Preventing Cavities in Preschoolers: Testing a Unique Service Delivery Model in American Indian Head Start Programs
“Daadloh Dooleél Happy Healthy Smiles”

Center for Native Oral Health Research
University of Colorado Anschutz Medical Campus
Aurora, CO

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• Center for American Indian and Alaska Native Health at the University of Colorado
  – Spero Manson PhD (Director)

This research is supported by: NIH/National Institute of Dental and Craniofacial Research agreement
U54 DE 019259
Oral Health Disparities Project

• NIDCR/NIH funded five oral health disparities research centers

• Three focus on ECC
  – University of Colorado
  – University of San Francisco
  – Boston University

• Center for Native Oral Health Research (CNOHR) is the only one whose entire focus is on American Indian/Alaska Native Oral health

• Judith Albino PhD (director); Terry Batliner DDS (co-director)
Study Team

PI (2009-2014): David Quissell, PhD
Co-I: Lucinda L. Bryant, PhD MSHA
Field Director (Navajo): Carmen George MS
Field Data Coordinator (Navajo): Nikola Toledo MPA
Community Liaison & Field QA: Diana Cudeii DH MS
Project Managers (Denver):
  Vong Smith BA and Raina Roan BA
Field Staff

Community Oral Health Specialists (COHS)

- Paula Begay
- Stella Begay
- Adrienne Dennison
- Nicole Garcia
- Tracy Goldtooth
- Kandeda Martinez-Cohoe
- Lolita Spencer
- Cerise Watson
- Rose Lee
- Helen Curley

Community Advisory Board

- Ms. Martha Charley
- Mr. Gregory Begay
- Ms. Marie Allen
- Mr. Dexter Albert
- Ms. Melissa Begay
Field Staff

Field Data Collectors

- Raina Roan
- Nik Johs
- Catherine Tuni-Williams
- Rosita Attakei
- Rita White
- Clarina Clark
- Marsha Tsosie
- Claire MacFadyen

- Abigail Berry
- Jayme Aragon
- Charity Watchman
- Sue McIntosh
- Betty Buchanan
- Aji Kobe
- Susan Vogel
- others

Acknowledgements

Special thanks to the Head Start families and the teachers and staff from 52 Navajo Nation Head Start classrooms
Community Partners

• Community Advisory Boards & Committee
  – Ms. Martha Charley
  – Mr. Gregory Begay
  – Ms. Marie Allen
  – Mr. Dexter Albert
  – Ms. Melissa Begay

• Navajo Nation Head Start
• Navajo Nation Department of Health
• Agencies
• Chapter Houses
Community Advisory Board & Committee

• Members provided input and guidance for all CNOHR projects
• Navajo community advisors reviewed all intervention materials
• Advocated for the communities’ participation in the project
• Advised the study staff and investigators regarding recruitment and retention strategies
Field Office Staff

• Field office was managed by tribal/community members who have good community relationships
• They were familiar with the local customs and geography of Navajo Nation
• Spoke the local tribal language and were sensitive to the families’ life-circumstances
Baby Teeth are Important for:

SMILING!
Baby Teeth are Important for:

EATING!

SMILING!
Baby Teeth are Important for:

- SMILING!
- SPEAKING and SINGING!
- EATING!
Baby Teeth are Important for:

- **SMILING!**
- **SPEAKING and SINGING!**
- **EATING!**
- **HOLDING SPACE FOR PERMANENT TEETH!**
- **SMILING!**
The Problem: Early Childhood Tooth Decay

- Tooth decay in primary dentition (baby teeth)
- 7 times more common than obesity
- Most common chronic condition of childhood
- Large disparities exist
- 86% of Navajo children 2-5 years of age


- Pain
- Difficulty chewing
- Worse quality of life
- Severe infections
- Emergency room
- Hospitalizations
- Missed school
Disease Process

CHRONIC INFECTIOUS DISEASE


2. Caregiver vertically transmits bacteria to infant

3. Bacteria feast on carbohydrate-rich diet of child

4. Feast by-product = acid

5. Acid quickly erodes thin enamel surface of child
Early Childhood Caries

A severe, rapidly progressing form of tooth decay in infants and young children.

Initial lesions—white decalcification with beginning enamel breakdown

Late stage lesions—moderate to severe enamel and dentin destruction
Where do cavities come from?

**TOOTH**
- Age
- Fluorides
- Morphology
- Nutrition
- Trace Elements
- Carbonate Level

**SUBSTRATE**
- Oral Clearance
- Oral Hygiene
- Salivary Stimulants
- Frequency of Eating
- Carbohydrate (type, concentration)

**FLOW RATE pH**

**FLORA**
- Strep, Mutans (Substrate)
- Oral Hygiene
- Flouride in Plaque
Specific Aims

Aim 1: Develop a manualized intervention with tribal and community input

Aim 2: Implement a community-based, tribal-delivered, oral health promotion intervention

Aim 3: Compare intervention vs. usual care
   - Change in cavities
   - Change in oral health knowledge and behaviors
Aim 1: Manualized Intervention

• Community Advisory Board
  – Center of Native Oral Health Research
  – Navajo Nation representation

• Community Advisory Committee
  – Navajo Nation
  – Head Start
  – Community Members

• Head Start Partnership

• Navajo Research Staff
Aim 2

Aim 2: Implement a community-based, tribal-delivered, oral health promotion intervention
Cluster-randomized trial of Head Start Centers across Navajo Nation

36 Head Start Centers → 52 classrooms → 26 intervention/26 usual care
Preventing Cavities in Preschoolers Research Study

**WHO:** Children ages 3-6 enrolled in Head Start

**WHEN:**
- **Intervention** (Fall 2011-Spring 2013)
- **Data collection:** Baseline and then annually x 3 years (2011-2014)

**WHERE:** Head Start classrooms across Navajo Nation
Community Oral Health Specialists (COHS)

• Lay tribal community members
• COHS were trained by a team of experts
  – 2 week training
  – instruction in oral disease, behavioral health (1-week)
  – Study design/preparation for enrollment (1-week)
  – Fluoride varnish application training in the field
• COHS also provided oral health promotion activities for children and parents

## Intervention Activities

**4 fluoride varnish applications across the school year**

### #1: Parent Day/Program Kick-off  (Parent and Child Activity #1)

<table>
<thead>
<tr>
<th>Parent/Caregiver activities</th>
<th>Child activities in classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>#2</strong>: Tooth Brushing &amp; Importance of Fluoride</td>
<td><strong>#2</strong>: Brushing for a Healthy Smile</td>
</tr>
<tr>
<td><strong>#3</strong>: You Can Help Prevent Caries</td>
<td><strong>#3</strong>: Our Teeth Do Not Like Sticky Foods–Nutrition</td>
</tr>
<tr>
<td><strong>#4</strong>: Healthy Adult Teeth Start with Healthy Baby Teeth</td>
<td><strong>#4</strong>: Visiting the Dentist</td>
</tr>
<tr>
<td></td>
<td><strong>#5</strong>: Fluoride is Our Friend</td>
</tr>
</tbody>
</table>

All include **self-management goal-setting activity**
Check your water at home to see if it has fluoride or not.

Fluoride varnish is a great source of fluoride.

Use toothpastes with fluoride.

Drink more tap water.

Fluoride Strengthens Teeth

Drink less bottled water without fluoride.
Your Name (Parent/Caregiver):
Name of your Head Start Child:
Phone Number:
Alternative Phone Number:

How you take care of your child's teeth is very important. Here is a list of things that you should do to help prevent cavities in your children. Circle the one you will do.

- Brush your child's teeth every morning and evening
- Help your child brush their teeth
- Brush with toothpaste with fluoride
- Don't share things you put in your mouth
- Eat fewer sugary, sticky snacks
- Eat more healthy snacks
- Drink less sugary drinks (juice, pop, soda, etc.)
- Avoid frequent snacking
- Drink tap water
- Stop the sippy cup
- Visit the dental provider 2 times a year

David Guazzelli, PhD  Principal Investigator; Preventing Caries in Preschoolers: Testing a Unique Service Delivery Model in American Indian Head Start Programs
COMPA 808-0992 / HHSR 800-5203 / NN-6588 IN-435 R 10/25/8
**Desired learning outcomes**

- Head Start parents will be able to recognize healthy teeth and will regularly screen/observe for signs of oral/dental abnormality.
- Head Start parents will report and seek care for children with dental abnormality.
- Children will be able to recall and state the functions of teeth.
- Children will express positive self care behaviors.
- Head Start parents will state the importance of children’s primary teeth.
Study Progress

Enrollment completed: 52 HS classrooms
-- 26 Intervention/26 Control
-- 1016 Caregiver/Child Dyads

Intervention completed
• 2011-12 and 2012-13 school years

Measuring outcomes
• Fall 2012 (Baseline assessment)
• Fall 2013 (Longitudinal data collection)
• Fall 2014 (Final data collection)
Outcome Measures

• Primary Outcome: level of caries disease (dmfs)

• Secondary Outcomes (survey)
  – Sociodemographic data: gender, age, education, employment, income, household composition, location of residence
  – Mediators/Moderators
    • Oral health factors: oral health-related quality of life, knowledge, attitudes, beliefs, behaviors
    • Psychological influences: distress, chronic, stress, social support, ethnic identity, perceived discrimination
    • Other health/risk factors: tobacco/alcohol use, health comorbidities.
Analytic Plan

• Baseline characteristics
  – t-tests for continuous variables
  – chi-square test for categorical variables

• Dental decay (dmfs, ds, and DMFS over time):
  – over-dispersed Poisson model

• Modified Intention-to-Treat

• Per-Protocol
BASELINE DATA

Daadloh Dooleel • Happy, Healthy Smiles
## Baseline Characteristics: Caregiver

### Modified Intention to Treat Cohort

<table>
<thead>
<tr>
<th>Caregiver Characteristic</th>
<th>Intervention (N = 463) Mean (SE) or %</th>
<th>Usual Care (N = 434) Mean (SE) or %</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>32.7 (0.5)</td>
<td>31.1 (0.5)</td>
<td>0.036</td>
</tr>
<tr>
<td>Gender (female)</td>
<td>85.1%</td>
<td>82.3%</td>
<td>0.27</td>
</tr>
<tr>
<td>Caregiver (mother)</td>
<td>77.5%</td>
<td>76.5%</td>
<td>0.12</td>
</tr>
<tr>
<td>Education (years)</td>
<td>13.8 (0.2)</td>
<td>13.5 (0.1)</td>
<td>0.21</td>
</tr>
<tr>
<td>No. Children in home</td>
<td>3.0 (0.1)</td>
<td>2.9 (0.1)</td>
<td>0.34</td>
</tr>
</tbody>
</table>
# Baseline Characteristics: Caregiver

## Modified Intention to Treat Cohort

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<thead>
<tr>
<th>Caregiver Characteristic</th>
<th>Intervention (N = 463) Mean (SE) or %</th>
<th>Usual Care (N = 434) Mean (SE) or %</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral Health Status*</td>
<td>3.3 (0.1)</td>
<td>3.2 (0.1)</td>
<td>0.81</td>
</tr>
<tr>
<td>Oral Health Knowledge Score**</td>
<td>75.1 (0.8)</td>
<td>73.6 (0.6)</td>
<td>0.14</td>
</tr>
<tr>
<td>Oral Health Behavior Score***</td>
<td>75.1 (0.8)</td>
<td>73.6 (0.6)</td>
<td>0.14</td>
</tr>
</tbody>
</table>

* Oral Health Status: 1 = Excellent, 2 = Very Good, 3 = Good, 4 = Fair, 5 = Poor
** Oral Health Knowledge:
*** Oral Health Behavior Score:
## Baseline Characteristics: Child

<table>
<thead>
<tr>
<th>Child Characteristic</th>
<th>Intervention Mean(SE) or %</th>
<th>Usual Care Mean(SE) or %</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>3.7 (0.3)</td>
<td>3.7 (0.04)</td>
<td>0.69</td>
</tr>
<tr>
<td>Gender (female)</td>
<td>51.0%</td>
<td>49.1%</td>
<td>0.69</td>
</tr>
<tr>
<td>Routine Dental Visit</td>
<td>88.6%</td>
<td>86.6%</td>
<td>0.41</td>
</tr>
<tr>
<td>Problem Dental Visit</td>
<td>53.1%</td>
<td>52.4%</td>
<td>0.41</td>
</tr>
<tr>
<td>Fluoride varnish past</td>
<td>81.4%</td>
<td>88.0%</td>
<td>0.14</td>
</tr>
<tr>
<td>Oral Health Status*</td>
<td>2.9 (0.1)</td>
<td>3.0 (0.1)</td>
<td>0.39</td>
</tr>
</tbody>
</table>

* 1 = Excellent, 2 = Very Good, 3 = Good, 4 = Fair, 5 = Poor
### Baseline Characteristics: Child

Modified Intention to Treat Cohort  
N = 883

<table>
<thead>
<tr>
<th>Child Characteristic</th>
<th>Intervention Mean (SE) or %</th>
<th>Usual Care Mean (SE) or %</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental decay (%)</td>
<td>86.5%</td>
<td>90.1%</td>
<td>0.13</td>
</tr>
<tr>
<td>dmfs</td>
<td>19.9 (1.0)</td>
<td>22.8 (1.2)</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Baseline dmfs
(maximum number of primary teeth surfaces – 92)

Distribution by Age
Age 3: Mean = 18.09 (N = 398)
Age 4: Mean = 22.94 (N = 537)
Age 5: Mean = 39.04 (N = 23)

(US population ages 2-5: dfs* = 2.58)
(Source: NHANES 1999-2004; dfs = decayed or filled surfaces, not missing)
Intervention Participation

Per-Protocol = ≥ 3 fluoride AND ≥ 3 child events AND ≥ 1 parent event
Results
## Modified Intention-to-Treat (N = 897)

<table>
<thead>
<tr>
<th>Timeline</th>
<th>N Int : UC</th>
<th>Disease (%) Int : UC</th>
<th>Intervention dmfs Mean (SD)</th>
<th>Usual Care dmfs Mean (SD)</th>
<th>p - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline (2011/2012)</td>
<td>443 : 424</td>
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<td></td>
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<td>Year 1 (2012/2013)</td>
<td>217 : 231</td>
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<td>Year 2 (2013/2014)</td>
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<td>Year 3 (2014)</td>
<td>118 : 111</td>
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**DMFS > 0**

| Year 3 (2014) | 118 : 111 |   |   |   |   |   |
# Modified Intention-to-Treat (N = 897)

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<th>Timeline</th>
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<td>Year 2 (2013/2014)</td>
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<td>95.4 : 96.1</td>
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<td>96.6 : 98.2</td>
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<th>DMFS &gt; 0</th>
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<tr>
<td>Year 3 (2014)</td>
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<td>39.8 : 42.3</td>
<td>1.6 (2.7)</td>
<td>1.6 (2.6)</td>
<td>0.43</td>
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</table>
Per-Protocol Analysis (N = 681)

<table>
<thead>
<tr>
<th>Timeline</th>
<th>N</th>
<th>Disease (%)</th>
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<td>Year 2 (2013/2014)</td>
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<td>Year 3 (2014)</td>
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<tr>
<td>Year 3 (2014)</td>
<td>585 : 111</td>
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Per-Protocol = ≥ 3 fluoride AND ≥ 3 child events AND ≥ 1 parent event
# Per-Protocol Analysis (N = 681)

<table>
<thead>
<tr>
<th>Timeline</th>
<th>N</th>
<th>Disease (%)</th>
<th>Intervention dmfs Mean (SD)</th>
<th>Usual Care dmfs Mean (SD)</th>
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<td>81.9 : 90.1</td>
<td>18.1 (19.8)</td>
<td>22.8 (20.1)</td>
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<tr>
<td>Year 1 (2012/2013)</td>
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<td>88.9 : 90.1</td>
<td>22.7 (20.7)</td>
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</tr>
<tr>
<td>Year 2 (2013/2014)</td>
<td>139 : 225</td>
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<td>25.5 (20.6)</td>
<td>31.2 (21.3)</td>
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</tr>
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<td>Year 3 (2014)</td>
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<tr>
<td>Year 3 (2014)</td>
<td>585 : 111</td>
<td>32.8 : 42.3</td>
<td>1.4 (2.5)</td>
<td>1.6 (2.6)</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Per-Protocol = ≥ 3 fluoride AND ≥ 3 child events AND ≥ 1 parent event
## Modified Intention-to-Treat Oral Health Knowledge Score

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Intervention Mean (SD)</th>
<th>Usual Care Mean (SD)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline (2011/2012)</td>
<td>75.1 (13.7)</td>
<td>73.6 (13.1)</td>
<td>0.37</td>
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<tr>
<td>Year 1 (2012/2013)</td>
<td>80.4 (13.1)</td>
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</tr>
<tr>
<td>Year 2 (2013/2014)</td>
<td>81.4 (14.8)</td>
<td>78.0 (13.2)</td>
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<td>79.5 (12.8)</td>
<td></td>
</tr>
<tr>
<td>Timeline</td>
<td>Intervention Mean (SD)</td>
<td>Usual Care Mean (SD)</td>
<td>p - value</td>
</tr>
<tr>
<td>----------------</td>
<td>------------------------</td>
<td>----------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Baseline (2011/2012)</td>
<td>75.2 (13.7)</td>
<td>73.6 (13.1)</td>
<td>0.01</td>
</tr>
<tr>
<td>Year 1 (2012/2013)</td>
<td>82.8 (11.9)</td>
<td>76.8 (13.5)</td>
<td></td>
</tr>
<tr>
<td>Year 2 (2013/2014)</td>
<td>81.7 (15.0)</td>
<td>78.0 (13.2)</td>
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</tr>
<tr>
<td>Year 3 (2014)</td>
<td>80.1 (13.2)</td>
<td>79.5 (12.8)</td>
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</tr>
</tbody>
</table>

Per-Protocol = ≥ 3 fluoride AND ≥ 3 child events AND ≥ 1 parent event
## Modified Intention-to-Treat Oral Health Behavior Score

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Intervention Mean (SD)</th>
<th>Usual Care Mean (SD)</th>
<th>p - value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline (2011/2012)</td>
<td>54.4 (19.3)</td>
<td>56.1 (18.3)</td>
<td>0.0006</td>
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<tr>
<td>Year 1 (2012/2013)</td>
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</tr>
<tr>
<td>Year 2 (2013/2014)</td>
<td>63.4 (18.7)</td>
<td>61.1 (18.3)</td>
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</tr>
<tr>
<td>Year 3 (2014)</td>
<td>65.6 (18.9)</td>
<td>66.4 (17.6)</td>
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</tbody>
</table>
## Per-Protocol Oral Health Behavior Score

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Intervention</th>
<th>Usual Care</th>
<th>p - value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
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</tr>
<tr>
<td>Baseline (2011/2012)</td>
<td>54.5 (19.2)</td>
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<tr>
<td>Year 1 (2012/2013)</td>
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<tr>
<td>Year 2 (2013/2014)</td>
<td>64.3 (19.3)</td>
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</tr>
<tr>
<td>Year 3 (2014)</td>
<td>66.8 (19.1)</td>
<td>66.4 (17.6)</td>
<td></td>
</tr>
</tbody>
</table>

Per-Protocol = ≥ 3 fluoride AND ≥ 3 child events AND ≥ 1 parent event
Caregiver Resources, Barriers, and Health Status

- Oral Health Literacy
- Comorbidities
- Parent’s Oral Health Status
- Alcohol Use
- Distress Factors
- Chronic Stress
- Perceived Discrimination
- Tribal Identity
- Sense of Coherence
- Social Support
- Access to a Working Vehicle
Intervention vs. Usual

- Significantly related to increases in caries
  - Stress/hassles ($r = 0.076, p = 0.04$)
  - Less financial stability ($r = -0.072, p = 0.0514$)
  - Lower internal Oral LOC ($r = -0.11, p = 0.002$)
  - Lower perceived seriousness ($r = -0.076, p = 0.04$)
  - Higher perceived barriers ($r = 0.097, p = 0.009$)

($r$: correlation coefficient)
Results

In multiple regression analysis, only internal LOC (locus of control) remained statistically significant ($p = 0.01$)
BARRIERS, CHALLENGES & SOLUTIONS
Communication

- Main communication tool: in person contact and phones
-Disconnected or nonfunctioning telephone lines posed one of the most common and difficult challenges
- Close collaboration between Head Start teachers and field staff
Retention Strategies

- Letter Sent Home: 53%
- Phone, Text and emails: 20%
- Home Visit (Only Year 4): 19%
- Through Head Start Staff: 4%
- Word of mouth: 3%
- Other...
Parent Attendance

Our Community Advisory Committee made suggestions to increase attendance.

• Increase communication with the parents
• Make the communications more personalized
• Partner with local parent committees
• Schedule events to accommodate work schedules
Findings

• Dental decay of **epidemic proportion** before started.

• Intervention caregivers had **better reported oral health knowledge and behaviors** than usual care.

• Parent/caregiver perception of themselves as **being able to control or influence their children’s oral health** was related to less serious dental caries increments (dmfs) over time.
Findings

- Intervention unable to impact level of caries disease compared to usual care in real-world setting (intention-to-treat).
- However, if enough intervention received—fewer children got disease and had fewer cavities.
- Caries at conclusion of intervention was extreme.
Conclusions (1)

- **Community participation** in development of oral health intervention was essential.
- Training **tribal community members** to become **Community Oral Health Specialists** was a community-based strategy to address a major health problem of Navajo children.
- Delivering an oral health promotion intervention in Head Start classrooms optimized **recruitment** and **intervention delivery** to children.
- However, **parent participation** in Head Start intervention less than optimal.
Take Away Messages

• Early childhood caries of epidemic proportion by the time children begin Head Start.
• Two is too late—begin prevention before the eruption of the first tooth.
• Dental restorations are critical to controlling disease.
• Changing parent behaviors is difficult.
Specific Recommendations

• Start prevention early in programs.
  – WIC, Nurse Family Partnership, Prenatal Programs
  – Early Head Start/Home-Based Head Start

• Increase access to restorative services.
  – Dental Therapists, Interim Therapeutic Restorations, Silver Diamine Fluoride

• Consider new models of care delivery in community.
  – Tele-dentistry

• Reduce access to sugary sweetened beverages.
• Increase access to healthy water.
Acknowledgements

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Thank You

http://www.ucdenver.edu/academics/colleges/PublicHealth/research/centers/CAIANH/cnohr/Pages/cnohr.aspx

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