]
- Jurkowski JM, Mills LLG, Lawson HA, Bovenzi MC, Quartimon R, Davison KK. Engaging low-income parents in childhood obesity prevention from start to finish: a case study. *Journal of Community Health*. 2013; 38(1):1–11. [PubMed: 22714670]
- Kawashita Y, Kitamura M, Saito T. Early childhood caries. *International journal of dentistry*. 2011; 2011:725320. doi: 10.1155/2011/725320. [PubMed: 22007218]
- Kreuter MW, Lukwago SN, Bucholtz DC, Clark EM, Sanders-Thompson V. Achieving cultural appropriateness in health promotion programs: targeted and tailored approaches. *Health Education and Behavior*. 2003; 30(2):133–146. [PubMed: 12693519]
- Phipps KR, Ricks TL, Manz MC, Blahut P. Prevalence and severity of dental caries among American Indian and Alaska Native preschool children. *Journal of Public Health Dentistry*. 2012 no-no. doi: 10.1111/j.1752-7325.2012.00331.x.
- Prinz RJ, Smith EP, Dumas JE, Laughlin JE, White DW, Barrón R. Recruitment and retention of participants in prevention trials involving family-based interventions. *American Journal of Preventive Medicine*. 2001; 20(1):31–37. [PubMed: 11146258]
- Quissell DO, Bryant LL, Braun PA, Cudeii D, Johs N, Smith VL, Albino J. Preventing caries in preschoolers: Successful initiation of an innovative community-based clinical trial in Navajo Nation Head Start. *Contemp Clin Trials*. 2014; 37(2):242–251. doi: 10.1016/j.cct.2014.01.004. [PubMed: 24469238]
- United States Department of Health and Human Services Centers for Disease Control. Dental caries in American Indian and Alaskan native children. *MMWR Morbidity/ Mortality Weekly Report*. 1985; 34(26):400–401.
- United States Department of Health and Human Services Indian Health Service. The 1999 Oral Health Survey of American Indian and Alaska Native Dental Patients. USDHHS; Rockville, MD: 2002. Retrieved from <http://www.ihs.gov/MedicalPrograms/Dental/docs/survey.pdf>
- United States Department of Health and Human Services. National Institute of Dental and Craniofacial Research NIDCR, e. Oral Health in America: A Report of the Surgeon General. 2000
- Yancey AK, Ortega AN, Kumanyika SK. Effective recruitment and retention of minority research participants. *Annual Review of Public Health*. 2006; 27:1–28.

Table 1

Characteristics of Head Start Parents and Children, Navajo Nation, 2011 and 2012 (N=518)

Characteristic	Mean (SD) or N (%)	
Sociodemographics		
Parent age (mean, sd)	32.4	(9.6)
Parent gender—female (n, %)	437	(84.4%)
Child age (mean, sd)	3.6	(0.5)
Child gender—female (n, %)	277	(53.5%)
Parent education (n, %)		
<High school graduate	77	(15.0%)
High school grad/GED	188	(36.6%)
Some college/vocational	185	(36.0%)
College degree or more	64	(12.4%)
Unknown	4	
Family income (n, %)		
<\$10,000	221	(50.1%)
\$10,000-\$19,999	83	(18.8%)
\$20,000-\$29,999	54	(12.3%)
\$30,000-\$39,999	38	(8.6%)
\$40,000	45	(10.2%)
Unknown	77	
Employed (n, %)	142	(27.4%)
Access to working vehicle (n, %)	440	(84.9%)
Oral health status of child or parent		
dmfs of child* (mean, sd)	19.9	(19.9)
Oral health status of child (n, %)		
Excellent	61	(11.9%)
Very good	117	(22.9%)
Good	183	(35.8%)
Fair	113	(22.1%)
Poor	37	(7.3%)
Unknown	7	
Oral health status of parent (n, %)		
Excellent	22	(4.4%)
Very good	66	(13.1%)
Good	204	(40.5%)
Fair	171	(33.9%)
Poor	41	(8.1%)
Unknown	14	
Pediatric oral health quality of life (mean, sd)	4.0	(9.4)
Oral health knowledge and behavior scores (mean, sd)		
Knowledge (of 100%)	74.8	(13.8)

Characteristic	Mean (SD) or N (%)	
Behavior (of 100%)	50.1	(22.1)
Psychosocial measures (1-5 scales, unless otherwise noted)		
Oral health locus of control (mean, sd)		
Internal	4.0	(1.0)
External others	2.2	(1.1)
External chance	2.4	(1.1)
Health belief model (mean, sd)		
Perceived susceptibility	3.4	(0.9)
Perceived seriousness	4.3	(0.8)
Perceived barriers	2.3	(0.7)
Perceived benefits	4.3	(0.8)
Self-efficacy (mean, sd)	4.4	(0.6)
Importance of oral health (mean, sd)	4.7	(0.5)
Sense of coherence (mean, sd, 1-7 scale)	5.2	(1.0)
Distress(mean, sd)	1.7	(0.7)
Stress (mean, sd)		
Expectations	2.4	(0.9)
Location hassles	2.1	(0.6)
Community family dysfunction	2.5	(1.1)
Community risky behavior	2.3	(1.0)
Community economic distress	3.1	(1.0)
Perceived discrimination (mean, sd)	1.8	(0.6)

* dmfs = decayed, missing, and filled tooth surfaces

Table 2

Participation in Oral Health Promotion Intervention by Annual Cohort, Head Start Children/Parents, Navajo Nation, 2011-2012

	Cohort 1 (2011) (N=286) N (%)	Cohort 2 (2012) (N=232) N (%)	Total (N=518) N (%)
Number of Child Fluoride Varnish Applications Received [*]			
0	28 (9.8)	13 (5.6)	41 (7.9)
1	12 (4.2)	12 (5.2)	24 (4.6)
2	18 (6.3)	9 (3.9)	27 (5.2)
3	50 (17.5)	39 (16.8)	89 (17.2)
4	178 (62.2)	159 (68.5)	337 (65.1)
Number of Child Oral Health Promotion Events Attended ^{**}			
0	25 (8.7)	13 (5.6)	38 (7.3)
1	17 (6.0)	15 (6.5)	32 (6.2)
2	31 (10.8)	22 (9.5)	53 (10.2)
3	65 (22.7)	43 (18.5)	108 (20.9)
4	90 (31.5)	81 (34.9)	171 (33.0)
5	58 (20.3)	58 (25.0)	116 (22.4)
Number of Child Fluoride Varnish Application Received and Child Oral Health Promotion Events Attended ^{***}			
0	23 (8.0)	9 (3.9)	32 (6.2)
1	5 (1.8)	5 (2.2)	10 (1.9)
2	5 (1.8)	5 (2.2)	10 (1.9)
3	7 (2.4)	4 (1.7)	11 (2.1)
4	13 (4.6)	8 (3.4)	21 (4.1)
5	25 (8.7)	16 (6.9)	41 (7.9)
6	16 (5.6)	19 (8.2)	35 (6.8)
7	68 (23.8)	51 (22.0)	119 (23.0)
8	67 (23.4)	60 (25.8)	127 (24.5)
9	57 (19.9)	55 (23.7)	112 (21.6)
Number of Parent Oral Health Promotion Events Attended ^{****}			
0	128 (44.8)	55 (23.7)	183 (35.3)
1	87 (30.4)	59 (25.4)	146 (28.2)
2	41 (14.3)	49 (21.1)	90 (17.4)
3	23 (8.0)	50 (21.6)	73 (14.1)
4	7 (2.5)	19 (8.2)	26 (5.0)

^{*} Chi-square test comparing distributions of child FV applications, Cohort 1 vs. Cohort 2, P = 0.25

^{**} Chi-square test comparing distributions of child OHP events, Cohort 1 vs. Cohort 2, P = 0.44

^{***} Chi-square test comparing distributions of child (FV + OHP) events, Cohort 1 vs. Cohort 2, P = 0.57

^{****} Chi-square test comparing distributions of parent OHP events, Cohort 1 vs. Cohort 2, P < 0.0001

Table 3

Factors Associated with Head Start Child Participation, Navajo Nation, 2011-2012

Factor	Bivariable Association (N=518)		Poisson Regression Model (N=474)		
	Correlation or Mean No. of Events	p-value	Regression Coefficient	95% CI	p-value
Cohort Year		0.06			0.26
Fall 2011 (N=286)	6.41		0.96	(0.90, 1.03)	
Fall 2012 (n=232)	6.83		Reference		
Child Gender		0.12			0.04
Female (N=277)	6.78		0.93	(0.87, 0.997)	
Male (N=241)	6.44		Reference		
Education		0.17			0.91
College degree (N=64)	7.06		1.01	(0.88, 1.16)	
Some college/Vocational (N=185)	6.71		0.98	(0.87, 1.10)	
HS grad/GED (N=188)	6.45		1.01	(0.90, 1.12)	
< HS graduate (N=77)	6.22		Reference		
Family income		0.08			0.61
Missing (N=77)	6.73		1.07	(0.96, 1.20)	
\$40K (N=45)	7.09		1.06	(0.93, 1.20)	
\$30K to <\$40K (N=38)	7.29		1.11	(0.97, 1.27)	
\$20K to <\$30K (N=54)	6.67		1.02	(0.90, 1.15)	
\$10K to <\$20K (N=83)	6.80		1.05	(0.95, 1.16)	
<\$10K (N=221)	6.25		Reference		
Employed		0.03			0.12
Yes (N=142)	6.96		1.06	(0.98, 1.15)	
No (N=361)	6.43		Reference		
Child OHS *		0.01			0.01
Excellent (N=61)	7.08		1.20	(1.01, 1.14)	
Very Good (N=117)	6.64		1.11	(0.95, 1.31)	
Good (N=183)	6.89		1.18	(1.01, 1.38)	
Fair (N=113)	6.13		1.02	(0.87, 1.19)	
Poor (N=37)	5.59		Reference		
POQL * (N=507)	-0.137	0.002	0.996	(0.99, 1.00)	0.04
Perceived Susceptibility (N=513)	-0.081	0.07	0.99	(0.96, 1.04)	0.79
Sense of Coherence (N=503)	0.139	0.002	1.02	(0.98, 1.07)	0.30
Distress (N=510)	-0.129	0.004	0.97	(0.92, 1.03)	0.31
Stress					
Community Risky Behavior (N=504)	0.076	0.09	1.02	(0.98, 1.06)	0.28
Perceived Discrimination (N=511)	-0.061	0.17	0.97	(0.91, 1.04)	0.39
Oral Health Locus of Control (External Chance) (N=513)	-0.060	0.17	1.001	(0.97, 1.04)	0.94
Navajo Nation Agency		0.01			0.004

Factor	Bivariable Association (N=518)		Poisson Regression Model (N=474)		
	Correlation or Mean No. of Events	p-value	Regression Coefficient	95% CI	p-value
1 (N=123)	6.54		0.94	(0.85, 1.04)	
2 (N=97)	6.65		0.90	(−1.01, 0.81)	
3 (N=100)	6.50		0.90	(−1.001, 0.81)	
4 (N=86)	5.94		0.81	(0.72, −0.90)	
5 (N=112)	7.22		Reference		

Note. Navajo Nation Agency numbers are categorical and have no substantive meaning.

* OHS—Oral health status; POQL—Pediatric oral quality of life

Table 4

Factors Associated with Head Start Parent Participation with Oral Health Promotion Events, Navajo Nation, 2011-12

Factor	Bivariable Association (N=518)		Poisson Regression Model (N=455)		
	Correlation or Mean No. of Events	p-value	Regression Coefficient	95% CI	p-value
Number in Household (N=496)	-0.110	0.01	0.94	(0.89, 0.98)	0.008
Parent Education		0.06			0.11
College degree (N=64)	1.30		1.10	(0.76, 1.58)	
Some college/voc. (N=185)	1.31		1.30	(0.96, 1.75)	
HS grad/GED (N=188)	1.29		1.35	(1.01, 1.81)	
<HS grad (N=77)	0.90		Reference		
Income		0.09			0.42
Missing (N=77)	1.25		0.98	(0.74, 1.30)	
\$40K (N=45)	1.56		1.23	(0.92, 1.65)	
\$30K-<\$40K (N=38)	1.68		1.33	(0.98, 1.81)	
\$20K-<\$30K (N=54)	1.26		1.16	(0.86, 1.57)	
\$10K-<\$20K (N=83)	1.18		1.08	(0.83, 1.42)	
<\$10K (N=221)	1.14		Reference		
Working vehicle		0.16			0.19
No (N=70)	1.06		0.82	(0.61, 1.11)	
Yes (N=440)	1.28				
dmfs* (N=497)	-0.115	0.01	0.998	(0.99, 1.002)	0.30
Child OHS*		0.01			0.41
Excellent (N=61)	1.49		1.43	(0.90, 2.29)	
Very good (N=117)	1.18		1.20	(0.78, 1.87)	
Good (N=183)	1.38		1.36	(0.90, 2.07)	
Fair (N=113)	1.05		1.20	(0.78, 1.83)	
Poor (N=37)	0.84		Reference		
POQL* (N=507)	-0.090	0.04	0.995	(0.98, 1.01)	0.48
Oral Health Locus of Control (External Others (N=512)	0.084	0.06	1.11	(1.02, 1.21)	0.02
Perceived Barriers (N=515)	0.073	0.10	1.22	(1.08, 1.38)	0.002
Sense of Coherence (N=503)	0.099	0.03	1.09	(0.99, 1.19)	0.08
Stress					
Expectations (N=508)	-0.067	0.13	0.98	(0.88, 1.09)	0.73
Local Hassles (N=513)	-0.058	0.19	0.97	(0.83, 1.14)	0.72
Cohort year		<0.0001			<0.0001
Fall 2011 (N=286)	0.93		0.59	(0.50, 0.71)	
Fall 2012 (N=232)	1.65		Reference		

* dmfs—decayed, missing, and filled tooth surfaces; OHS—oral health status; POQL—Pediatric Oral Quality of Life