



## AGENDA

Prior to the Advisory Committee meeting for Dental Pilot Project #100, there will be a public presentation by Dr. Tim Ricks and the Oregon Health Authority. Please see the following page more information.

Due to the presentation, the Advisory Committee meeting will officially begin at 1:00pm in Room 900.

9:30-11:30	TIM RICKS, DMD, MPH, REAR ADMIRAL, ASSISTANT SURGEON GENERAL Chief Dental Officer, US Public Health Service Deputy Director, IHS Division of Oral Health
11:30-1:00	Lunch on Your Own

“Oregon Tribes Dental Health Aide Therapist Pilot Project”  
Annual Dental Pilot Project Program  
Advisory Committee Meeting DPP #100  
**September 23, 2019 1:00pm-4:00pm**  
**Conference Call In: 1-888-636-3807 Code: 79 38 00**

Location: Portland State Office Building <b>Room 900, 9<sup>th</sup> Floor</b>		
1:00-1:10	Official Introductions, Agenda Review, Housekeeping	Sarah Kowalski, RDH, MS
1:10-1:50	Presentation, Dental therapists linked to improved dental outcomes.	Donald L. Chi, DDS, PhD
1:50-2:20	<i>Questions and Answers</i>	
2:20-2:30	<b><i>Break</i></b>	
2:30-3:00	Northwest Portland Area Indian Health Board, Update and Presentation; Update on CODA	Pam Johnson Miranda Davis, DDS Gita Yitta, DMD
3:00-3:10	<i>Questions and Answers</i>	
3:10-3:40	Evaluation and Monitoring Activities; Chart Review Process Overview; Scoring Methodology	Fred King, MS, PhD Kelly Hansen
3:40-3:50	<i>Questions and Answers</i>	
3:50-3:55	OHA Program Updates, Meeting Schedule, Site Visit Schedule	Sarah Kowalski, RDH, MS Kelly Hansen
3:55-4:00	Public Comment Period	Public comments are limited to 2 minutes per individual

- Invited representatives from the Northwest Portland Area Indian Health Board are invited to participate fully in the the Advisory Committee meeting.
- Next Meeting: **Monday, December 16<sup>th</sup>, 2019**, Portland State Office Building – 10:00am-12:00pm
  - Calibration Training: Monday, December 16<sup>th</sup>, 2019, Portland State Office Building – 12:30-4:00pm

---

# Quarterly Advisory Committee Meeting

## Dental Pilot Project #100 "Oregon Tribes Dental Health Aide Therapist Pilot Project"

September 23, 2019



# Dental Therapists in Alaska's YK Delta: A Mixed Methods Evaluation

---

Donald L. Chi

University of Washington



@donaldLchi

Oregon Health Authority

September 2019

# objective

share findings from mixed-methods evaluation of dental therapists in Alaska's YK Delta







*Era Alaska*

**N1275N**

KPN

INSPECTED  
FROZEN

















DURACELL  
COPPERTOP  
BATTERIES

BICYCLE  
JUMBO

CUP NOODLES  
CHICKEN FLAVOR

DURACELL  
COPPERTOP  
BATTERIES

CUP NOODLES  
CHICKEN FLAVOR  
For the Very Best in Ramen Noodle Soup

70662-03502  
NISSIN  
CUP NOODLES

CUP NOODLES  
FAMILY PACK

CUP NOODLES  
CHICKEN FLAVOR  
For the Very Best in Ramen Noodle Soup

WITH SHRIMP  
6-2.25 OZ (64g) CUPS  
TOTAL NET WT. 13.5 OZ (384g)  
RAMEN NOODLE SOUP

CUP NOODLES  
WITH SHRIMP

Top Ramen  
Cups of Noodles  
CHICKEN FLAVOR

70662-03501  
NISSIN  
CUP NOODLES

SHRIMP FLAVOR

CHICKEN FLAVOR

BEEF FLAVOR  
6-2.25 OZ (64g) CUPS  
TOTAL NET WT. 13.5 OZ (384g)  
RAMEN NOODLE SOUP

CHICKEN FLAVOR

CHICKEN FLAVOR

Top Ramen  
CHICKEN FLAVOR  
6-2.25 OZ (64g) CUPS  
TOTAL NET WT. 13.5 OZ (384g)

CHICKEN FLAVOR

CHICKEN FLAVOR

Top Ramen  
CHICKEN FLAVOR

CHICKEN FLAVOR

CHICKEN FLAVOR

Top Ramen  
CHICKEN FLAVOR

CHICKEN FLAVOR

Original  
CUP NOODLES

Top Ramen  
CHICKEN FLAVOR

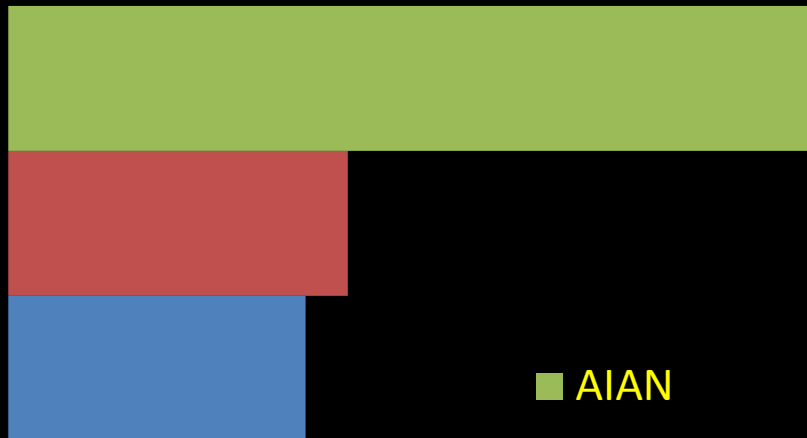
The Original  
CUP NOODLES  
CHICKEN FLAVOR





3.91 ea.

untreated decay



preschoolers  
ages 3-5

- AIAN
- US
- HP2020

caries experience



0 10 20 30 40 50 60 70 80 %





**Kool-Aid** TROPICAL PUNCH SAVE 34 QUARTS

**COUNTRY TIME** LEMONADE 136

**Kool-Aid** TROPICAL PUNCH SAVE 34 QUARTS

**Kool-Aid** TROPICAL PUNCH SAVE 34 QUARTS

**COUNTRY TIME** LEMONADE 136

**Kool-Aid** TROPICAL PUNCH SAVE 34 QUARTS

**Kool-Aid** TROPICAL PUNCH SAVE 34 QUARTS

**COUNTRY TIME** LEMONADE 136

**Kool-Aid** TROPICAL PUNCH SAVE 34 QUARTS

**Kool-Aid** TROPICAL PUNCH SAVE 34 QUARTS

**COUNTRY TIME** LEMONADE 136

**Kool-Aid** TROPICAL PUNCH SAVE 34 QUARTS



# mean daily intake



=



sugared fruits  
drinks @ home

# context

## Alaska Native history

Settler colonialism: **sugar**, flour, fat, salt

Permafrost

Isolated communities and provider shortages

## Tooth decay: a multifactorial disease

High sugar diet

Inadequate fluoride

No dental care

# questions

**Do outcomes improve as the number of DT treatment days increase?**

**What is the impact of DT as reported by providers and experienced by community members?**



# Q1 methods

Data (2006 to 2015)

YKHC dental EHR, N=28,191

Medicaid data, N=22,351

Community-level geocoding

Predictor: DT treatment days (EHR)

Continuous variable

# Q1 methods

5 dental use measures (EHR and Medicaid)

Children with preventive care (exam, cleaning, or fluoride)

Children <3y with D-E-F-G extraction

Children <6y with treatment under general anesthesia

Adults with preventive care

Adults with extraction

# Q1 methods

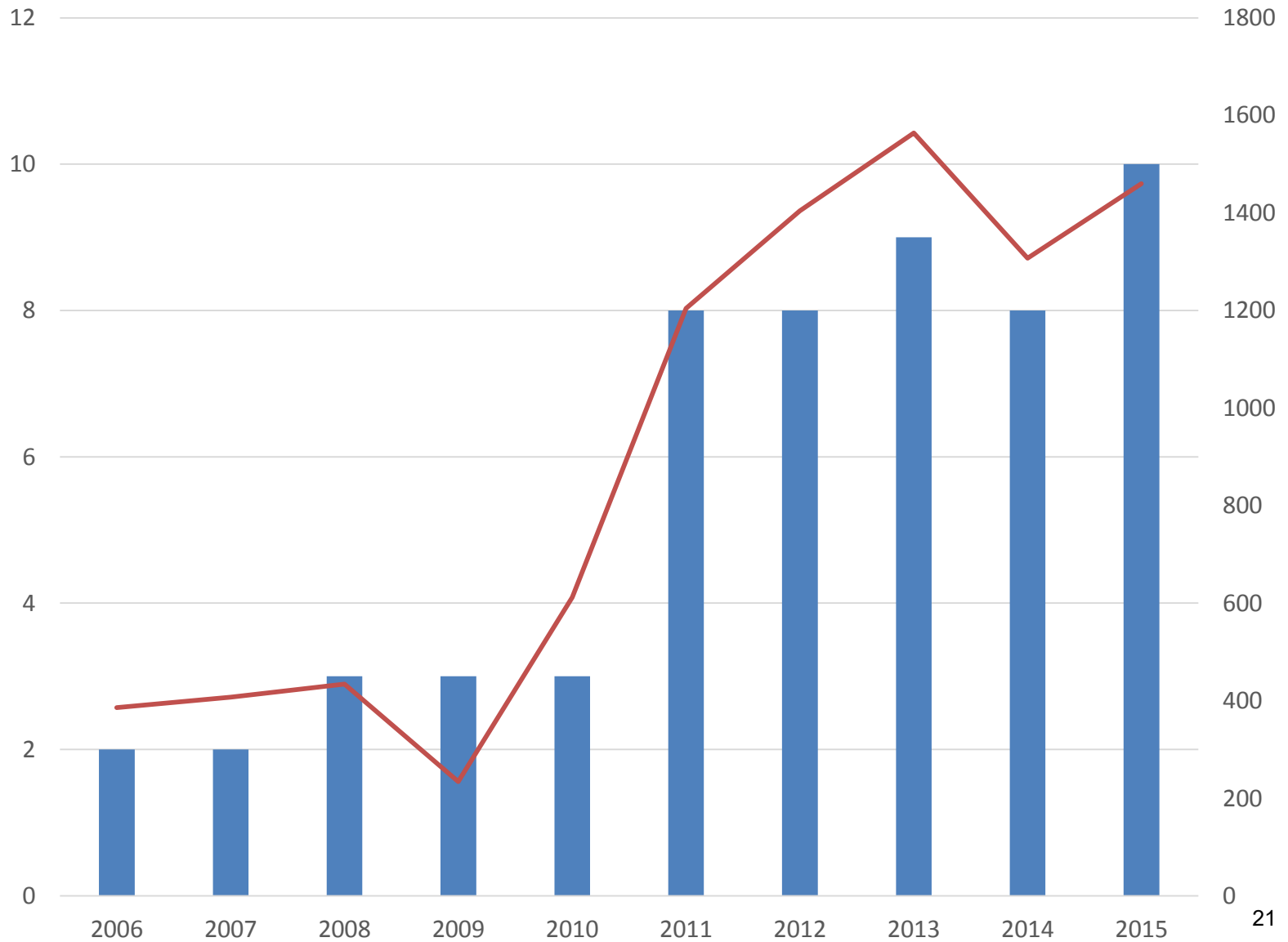
Spearman partial correlation coefficients

Adjusted for 2 confounders

dentist treatment days

baseline poverty

# # of DTs and treatment days





# use

Outcome	10-year mean (EHR)	10-year mean (Medicaid)
Child preventive care	31.8%	15.4%
D-E-F-G extraction	14.0%	3.1%
General anesthesia	5.7%	5.4%
Adult preventive care	18.7%	3.8%
Adult extraction	32.9%	7.8%

# Spearman partial correlation coefficients\*

Outcome	Coefficient (EHR)	P-value	Coefficient (Medicaid)	P-value
Child preventive care	<b>+0.26</b>	<.0001	<b>+0.23</b>	<.001
D-E-F-G extraction	<b>-0.28</b>	<.0001	<b>-0.17</b>	0.03
General anesthesia	<b>-0.27</b>	<.0001	+0.05	0.45
Adult preventive care	<b>+0.30</b>	<.0001	<b>+0.20</b>	<.001
Adult extraction	<b>-0.46</b>	<.0001	<b>-0.16</b>	0.02

\*adjusted for dentist treatment days and baseline poverty

# Q2 methods

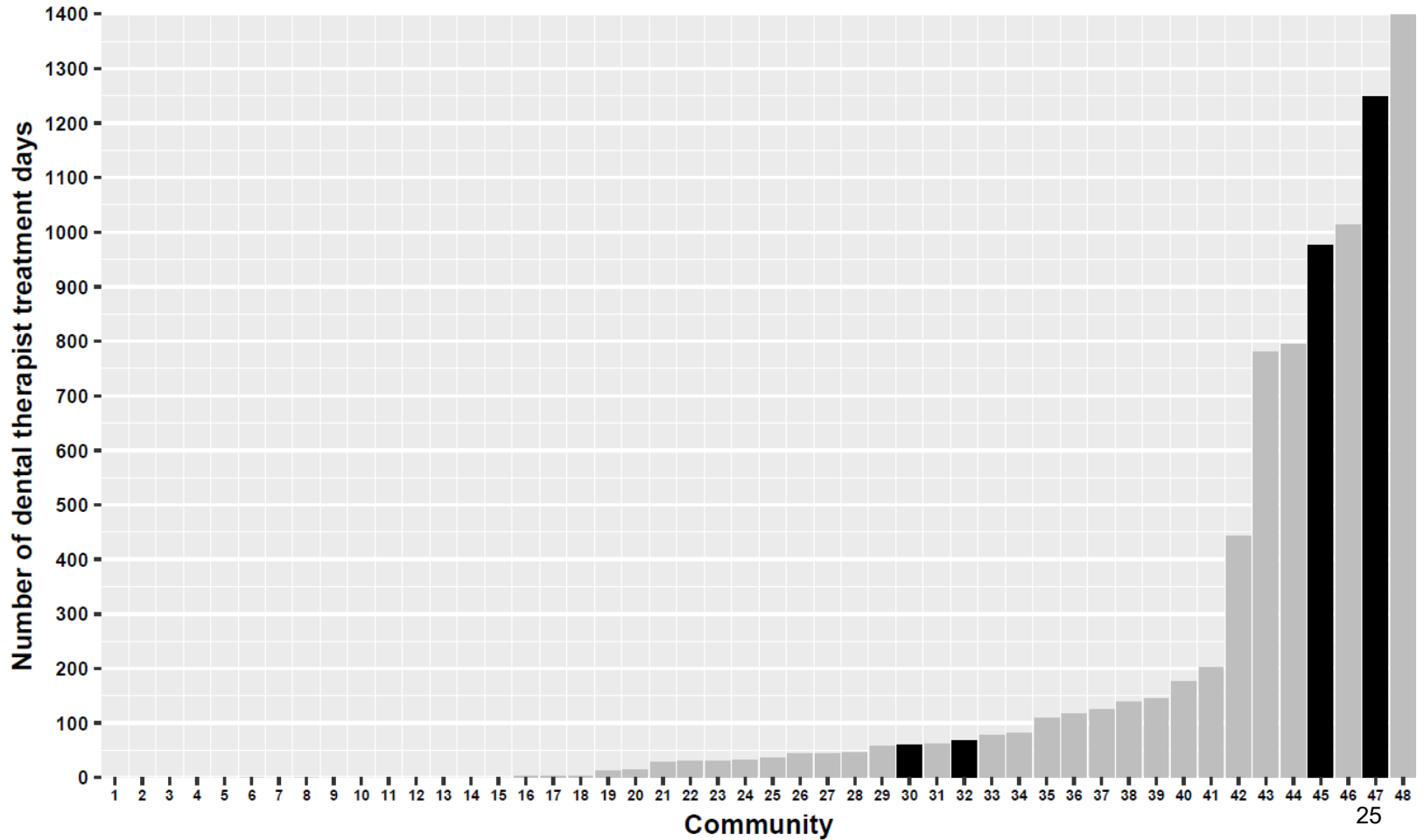
telephone interviews with YKHC providers (N=16)

in-person interviews and focus groups with individuals from 6 YK Delta communities (N=125)

semi-structured interviews, digitally recorded and transcribed, inductive coding and content analytic techniques

# Q2 methods

6 communities selected on exposure to DT (high, medium, no)



# results

## providers

increased knowledge about oral health, evolving norms, less disease, and improved quality of life

communities have benefited from restorative and preventive care provided by DT (e.g., children with no cavities)

DT have a limited scope of practice

satisfied, but adults continue to have unmet needs

# results

## community members

high levels of unmet needs among adults because of inability to access routine and non-emergency care

multiple points of care: local communities (direct care or triage), sub-regional clinics, Bethel, Anchorage (resources)

greater levels of health education, treatment, disease prevention, and improve quality of life

changing norms, values



# conclusions

DT have made important contributions to the oral health care delivery system in the YK Delta

Providers and community members are satisfied with the program

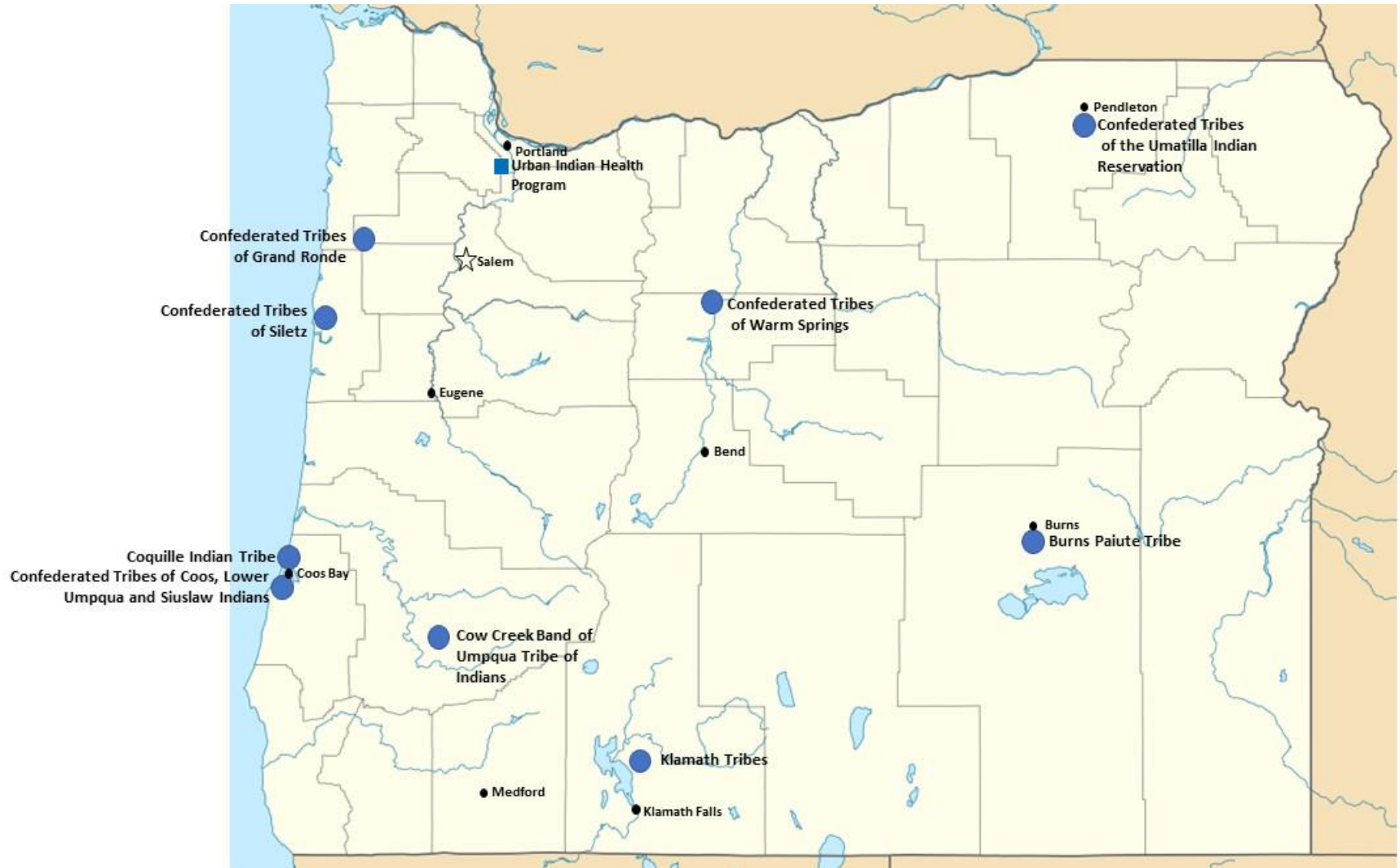
Future opportunities to incorporate behavioral strategies (to optimize prevention) and address unmet needs in adults

# discussion & questions

Study was funded in part by the Pew Charitable Trusts, the Kellogg Foundation, and the Rasmuson Foundation

**dchi@uw.edu**  
**@donaldLchi**

# Oregon's Nine Federally Recognized Tribes



# Termination & Relocation

---

The Klamath Termination Act (PL 587) enacted in 1954 and terminated Federal supervision over land and members

The Western Oregon Indian Termination Act (PL 588) was passed in August 1954 as part of the United States Indian termination policy and affected ~60 Oregon Tribes (Siletz, Grand Ronde, Coquille, Coos, Lower Umpqua, Siuslaw, and other Oregon tribes) effective immediately

The Indian Relocation Act of 1956 encouraged Native Americans to leave Indian reservations, acquire vocational skills, and assimilate into the general population



# Historical Trauma

Historical trauma refers to cumulative emotional and psychological wounding, extending over an individual lifespan and across generations, caused by traumatic experiences.

- Loss of Land
- Loss of Culture
- Loss of Language
- Boarding Schools
- Relocation Act

How do these things continue to affect Native people and where they live, work and play?



# Restoration 1977-1989

1977, the Siletz Tribe was recognized and restored

1982, the Cow Creek Band of the Umpqua Tribe was restored

1983, Grand Ronde Restoration Act (PL 98-165), creating the Confederated Tribes of Grand Ronde

1984, Coos, Lower Umpqua, and Siuslaw had trust status restored

1986, Klamath had their trust status restored

1989, Coquille Restoration Act to restore federal trust relationship

**WE ARE STILL HERE! WE ARE STRONG! WE ARE RESILIENT!**





# Oregon Indian Population

- 129,579 AI/AN (alone or in combination, ACS 2015)

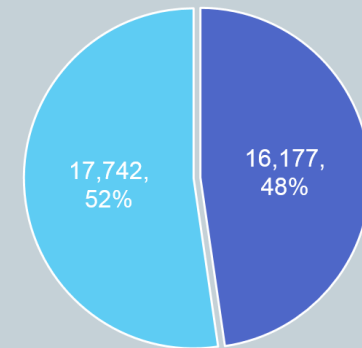
Total HNA Enrollment	Total Enrollment	% of Total
33,919	945,619	3.5%

- 15,314 AI/AN in Portland (alone or in combination, ACS 2015)

- Portland is 9<sup>th</sup> largest Native American population in USA
- AI/AN Enrolled in OHP

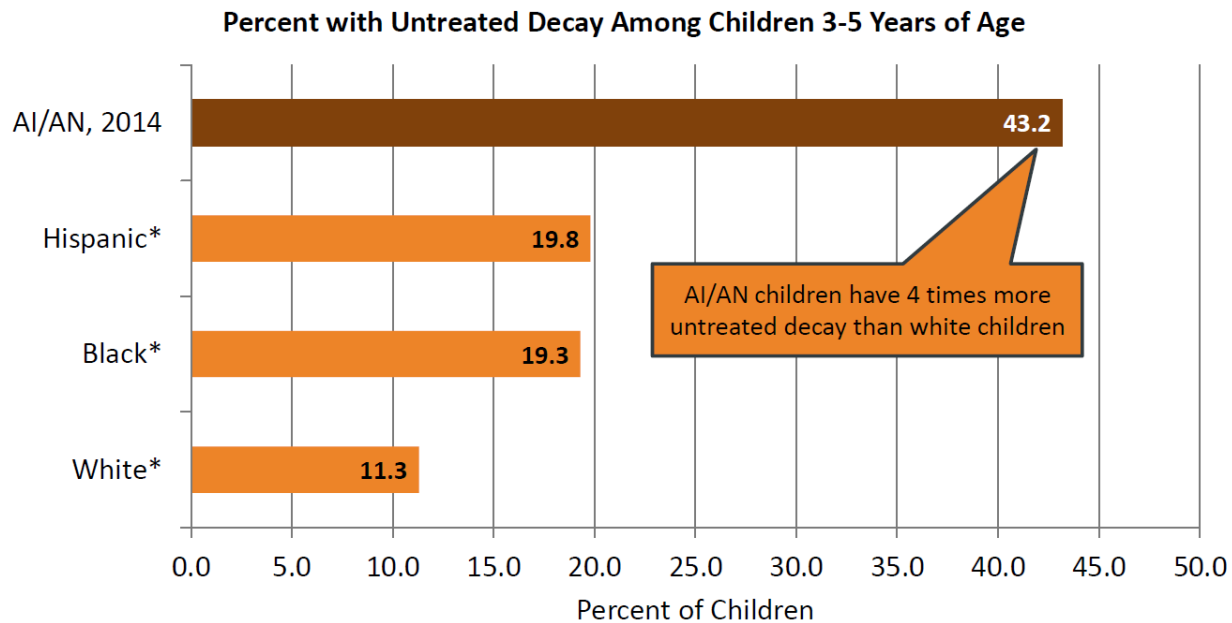
Fee For Service/Managed Care

Fee For Service / Managed Care



# Oral Health Disparities

## FINDING # 2 (CONT.): AI/AN CHILDREN HAVE MORE TOOTH DECAY THAN OTHER POPULATIONS

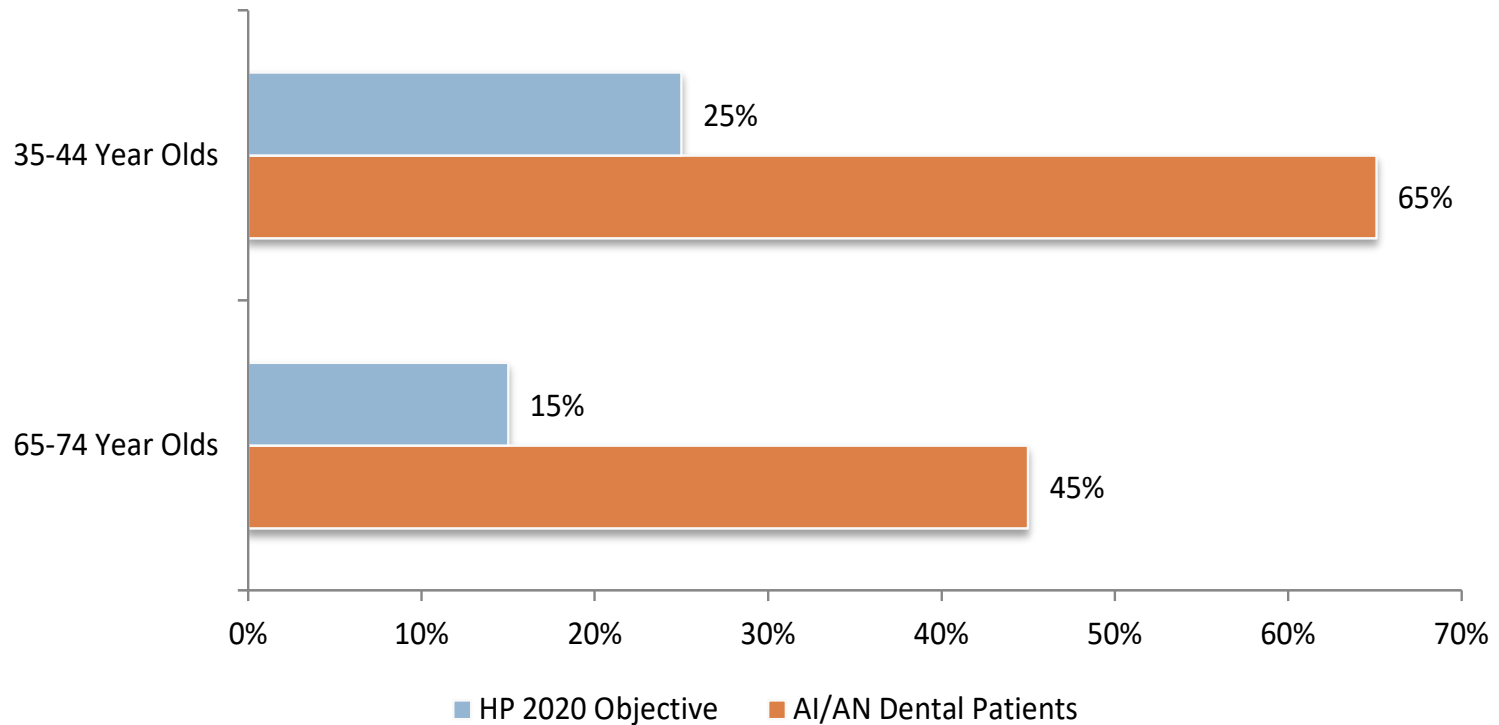


\* Data Source: NHANES 2009-2010



## Indian Health Service Data Brief ❖ March 2016

Figure 2: Percent of Adults with Untreated Tooth Decay by Age Group  
AI/AN Dental Patients (IHS 2015) Compared to HP 2020 Objectives



# What are the barriers to care?

- Shortage and high turnover rate of dentists in tribal communities
- Lack of resources—IHS chronically underfunded
- Cost of care
- Historical trauma
- Lack of culturally competent providers
- Geographic isolation



# An oral health care solution: Dental Health Aide Therapists



- Model began in the 1920s, brought to US by Alaska Natives 2006 as part of Community Health Aide Program.
- Dental therapists practice in 54 countries, and in the US authorized in AK, MN, ME, VT, WA, AZ, MI, NM, ID and OR pilots.
- Alaska DHAT Education Program is a partnership between Alaska Native Tribal Health Consortium and Ilisagvik Tribal College. It uses a 2-calendar-year curriculum and students graduate with a AAS degree.

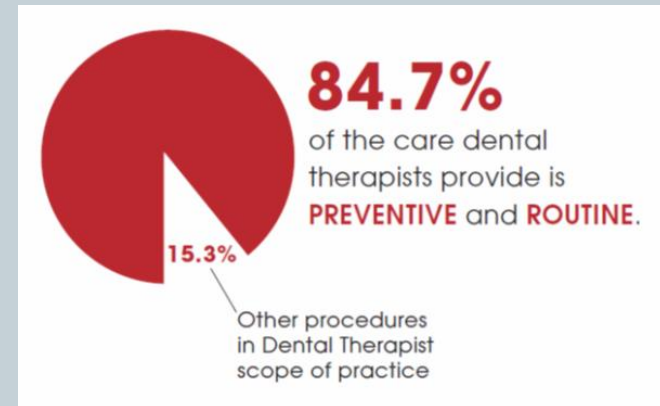




# What do Dental Therapists *do*?

1. Most of scope is preventive and routine
2. Treat dental disease when present and within scope of practice

- ✓ Patient education
- ✓ Dental exams/evaluations
- ✓ Fluoride
- ✓ Sealants
- ✓ Simple cleanings
- ✓ Removing dental decay
- ✓ Fillings
- ✓ Simple extractions



# Pilot Project #100: Tribal Dental Health Aide Therapist Project

---

**Purpose:** Develop a new category of dental personnel in Oregon and teach new oral health care roles to previously untrained individuals. We will be recruiting, training and employing Dental Health Aide Therapists, primary care oral health providers, to work in underserved tribal communities to achieve pilot objectives.

**Short term objectives:**

Increase the efficiency of the dental clinic and dental team;  
Increase the ability of tribal health programs to meet unmet need;  
Increase provider job satisfaction and patient satisfaction.

**Long term objectives:**

Increase the number of Native providers serving Native communities;  
Increase patient education at the community level;  
Increase treatment of decay and decrease decay rates in pilot populations;  
Improve overall understanding of oral health in relation to overall health, and:  
Improve oral care behaviors in pilot communities.



# NPAIHB Partner Sites: Tribal Dental Health Aide Therapist Project





Marissa Gardner  
CTCLUSI



Naomi Petrie, CTCLUSI



Jason Mecum  
Coquille



Alex Jones, Coquille



Kari Douglass, NARA



# Key Pilot Project #100 staff and consultants

---

Project Dental Director: Gita Yitta, DMD

Consulting Dentist: Dane Lenaker, DMD

NARA Supervising Dentist: Azma Ahmed, DDS

CTCLUSI Supervising Dentist: Sarah Rodgers, DMD

External Evaluating Dentist: Cheryl Sixkiller, DDS

NPAIHB (project sponsor) Staff: Miranda Davis, DDS, MPH; Joe Finkbonner, RPh, MHA; Christina Peters; Pam Johnson

Evaluators: Joan LaFrance, EdD; Janet Gordon, PhD, Mekinak Consulting

Site Health Directors: Allyson Lecatsas, NARA; Kelle Little, RDN, Coquille; Vicki Faciane, CTCLUSI

Site DHAT coordinators: April Geisler, NARA; Dennita Antonellis-John, MPH, Coquille; Jamie Meyers, CTCLUSI





# Pilot Project #100 Internal Advisory Committee

**Christopher G. Halliday, D.D.S., M.P.H.,  
RADM (ret.),**

Deputy Director, Division Of Oral Health, Indian  
Health Service HQ

**Victoria Warren-Mears, PhD, RDN, FAND**

Director, Northwest Tribal Epidemiology Center

**Mary Williard, DDS**

Director, Alaska Dental Therapy Education  
Program

Alaska Native Tribal Health Consortium

**Kelle Little, RDN**

Health and Human Services Administrator  
Coquille Indian Tribe Community Health Center

**Vicki Faciane**

Health and Human Services Administrator,  
CTCLUSI

**Allyson Lacatsas**

Director of Health Services, NARA

**Chief Warren Brainard, CTCLUSI**

**Rachael Hogan, DDS**

Dental Director, Swinomish Indian Tribal  
Community

Washington State Dental Association Member  
Arcora Foundation Board Member

**Frank Catalanotto, DMD**

Professor, Department of Community Dentistry  
and Behavioral Science, University of Florida  
College of Dentistry



# Monitoring Safety and Quality

---

## **Before students return to employment sites:**

- Graduate from Alaska Dental Therapy Education Program (ADTEP). Cannot graduate without showing competency in every procedure, and have a full year's worth of clinic work as part of the program.
- Supervising dentists undergo training provided by ADTEP and Pilot Dental Director.
- Director and staff of ADTEP visit employment sites and do a thorough clinic assessment to ensure graduates will be returning to a clinic that meets IHS standards.
- The project passed our first OHA site visit which evaluated the curriculum, educators and student's progress at ADTEP.



# Monitoring Safety and Quality

## **Preceptorship:**

- Preceptorship for trainees is 400+ hours of direct supervision and includes a checklist of 4-8 of every procedure in scope. As trainees complete procedures in checklist they can be moved into a practice plan under the level of supervision deemed appropriate by supervising dentist, or required by OHA.
- Supervising dentists evaluate and make comments as necessary on every procedure through an online patient encounter form, and that information is submitted to OHA every quarter.
- Consent forms to see a DHAT are currently being collected for every patient encounter.



# Monitoring Safety and Quality

## **Post Preceptorship:**

- Practice Agreement includes all procedures allowed by supervising dentist, including any restrictions on supervision and additional documentation required.
- If in the event a new supervising dentist is assigned, each procedure listed in the Practice Agreement must be successfully demonstrated once to the new supervising dentist under direct supervision for a minimum of 80 hours.
- Every two years the Practice Agreement must be reviewed, and each procedure listed in the practice agreement successfully demonstrated at least once to supervising dentist for a minimum of 80 hours.
- Weekly chart review by supervising dentist of irreversible procedures submitted to OHA every quarter.
- External Dentist reviews random sample of 10 charts and required images of irreversible procedures, submitted to OHA quarterly.



# Monitoring Safety and Quality

---

## **Employment phase:**

### **Standard Operating Procedures**

- **Protocols for radiography and intraoral photography** – used to help the evaluating dentists assess the quality of the DHAT's work.
- **Infection Control Guidelines** – according to OARs 818-012-0400.
- **HIPAA (Health Insurance Accountability and Portability Act):**  
Transmission of protected health information must follow the Department of Health and Human Service Guidelines.





# Monitoring Safety and Quality

## **SOP continued:**

- **Consent forms:** In compliance with OAR 333-010-0440, informed consent is required for each visit. The patient must sign and date the general DHAT treatment administration paper consent form indicating they understand the DHAT role. Before proceeding with treatment, the DHAT must obtain and document PARQ verbal consent which includes possible complications of treatment. For other procedures such as extractions and silver diamine fluoride procedures, a digital consent format is acceptable.
- **Photos:** Procedures requiring tooth preparation and final restoration require pre-op, mid-op, and post-op intraoral photos when appropriate. Images must be of high quality with no debris, blood, or excess restorative material present. Extractions: A recent radiograph of the tooth to be extracted is required including a pre-op intraoral photo. A post-op photo of the removed tooth must be taken including all residual coronal or root tip remnants. A post-op PA is not required.



# Monitoring Safety and Quality

## **SOP continued:**

### Defining and Tracking Potential Outcomes of Irreversible Procedures:

A new code was created in Dentrix and charted for return visits for any complication related to an irreversible procedure completed by a DHAT.

Charts with those codes are added to those pulled weekly for review by the supervising dentist, are included in the random sample of charts pulled by the external supervising dentist, and are made available for review by OHA.

All reviews of charts should confirm appropriate care given to the returning patient, and note if the return visit was unrelated to the original procedure.



# Monitoring Safety and Quality

## External/OHA Review and Monitoring

- Original Application reviewed by OHA Technical Review Board comprised of members of dental professional associations, Board of Dentistry, individual oral health providers.
- Adverse events required to be reported within 24 hours and included in quarterly report.
- Reports submitted quarterly on all aspects of project, including evaluation data and monitoring and demographic data collected *per procedure*.
- OHA site visits to training and utilization sites, including interviews with pilot participants, tour of facilities and chart reviews drawn from random sample of all DHAT charts.
- OHA Advisory Committee reviews and offers opinions on modifications, documents, protocols, and participates in site visits and chart reviews.



# Measurable Outcomes

---

**What evidence is there that the pilot has expanded access to dental services and education to targeted Tribal communities?**

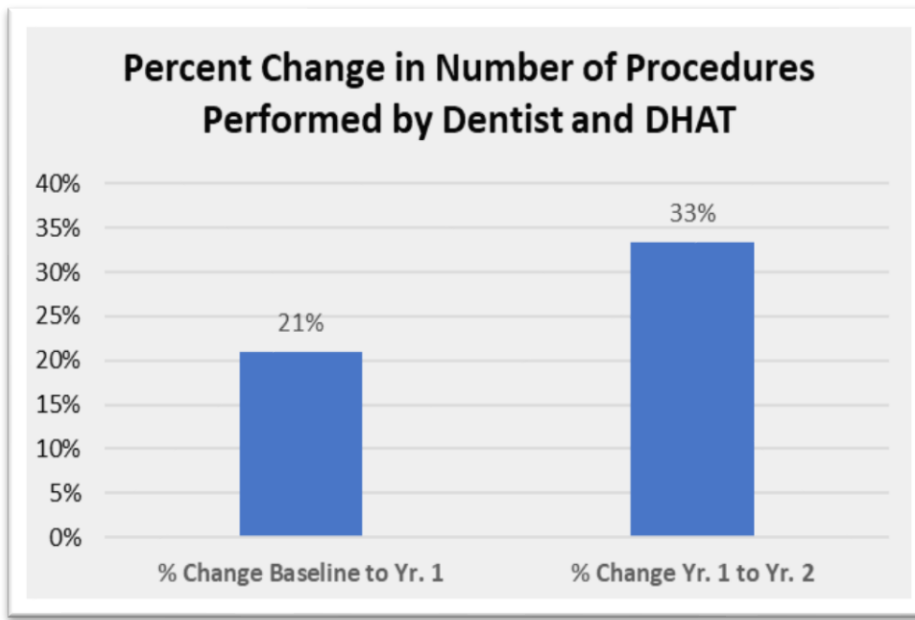
**How has the pilot ensured patient safety and quality dental care, and influenced patient satisfaction with services?**

**Has the pilot impacted the productivity of the oral health team and the costs of dental care in the tribal communities?**

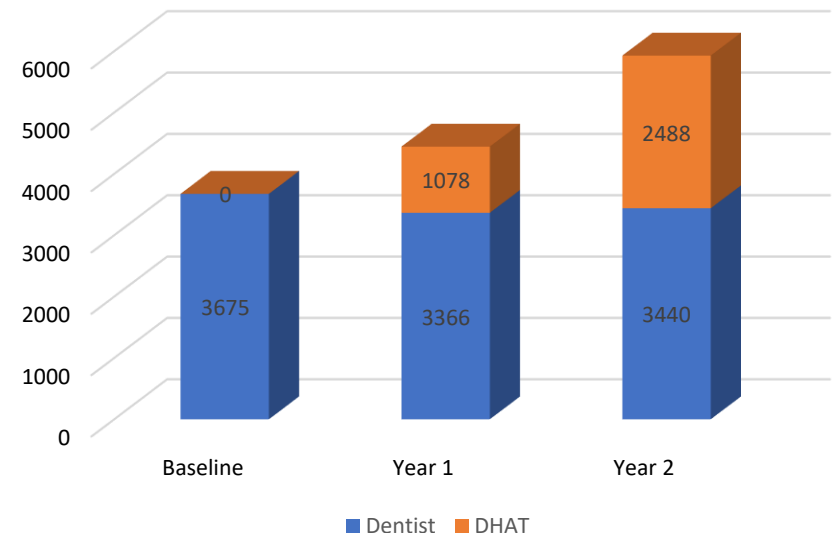


# CTCLUSI 2-year findings

- More patients treated
- More procedures performed per patient
- More complex procedures (Level 4 and 5) done by dentist



**Number of Procedures by Dentist and DHATS by Year**



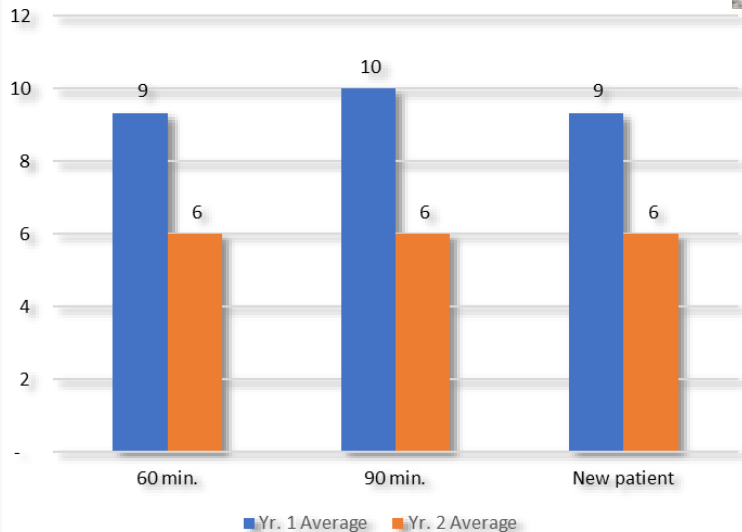


# CTCLUSI

## 2-year findings



Average Wait in Weeks to See Dentist



- Shorter wait time for all providers
- Phone interviews: high level of satisfaction with the DHAT's services
- High levels of safety and quality
- DHAT will be providing education and outreach in the community



---

# Dental Pilot Project Program Evaluation & Monitoring Activities



# Evaluation and Monitoring Activities

- Oregon Health Authority
  - 333-010-0790 Authority Responsibilities
  - Ongoing Project Monitoring
  - Convene Advisory Committee
  - Site Visits
    - At least annually
    - Include:
      - Interviews with Participants
      - Review of Patient Records
- Project Sponsors (NPAIHB)
  - 333-010-0780 Pilot Project Evaluation and Monitoring by Sponsor
  - Required Project Evaluation and Monitoring Plan
    - (6) Defined measures to evaluate safety and quality of care provided
    - (7) A process for ongoing quarterly monitoring
    - Regular evaluation for CQI



Advisory Committee

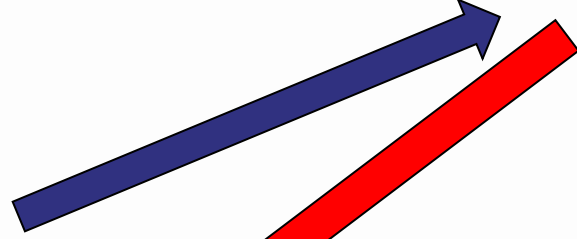
# Site Visits



Dental Pilot Project Program



Chart Review



- Interview(s) with Trainee(s)
- Interview(s) with Supervising Dentists
- Others

# Site Visits



- Reports are compliance in nature
- Opportunity for project reflection and quality improvement

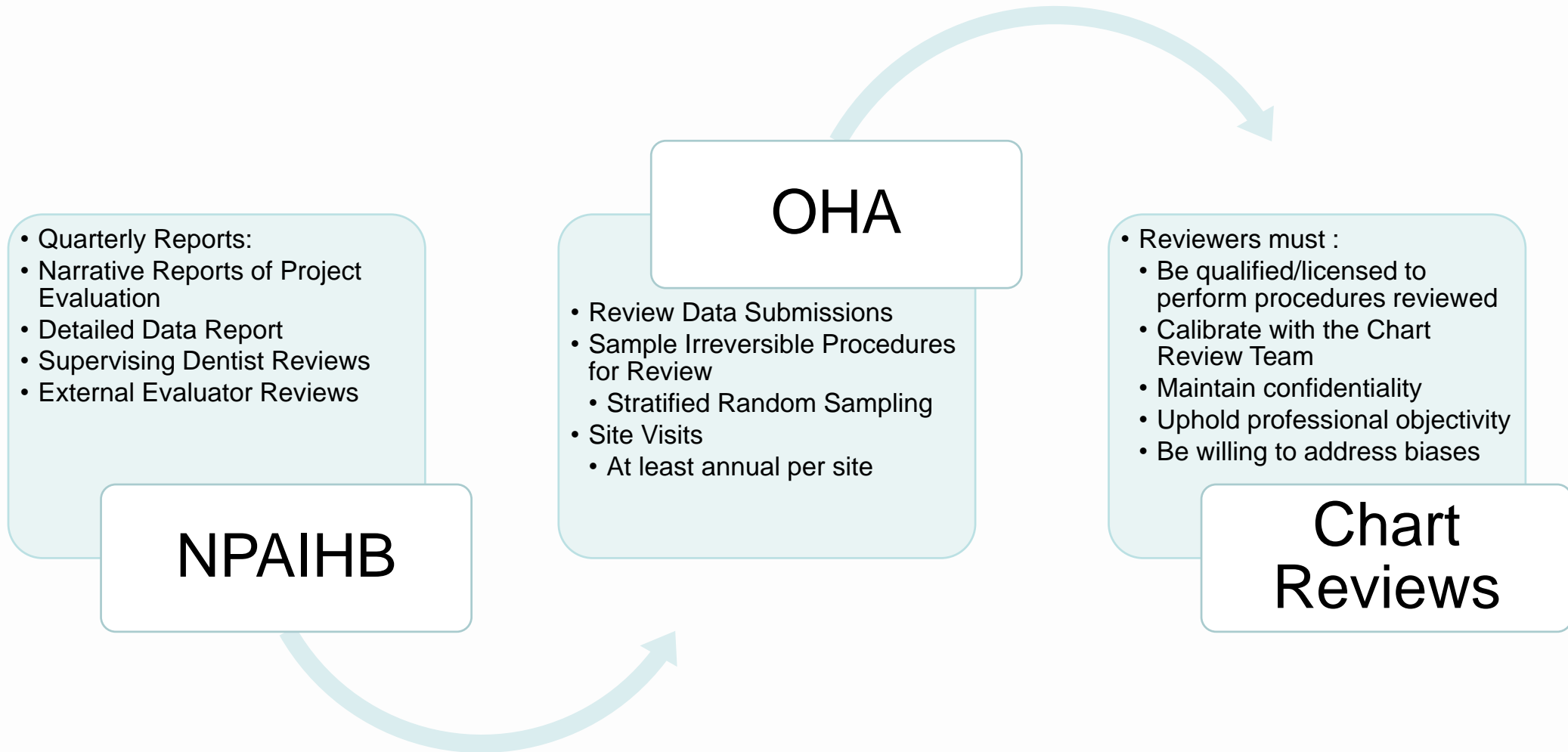


# Challenges & Lessons Learned



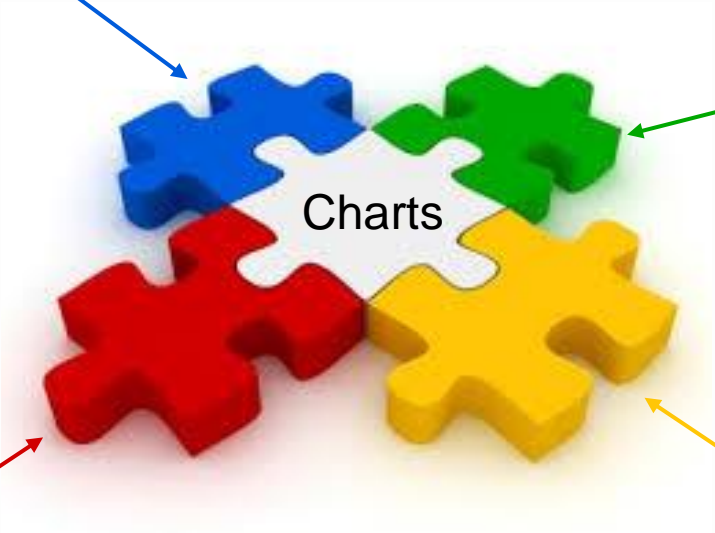
- NARA Site Visit
    - Stipulated Agreement
1. All extractions must be performed under the indirect supervision of the DHAT trainee's supervising dentist.
  2. Document authorization from the supervising dentist for the extraction.
  3. For primary teeth, the trainee may perform non-surgical extractions on teeth that exhibit some degree of mobility. The trainee will not extract a tooth if it is unerupted, impacted, fractured or decayed to the gum line, or needs to be sectioned for removal.
  4. For permanent teeth, the trainee may perform non-surgical extractions of periodontally diseased teeth with evidence of bone loss and +2 degree of mobility. The trainee will not extract a tooth if it is unerupted, impacted, fractured or decayed to the gum line, or needs to be sectioned for removal.

# Data Trails



Oregon Board of Dentistry  
(OBD)

Oregon Health Authority  
(OHA)



Advisory Committee  
DPP#100

Oregon Health and Science University  
(OHSU)



# Chart Review

## OHA Clinical Chart Review Form Guidelines

Sources: IHS Oral Health Program Guide, OHA DPP#100 Advisory Committee input, Western Regional Examining Board, Kalenderian E. Classifying Adverse Events in the Dental Office. Journal of Patient Safety. 2017

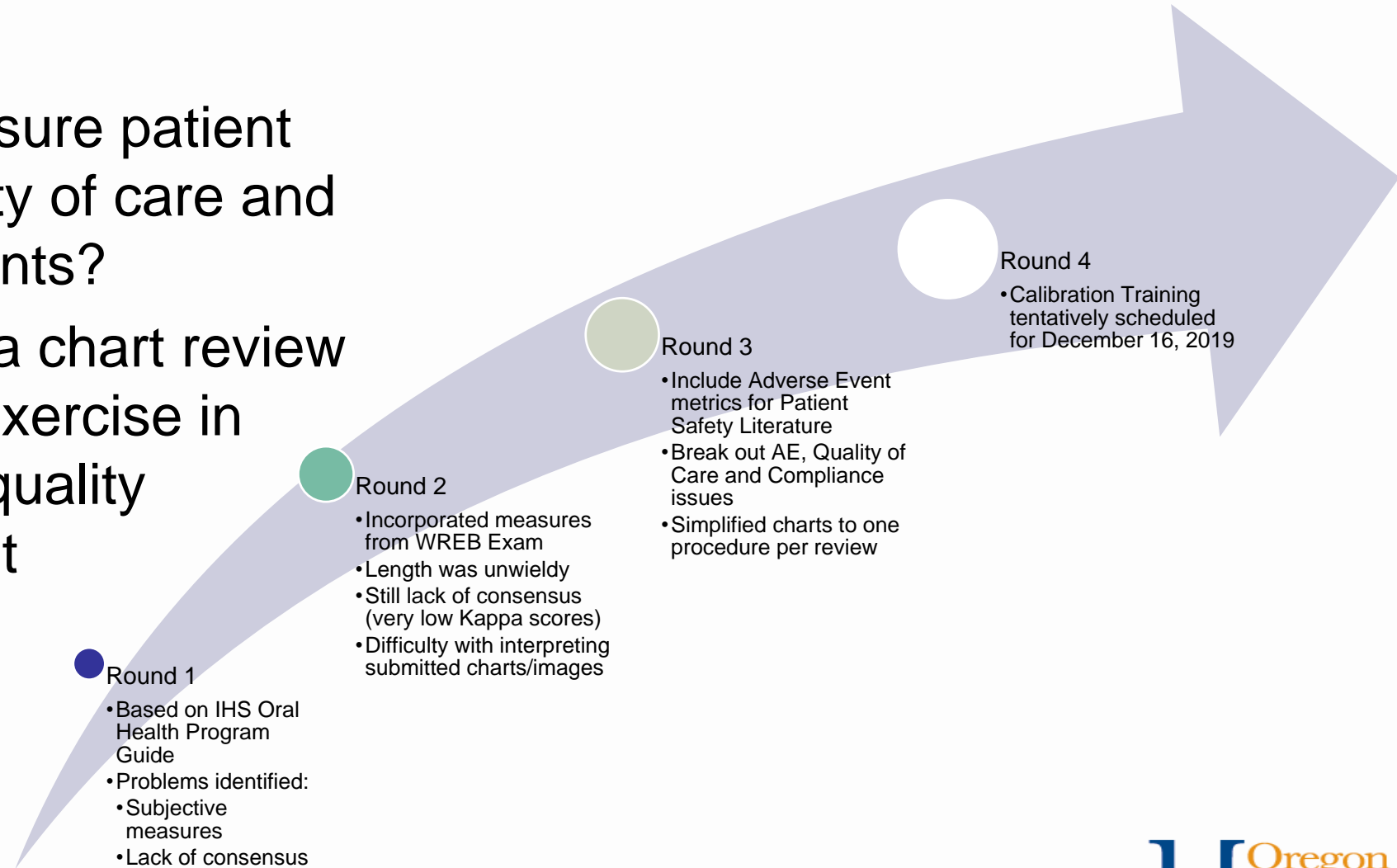
### Reminders:

- N/A (Not Applicable) and Unable to Determine are always additional answer options
- Please provide additional comments whenever possible. Comments are required when rating below the minimum standard of care.
- Please note in comment sections whenever images are not sufficient for dependable evaluation.

CRITERIA	Description	Assessment	Comments
<b>Diagnosis</b>			
1. Diagnosis Description Appropriate	<b>Yes:</b> Falls within minimum standard of care.	<b>No:</b> Must indicate deficiency in comments.	
2. Treatment appropriate	<b>Yes:</b> Falls within minimum standard of care.	<b>No:</b> Must indicate deficiency in comments.	
<b>Images</b>			
1. Radiographs available and sufficient for diagnosis	<b>1:</b> Radiographs are present and adequate for evaluation	<b>2:</b> Radiographs are present, but not adequate for evaluation. Please describe why.	<b>3:</b> Radiographs are not present for this procedure
2. Intra-Oral Images are sufficient for evaluation.	<b>1:</b> Intra-oral images are present and adequate for evaluation	<b>2:</b> Intra-oral images are present, but not adequate for evaluation. Please describe why.	<b>3:</b> Intra-oral images are not present for this procedure
<b>Administration of Drugs</b>			
1. Anesthetic used appropriate for procedure	<b>Yes:</b> Appropriate anesthetic, location, and dosage	<b>No:</b> Grossly inappropriate anesthetic, location, or dosage	
2. Within recommended Limits	<b>Yes:</b> Drug dosages are within limits recommended by the Physician's Desk	<b>No:</b> Drug dosages are outside recommended limits	<b>Unable to Determine</b>

# Challenges and Lessons Learned in Chart Reviews

- How to measure patient safety, quality of care and adverse events?
- Developing a chart review form → an exercise in continuous quality improvement





# Scoring quality of care from chart reviews

# Chart review form

## OHA Clinical Chart Review Form Guidelines

Sources: IHS Oral Health Program Guide, OHA DPP#100 Advisory Committee input, Western Regional Examining Board, Kalenderian E. Classifying Adverse Events in the Dental Office. Journal of Patient Safety. 2017

### Reminders:

- N/A (Not Applicable) and Unable to Determine are always additional answer options
- Please provide additional comments whenever possible. Comments are required when rating below the minimum standard of care.
- Please note in comment sections whenever images are not sufficient for dependable evaluation.

CRITERIA	Description	Assessment	Comments
<b>Diagnosis</b>			
1. Diagnosis Description Appropriate	<b>Yes:</b> Falls within minimum standard of care.	<b>No:</b> Must indicate deficiency in comments.	
2. Treatment appropriate	<b>Yes:</b> Falls within minimum standard of care.	<b>No:</b> Must indicate deficiency in comments.	
<b>Images</b>			
1. Radiographs available and sufficient for diagnosis	<b>1:</b> Radiographs are present and adequate for evaluation	<b>2:</b> Radiographs are present, but not adequate for evaluation. Please describe why.	<b>3:</b> Radiographs are not present for this procedure
2. Intra-Oral Images are sufficient for evaluation.	<b>1:</b> Intra-oral images are present and adequate for evaluation	<b>2:</b> Intra-oral images are present, but not adequate for evaluation. Please describe why.	<b>3:</b> Intra-oral images are not present for this procedure
<b>Administration of Drugs</b>			
1. Anesthetic used appropriate for procedure	<b>Yes:</b> Appropriate anesthetic, location, and dosage	<b>No:</b> Grossly inappropriate anesthetic, location, or dosage	
2. Within recommended Limits	<b>Yes:</b> Drug dosages are within limits recommended by the Physician's Desk Reference or American Hospital Formulary Service. Dosage notation includes quantity, type, concentration and strength	<b>No:</b> Drug dosages are outside recommended limits.	<b>Unable to Determine</b>

## I. Standard of care: **six questions**

Questions on the rating form that address standard of care were identified.

### Diagnosis (page 1)

#### 1. Diagnosis description appropriate

Yes, Falls within minimum standard of care.

No (Must indicate deficiency in comments.)

#### 2. Treatment appropriate (page 1)

Yes, Falls within minimum standard of care.

No (Must indicate deficiency in comments.)

### 3. Evaluation of Procedure Overall impression of procedure quality – used for all procedures (page 2)

- 1: Significant deficiencies exist. Procedure can be considered a failure
- 2: Significant deficiencies exist, procedure falls under absolute minimum standard of care
- 3: Minimum standard of care. Only minor deficiencies present.
- 4: Procedure quality is adequate to good. Only minor deficiencies present.
- 5: Procedure is highly successful, no deficiencies present.

#### 4. Amalgam/Composite Restorations – Posterior (page 5-6)

Prep: Outline and Extension

Prep: Internal Form

Prep: Operative Environment

Finish: Anatomical Form

Finish: Margins

Finish: Damage

#### 5. Anterior Composite Restorations (page 7)

Prep: Outline and Extension

Prep: Shape and Extension

Operative Environment

Finish: Anatomical Form

Finish: Margins

Finish: Damage

## 6. Stainless Steel Crowns (page 9)

Prep: Occlusal Reduction/ Incisal Reduction /Proximal reduction

Prep: Caries Removal

Prep: Operative Environment

Adaptation, Cementation, Occlusion

Finish: Function



## Diagnosis (page 1)

### 1. Diagnosis description appropriate

Yes, Falls within minimum standard of care. =1

No (Must indicate deficiency in comments.) =2

### 2. Treatment appropriate (page 1)

Yes, Falls within minimum standard of care. =1

No (Must indicate deficiency in comments.) =2

An average score of 1.5 or higher indicated that most of the reviewers rated the diagnosis description as below the minimum standard of care.

Evaluation of Procedure (page 2)  
– used for all procedures

Overall impression of procedure quality

- 1 = Significant deficiencies exist. Procedure can be considered a failure
- 2 = Significant deficiencies exist, procedure falls under absolute minimum standard of care
- 3 = Minimum standard of care. Only minor deficiencies present.
- 4 = Procedure quality is adequate to good. Only minor deficiencies present.
- 5 = Procedure is highly successful, no deficiencies present.

A cutoff score of 3 was used to identify cases that fell below the minimum standard of care for this question.

## 4. Amalgam/Composite Restorations – Posterior (page 5-6)

Prep: Outline and Extension

Prep: Internal Form

Prep: Operative Environment

Finish: Anatomical Form

Finish: Margins

Finish: Damage

1 = Unacceptable      2 = Inadequate

3 = Acceptable      4 = Appropriate      5 = Optimal

## 5. Anterior Composite Restorations (page 7)

Prep: Outline and Extension

Prep: Shape and Extension

Operative Environment

Finish: Anatomical Form

Finish: Margins

Finish: Damage

1 = Unacceptable      2 = Inadequate

3 = Acceptable

4 = Appropriate

5 = Optimal

## 6. Stainless Steel Crowns (page 9)

Prep: Occlusal Reduction/ Incisal Reduction /Proximal reduction

Prep: Caries Removal

Prep: Operative Environment

Adaptation, Cementation, Occlusion

Finish: Function

1 = Unacceptable      2 = Inadequate  
3 = Acceptable      4 = Appropriate      5 = Optimal

The ratings given by the dentists reviewing the charts were averaged to score each procedure in all six areas to indicate whether the quality of care standard was met.



# Site Visits



**November 6, 2019**

# Dental therapists linked to improved dental outcomes for Alaska Native communities in the Yukon-Kuskokwim Delta

Donald L. Chi, DDS, PhD<sup>1</sup>; Dane Lenaker, DMD, MPH<sup>2</sup>; Lloyd Mancl, PhD<sup>1</sup>; Matthew Dunbar, PhD<sup>3</sup>; Michael Babb, MA<sup>3</sup>

1 School of Dentistry, University of Washington, Seattle, WA, USA

2 Southeast Alaska Regional Health Consortium, Sitka, AK, USA

3 Center for Studies in Demography and Ecology, University of Washington, Seattle, WA, USA

## Keywords

Dental Health Aide Therapists; Alaska Native oral health disparities; dental utilization; access to dental care; dental workforce.

## Correspondence

Donald L. Chi, School of Dentistry, University of Washington, Seattle, WA 98195-7475, USA. Tel.: 206 616-4332; Fax: 206 685-4258; e-mail: dchi@uw.edu. Dane Lenaker is with the Southeast Alaska Regional Health Consortium. Lloyd Mancl is with the School of Dentistry, University of Washington. Matthew Dunbar and Michael Babb are with the Center for Studies in Demography and Ecology, University of Washington.

Received: 10/15/2017; accepted: 12/15/2017.

doi: 10.1111/jphd.12263

Journal of Public Health Dentistry 00 (2018) 00–00

## Abstract

**Objectives:** Dental Health Aide Therapists (DHATs) have been part of the dental workforce in Alaska's Yukon-Kuskokwim (YK) Delta since 2006. They are trained to provide preventive and restorative care such as filling and extractions. In this study, we evaluated community-level dental outcomes associated with DHATs.

**Methods:** This was a secondary data analysis of Alaska Medicaid and electronic health record data for individuals in Alaska's YK Delta (2006-2015). The independent variable was the number of DHAT treatment days in each community. Child outcomes were preventive care, extractions, and general anesthesia. Adult outcomes were preventive care and extractions. We estimated Spearman partial correlation coefficients to test our hypotheses that increased DHAT treatment days would be associated with larger proportions utilizing preventive care and smaller proportions receiving extractions at the community-level.

**Results:** DHAT treatment days were positively associated with preventive care utilization and negatively associated with extractions for children and adults ( $P < 0.0001$ ). DHAT treatment days were not associated with increased dental treatment under general anesthesia for children.

**Conclusions:** Dental therapists are associated with more preventive care and fewer extractions. State-level policies should consider dental therapists as part of a comprehensive solution to meet the dental care needs of individuals in underserved communities and help achieve health equity and social justice.

## Introduction

Poor oral health is common in Alaska Native communities (1-3). Untreated tooth decay leads to pain, difficulties eating and sleeping, systemic diseases, hospitalization, and, in rare cases, death (4,5). Other consequences include school absences, poor grades, low self-esteem, and employment problems (6-8). There are persisting oral health inequalities in Alaska Native communities (9,10).

Tooth decay is a multifactorial disease linked to a high sugar diet, inadequate fluoride, and poor access to dental care (11). Sugar-sweetened beverages comprise a large portion of modern Alaska Native diets and have fueled the tooth decay epidemic (12,13). In addition, piped-in water is not universal in Alaska Native communities, making water fluoridation costly (14). Further complicating local fluoride

acceptance is the only documented death linked to water fluoridation in Hooper Bay, Alaska (15). Finally, Alaska Native communities are remote, making it difficult to provide a regular, local source of dental care. Seeking care involves traveling long distances, usually by airplane. As a result, most individuals are unable to receive preventive care or needed restorative treatment.

To begin addressing dentist shortages, the Alaska Native Tribal Health Consortium trained Dental Health Aide Therapists (DHATs) for deployment in areas like Alaska's Yukon-Kuskokwim (YK) Delta. The DHAT program is based on a model in place for decades in New Zealand and more than 50 other countries (16,17). The first DHATs began providing dental care in the YK Delta in 2006. DHATs are recruited

from local communities and are trained to provide preventive care as well as restorative care for primary teeth (e.g., fillings, crowns, pulp therapy, extractions) and permanent teeth (e.g., simple fillings and extractions) under general supervision in local communities by dentists located in the hub city of Bethel (18). Dental therapists currently provide care in Alaska, Minnesota, and parts of Washington state and Oregon (19). Vermont and Maine have authorized the practice of dental therapy, and other states are considering similar legislation (19).

Studies have documented initial outcomes associated with the DHAT program in the YK Delta. DHATs provide care that is similar to care provided by dentists in terms of clinical quality (20,21). Residents of YK Delta communities served by DHATs have reported shorter wait times for dental appointments and satisfaction with the care provided by DHATs (22). No studies to date have documented longer-term outcomes associated with this innovative workforce program.

Persisting oral health inequalities in underserved communities underscore the importance of research aimed at advancing social justice (23). Dental therapists are part of an upstream approach that could help to address oral health inequalities by diversifying the dental workforce, removing barriers to care, and closing the health gap between individuals in resource-rich and resource-poor communities.

The goal of this study was to evaluate YK Delta's DHAT program. The main research question was whether DHATs are associated with improved oral health outcomes since 2006. We hypothesized that a larger number of DHAT treatment days would be associated with dental utilization patterns consistent with improved oral health over time (e.g., more preventive care, fewer extractions, less general anesthesia). This is based on two premises: 1) indigenous communities have low rates of preventive care utilization and high rates of extractions and treatment under general anesthesia; and 2) dental therapists have the potential to influence these trends. The long-term goals of this research are to provide policymakers with information on existing dental therapy programs and to develop strategies to optimize the DHAT program.

## Methods

### Study location

This study focused on communities served by the Yukon-Kuskokwim Health Corporation (YKHC). Prior to 2006, patients traveled from remote communities to Bethel to obtain dental care. Dentists traveled to communities on an annual basis. DHATs work in decentralized Sub-Regional Clinics and travel to remote communities to provide care.

### Study design and data sources

This was a retrospective observational study (calendar years 2006–2015), corresponding to the 10-year period in which DHATs started providing care under general supervision in the YK Delta to when the most recent data were available. The study was approved by the YKHC Human Studies Committee and the University of Washington Institutional Review Board.

There were two data sources. The first was Medicaid data provided by the Alaska Department of Health and Human Services. These consisted of data on 1) monthly enrollment (e.g., name, age, sex, address) and 2) dental claims, indicating all procedures for which a claim was submitted by a dental provider and corresponding dates of services. The second was electronic health record (EHR) data provided by the YKHC dental clinic. These data consist of diagnosis and treatment data for all YKHC patients who received any dental care during the study period.

### Classifying individuals into communities

We classified individuals into a mutually exclusive YK Delta community for each study month. Of the 322,578 individuals in the Medicaid dataset, 22,645 lived in the YK Delta at some point during the 10-year study period. We used monthly address data to geocode these individuals using the Google Maps Geocoding API. There were 22,353 individuals with a geocodable address. Our geocoding algorithm accounted for individuals who moved within the YK Delta and YK Delta residents who lived outside of the YK Delta for at least 1 month during the study period. We reconciled address data for 1,034 individuals with overlapping dates of residence (e.g., an individual listed as living in a community May 1, 2007 to September 9, 2009 and July 1, 2008 to October 31, 2010). Twenty-seven individuals were excluded because of missing or invalid dates of residence.

The resulting Medicaid dataset contained 22,326 unique individuals who lived in the YK Delta for at least 1 month during the study period. The resulting EHR dataset contained 28,821 unique individuals who utilized dental care through a YKHC dental clinic at least once during the study period, all of whom were geocoded into a YK Delta community.

### Predictor variable

The main community-level predictor variable was the total number of days in which a community had  $\geq 1$  DHATs providing care (DHAT treatment days). This continuous variable was created from the EHR data. We identified all dental claims in the EHR dataset with a valid Current Dental Terminology (CDT) code submitted by a DHAT during the study period. For each day on which a DHAT provided dental care, the location of service (as indicated in the EHR) was noted and counted as one DHAT treatment day.

## Outcome variables

There were three child and two adult outcomes, each measured at the community-level using both the Medicaid and EHR data.

### Child outcomes

a) Proportion of children <18 years utilizing preventive care, defined as an exam (D0120/D0145/D0150), cleaning (D1110/D1120), fluoride (D1203/D1204/D1206/D1208), or cleaning and fluoride (D1201/D1205). b) Proportion of children <3 years who had their four front teeth (D-E-F-G) extracted (D7111/D7140). c) Proportion of children <6 years who received  $\geq 5$  stainless steel crowns on a single day, a proxy measure of general anesthesia (D2930).

### Adult outcomes

d) Proportion of adults  $\geq 18$  years utilizing preventive care, defined as an exam (D0120/D0150), cleaning (D1110), fluoride (D1204/D1206), or cleaning and fluoride (D1205). e) Proportion of adults  $\geq 18$  years with any tooth extraction (D7111/D7140).

The two datasets had different denominators. For the Medicaid data, the yearly denominators consisted of individuals classified into a community and enrolled in Medicaid for  $\geq 1$  month during the calendar year. For the EHR data, the yearly denominators consisted of individuals who were classified into a community and had at least one dental claim in the calendar year.

### Confounders

We identified two potential confounders. The first was dentist treatment days, which is the total number of days in which communities had one or more dentists providing treatment. We identified all EHR dental claims submitted by a dentist and estimated the total number of treatment days provided by a dentist in each community. The second was baseline poverty, which accounted for potential differences in resources and social conditions. Because there was no standardized community-level poverty measure, we adopted a proxy measure from the US Census Bureau indicating the proportion of all individuals living below poverty in 1999 in each community (potential range: 0 to 100).

### Analyses

The analyses were restricted to dental services provided within YK Delta communities. Location of service was unavailable in the Medicaid data. Therefore, we used the EHR data to determine the location of service for each Medicaid dental service. We matched on name, sex, and date of birth. After excluding claims without a match, there were 13,810 unique individuals

in the final analytic population for the Medicaid data. The EHR claims data included information on location of service. After removing claims associated with locations of service outside of the YK Delta, there were 28,191 unique individuals in the final analytic population for the EHR data.

We used Spearman partial correlation coefficients for the confounder analyses (24). Spearman partial correlation coefficients were used to evaluate our study hypotheses ( $\alpha = 0.05$ ), adjusting for dentist treatment days and baseline poverty. We adjusted for dentist treatment days to control for background differences in dental care due to dentists and as a surrogate measure for other potential secular trends in the availability of dental care. The analyses were aggregated by year for each community (48 communities  $\times$  10 years,  $n = 480$ ), and generalized estimating equations were used to account for clustering within village due to multiple observation years (25). Observations from different villages were assumed to be independent. Three communities with small populations were excluded. We used SAS version 9.4 for the statistical analyses (SAS Institute, Inc., Cary, NC, USA).

## Results

### Study communities

There were 48 study communities. Sixteen communities had no dental services provided by a DHAT. The mean proportion of individuals at the community-level in 1999 that were below poverty was 28 percent (range: 10.7 to 64.5 percent).

### Predictor variable

The predictor variable was the number of DHAT treatment days. In 2006, there were two practicing DHATs in the YK Delta. The number of DHATs increased to 10 by 2015. In the 10-year period, there were a total of 9,012 DHAT treatment days.

### Child outcomes

Mean preventive utilization for children was 15.4 percent in the Medicaid data and 31.8 percent in the EHR data (Table 1). Over the 10 years, the proportion of children who received preventive care increased fivefold in the Medicaid data (7.4 to 35.6 percent) and doubled in the EHR data (30.5 to 57.8 percent). The mean proportion of D-E-F-G extractions for children was 3.1 percent in the Medicaid data and 14 percent in the EHR data. The proportion of D-E-F-G extractions increased in Medicaid data (1.9 to 16.3 percent) and decreased in the EHR data (19.2 to 12.1 percent). The mean proportion of children utilizing dental care under general anesthesia was 5.4 percent in the Medicaid data and 5.7 percent in the EHR data. The proportion of children undergoing

**Table 1** Dental Utilization for Individuals in Alaska’s Yukon-Kuskokwim Delta by Year (2006 to 2015)

	Year (%)										All years (%)
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Child preventive dental care, Medicaid data	7.4	9.0	10.7	8.7	13.4	13.3	17.7	21.1	30.4	35.6	15.4
Child preventive dental care, EHR data	30.5	24.2	30.4	29.5	35.4	27.4	35.4	42.2	52.7	57.8	31.8
Child D-E-G-F extraction, Medicaid data*	1.9	3.2	2.3	2.7	2.9	3.4	3.4	5.4	8.0	16.3	3.1
Child D-E-G-F extraction, EHR data	19.2	20.1	20.6	26.4	13.1	9.7	9.1	12.5	14.4	12.1	14.0
Child general anesthesia, Medicaid data†	1.6	2.4	2.1	2.0	4.0	5.5	6.4	7.4	13.7	15.8	5.4
Child general anesthesia, EHR data	7.3	7.8	7.6	7.7	8.1	5.9	5.6	5.9	6.3	4.8	5.7
Adult preventive dental care, Medicaid data	1.1	2.6	2.6	2.5	3.0	4.3	4.3	5.6	8.5	6.4	3.8
Adult preventive dental care, EHR data	24.0	19.8	15.7	16.7	24.4	22.8	20.7	28.9	36.9	35.3	18.7
Adult extraction, Medicaid data	6.6	8.9	7.3	6.6	8.1	6.9	7.8	7.6	10.7	10.3	7.8
Adult extraction, EHR data	34.5	32.7	33.2	33.7	31.9	29.2	27.5	29.1	31.0	30.9	32.9

\*There were no tooth numbers available in the Medicaid data. Therefore, this measure was defined as four extractions on the same day.  
 †There were no tooth numbers available in the Medicaid data. Therefore, this measure was defined as five or more stainless steel crowns on the same day.

general anesthesia increased in the Medicaid data (1.6 to 15.8 percent) and decreased in the EHR data (7.3 to 4.8 percent).

**Adult outcomes**

Mean preventive dental care utilization for adults was 3.8 percent in the Medicaid data and 18.7 percent in the EHR data (Table 1). Adult preventive care utilization in the Medicaid data started at 1.1 percent (2006), peaked to 8.5 percent (2014), and decreased to 6.4 percent (2015). For the EHR data, preventive utilization fluctuated during the 10-year study period, starting at 24 percent (2006) and ending at 35.3 percent (2015). The mean proportion of adults with extractions was 7.8 percent in the Medicaid data and 32.9 percent in the EHR data. Adult extractions fluctuated in both datasets, increasing from 6.6 to 10.3 percent in the Medicaid data and decreasing from 34.5 to 30.9 percent in the EHR data.

**Confounder analyses**

Dentist treatment days were positively associated with the predictor ( $\rho = 0.31$ ;  $P < 0.0001$ ) and significantly associated with most outcomes (Table 2). Baseline poverty was not

associated with the predictor ( $\rho = -0.12$ ;  $P = 0.53$ ) but significantly associated with most outcomes (Table 2).

**Main statistical analyses**

Across the 10-year study period in both EHR and Medicaid datasets, increased DHAT treatment days were positively associated with child and adult preventive care, and negatively associated with extractions for children and adults (Table 3). From the EHR data, DHAT treatment days were negatively associated with treatment under general anesthesia for children, but this association was not statistically significant in the Medicaid data.

**Discussion**

This is first known study to evaluate long-term outcomes associated with DHATs. The main finding is that increased DHAT treatment days were positively associated with preventive care utilization and negatively associated with extractions. These trends suggest that dental outcomes have improved in Alaska’s YK Delta with the introduction of

**Table 2** Spearman Correlation Coefficients for Model Confounders

	Spearman correlation coefficients				
	Child preventive dental care	Child D-E-F-G extraction	Child general anesthesia	Adult preventive dental care	Adult extraction
Dentist treatment days (Medicaid data)	0.33 <0.0001	0.21 <0.001	0.16 0.01	0.31 <0.001	0.02 0.78
Dentist treatment days (EHR data)	0.25 <0.001	0.13 0.09	0.17 0.03	0.26 <0.001	-0.22 <0.01
Baseline poverty (Medicaid data)	-0.12 <0.001	-0.16 <0.01	-0.18 <0.0001	-0.10 0.01	-0.001 0.53
Baseline poverty (EHR data)	-0.15 <0.001	-0.18 <0.01	-0.16 <0.01	-0.20 <0.001	0.001 0.91



**Table 3** Spearman Partial Correlation Coefficients Between DHAT Treatment Days (Continuous Variable) and Each Outcome During 10-Year Study Period Based on Medicaid and EHR Data

DHAT treatment days	Spearman partial correlation coefficients* P-values				
	Child preventive dental care	Child D-E-F-G extraction	Child general anesthesia	Adult preventive dental care	Adult extraction
Medicaid data	0.23 <0.0001	-0.17 0.03	0.05 0.45	0.20 <0.001	-0.16 0.02
EHR data	0.26 <0.0001	-0.28 <0.0001	-0.27 <0.0001	0.30 <0.0001	-0.46 <0.0001

\*Adjusted for dentist treatment days and baseline poverty.

dental therapists. These results are consistent with a study reporting positive associations between pediatric dentist density and preventive dental care use for children in Medicaid (26).

There are a number of potential explanations. The most plausible mechanism underlying increased preventive care utilization is improved local access to providers, which may have also increased patient demand for care. This is consistent with previous work indicating reduced patient-reported wait times for dental appointments in YK communities (22). Fewer extractions could indicate improvements in oral health behaviors and beliefs, as well as earlier restorative intervention before the need for extractions. These mechanisms could be assessed in the future by further examining restorative claims data and conducting interviews in communities, and comparing oral health behaviors and beliefs across communities that vary on DHAT treatment days. Similar interviews could be conducted with DHATs and dentists to measure provider perceptions of how patient attitudes, beliefs, and behaviors regarding oral health have changed over time.

We had inconsistent findings regarding general anesthesia for children. DHAT treatment days were negatively associated with general anesthesia in the EHR data but not significant in

the Medicaid data. There are two possible explanations for this discrepancy. First, population characteristics differed across the two datasets. The EHR data consisted of individuals who utilized dental care, whereas the Medicaid data included all enrollees regardless of utilization of dental care. Second, the Medicaid-based outcome could be misspecified due to lack of tooth-level data. There was a near doubling in the proportion of children in the Medicaid data receiving dental care under general anesthesia between 2013 and 2014, which was not observed in the EHR data. A conservative conclusion is that increased DHAT treatment days were not associated with increased proportions of children receiving dental care under general anesthesia. Future research should continue to examine the associations between DHAT treatment days and child general anesthesia.

Improvements in dental utilization were particularly noticeable in communities where DHATs had the greatest presence. In post-hoc subgroup analyses, we identified communities in which DHATs did not provide any dental treatment ( $N = 16$ ) and communities in which the DHAT treatment day to population ratio was >75th percentile ( $N = 7$ ). Across both datasets, communities with the highest DHAT treatment days exhibited consistently greater

**Table 4** Percentage Point Differences in Outcomes Between Communities with No DHAT Treatment Days and the Highest Number of DHAT Treatment Days

	No DHAT treatment day communities $N = 16$ (%)	Highest DHAT treatment day communities $N = 7$ (%)	Percentage point difference between highest and no DHAT treatment day communities (%)
Medicaid data			
Child preventive dental care	15.5	24.8	9.3
Child D-E-F-G extraction	7.3	1.9	-5.4
Child general anesthesia	7.9	5.5	-2.4
Adult preventive dental care	3.2	5.6	2.4
Adult extraction	9.6	7.1	-2.5
EHR data			
Child preventive dental care	30.5	46.9	16.4
Child D-E-F-G extraction	22.6	7.4	-15.2
Child general anesthesia	8.5	5.4	-3.1
Adult preventive dental care	15.3	27.1	11.8
Adult extraction	40.5	27.0	-13.5

proportions of individuals utilizing preventive care and lower proportions utilizing invasive dental treatment (Table 4). Differences were similar in the EHR data although the magnitudes were larger. These findings suggest that clinically meaningful improvements in dental use can be achieved by incorporating DHATs into the care delivery system. Potential challenges to maintaining a cadre of active DHATs include difficulties with recruitment, preventing provider burn out, and managing provider preferences for communities that may not be the areas of greatest need – all of which are similar difficulties in retaining dentists in underserved areas (27-29). These issues should be explored through research involving current and former DHATs so that recruitment and retention strategies can be improved.

DHATs appear to have an impact on the dental care delivery system. Over the 10-year period, 13 DHATs provided 9,012 treatment days in the YK Delta, compared to 23,368 days of treatment provided by 41 full-time dentists and 14 per diem dentists. The mean number of treatment days provided by each DHAT was slightly higher than dentists, but the number of patients treated and the complexity of care are likely to be different.

One goal of the DHAT program is to address pent up demand for emergency and routine dental care needs, which should level off over time. As this happens, one would expect DHATs to spend more of their time on prevention efforts that go beyond the clinic setting. This could come in the form of community- and home-based behavioral and social interventions aimed at reducing sugared sweetened beverages and improving toothbrushing with fluoridated toothpastes. Evidence-based preventive efforts could be incorporated into the scope of dental therapy practice, which might be particularly effective in indigenous communities because of cultural concordance between DHATs and community members.

Future research should assess how community-level dental care needs change as dental therapists are integrated into the local delivery care system, and characterize the proper balance for DHATs between restorative and preventive activities based on changing community needs. The ultimate goal is to ensure that dental therapy programs do not simply replicate the existing dental care delivery system that focuses primarily on clinic-based treatment and that dental therapists and dentist are providing care that optimizes health outcomes at the lowest cost possible.

Policymakers considering dental therapy legislation are increasingly interested in outcomes data. One example is cost effectiveness. A recent simulation study from the United Kingdom found that mid-level dental providers working in a public dental care delivery system can be a dominant strategy over dentists (i.e., improved outcomes at a lower cost) (30). These findings may be applicable to the YK communities. Additional cost-effectiveness analyses would help to provide answers applicable to the US context.

Our study findings support dental therapists as part of an upstream approach to help address oral health inequalities and achieve social justice (23). Dental therapists in the YK Delta have diversified the dental workforce, created opportunities for community members to serve as healers, and removed cultural barriers to care – important steps in achieving health equity and social justice within indigenous communities.

The main study strength is that we had two longitudinal data sources. However, there are at least six limitations. First, this was an observational study. All findings are associations. Causal inferences can only be drawn from randomized clinical trials, but such trials are unlikely because of cost. In addition, there are ethical considerations in withholding care that has been shown to be safe and effective. Second, there is the potential for selection bias. We attempted to address this problem by adjusting for confounders. However, baseline poverty in 1999 may not accurately measure differences in resources across communities, particularly because the study period began in 2006. Future work should continue to refine the models by identifying and operationalizing additional covariates.

Third, there were differences between the two datasets. Utilization trends were consistent, but Medicaid proportions were generally lower than EHR proportions (Table 1). One reason is that the annual Medicaid denominators included all enrollees regardless of utilization. When we restricted the Medicaid analyses to those who utilized care, the proportions between the two datasets converged. For instance, Medicaid preventive care use in 2015 increased to 65.5 percent for children and 35.6 percent for adults.

Fourth, there was a relatively low match for location of service in the Medicaid data, which raises potential concerns regarding generalizability. We compared demographic and utilization differences between the 13,810 retained and 8,516 excluded Medicaid enrollees. There were no differences in sex or age distribution between retained and excluded enrollees. Proportions of retained children and adults who utilized preventive care utilization were higher, whereas there were no consistent differences in D-E-F-G extractions, dental treatment under general anesthesia, or adult extractions. These findings make it difficult to draw definitive conclusions regarding the degree of systematic bias represented in the retained Medicaid enrollees. Future studies should develop methods to increase the proportion of matches between individuals in Medicaid and EHR data as well as ways to impute location of service for Medicaid enrollees when matching is not possible.

Fifth, our study focused on utilization. We did not assess other outcomes like unmet dental care needs, disease prevented, or quality-of-life. Future studies should be conducted to evaluate ways dental therapists can help improve patient-centered outcomes. In addition, qualitative work within communities of varying degrees of DHAT treatment days could



reveal other important differences associated with care provided by DHATs.

Sixth, dental care is not a panacea. Preventive care utilization was generally low even in recent years. This underscores the importance of targeting behaviors relevant in oral health such as limiting sugar intake and optimizing fluoride exposure. Future work should examine how preventive behaviors and norms within Alaska Native communities are influenced by the presence of DHATs. There is a need for evidence-based strategies that can be incorporated into the Alaska Native dental care delivery system to help providers like DHATs promote patient-level behavior change. This is especially relevant in the YK Delta in which DHATs maintain familial ties, share a common history, and understand the strengths and challenges as experienced by local populations. The eventual goal would be to harness the dental care delivery system as a way to improve oral health behaviors among individuals and norms within families and communities.

## Conclusions

Our results provide evidence of positive benefits associated with dental therapists within underserved communities. These promising findings are relevant to policymakers in states with active or pending dental therapy legislation, which is a step toward meeting the dental care needs of vulnerable populations and achieving oral health equity and social justice.

## Acknowledgments

Thank you to the individuals and communities in the Yukon Kuskokwim Delta represented in this study for making this study possible. We also thank the Yukon Kuskokwim Health Corporation and the Alaska Department of Health and Human Services for providing data. This study was funded in part by the Pew Charitable Trusts, the W.K. Kellogg Foundation, the Rasmuson Foundation, the U.S. National Institute of Dental and Craniofacial Research Grant No. K08DE020856, the William T. Grant Foundation Scholars Program, and the Center for Advanced Study in the Behavioral Sciences (CASBS) at Stanford University.

## References

- Lewis CW, Riedy CA, Grossman DC, Domoto PK, Roberts MC. Oral health of young Alaska Native children and their caregivers in Southwestern Alaska. *Alaska Med.* 2002;**44**(4): 83-7.
- American Academy of Pediatrics, Committee on Native American Child Health, Canadian Paediatric Society, First Nations, Inuit and Métis Committee. Early childhood caries in indigenous communities. *Pediatrics.* 2011;**127**(6): 1190-8.
- Chi DL. Reducing Alaska Native paediatric oral health disparities: a systematic review of oral health interventions and a case study on multilevel strategies to reduce sugar-sweetened beverage intake. *Int J Circumpolar Health.* 2013; **72**(1):21066.
- Casamassimo PS, Thikkurissy S, Edelstein BL, Maiorini E. Beyond the dmft: the human and economic cost of early childhood caries. *J Am Dent Assoc.* 2009;**140**(6):650-7.
- Holmberg P, Hellmich T, Homme J. Pediatric sepsis secondary to an occult dental abscess: a case report. *J Emerg Med.* 2017;**52**(5):744-8.
- Jackson SL, Vann WF Jr, Kotch JB, Pahel BT, Lee JY. Impact of poor oral health on children's school attendance and performance. *Am J Public Health.* 2011; **101**(10):1900-6.
- Guarnizo-Herreño CC, Wehby GL. Children's dental health, school performance, and psychosocial well-being. *J Pediatr.* 2012;**161**(6):1153-9.
- Glied S, Neidell M. The economic value of teeth. *J Hum Resour.* 2010;**45**(2):468-96.
- Centers for Disease Control and Prevention (CDC). Dental caries in rural Alaska Native children—Alaska, 2008. *MMWR Morb Mortal Wkly Rep.* 2011;**60**(37): 1275-8.
- Chi DL, Hopkins S, O'Brien D, Mancl L, Orr E, Lenaker D. Association between added sugar intake and dental caries in Yup'ik children using a novel hair biomarker. *BMC Oral Health.* 2015;**15**(1):121.
- Fisher-Owens SA, Gansky SA, Platt LJ, Weintraub JA, Soobader M-J, Bramlett MD, Newacheck PW. Influences on children's oral health: a conceptual model. *Pediatrics.* 2007; **120**(3):510-20.
- Price WA. Eskimo and Indian field studies in Alaska and Canada. *J Am Dent Assoc.* 1936;**23**(3):417-37.
- Kolahdooz F, Simeon D, Ferguson G, Sharma S, Smith B. Development of a quantitative food frequency questionnaire for use among the Yup'ik people of Western Alaska. *PLoS One.* 2014;**9**(6):100412.
- Atkins CY, Thomas TK, Lenaker D, Day GM, Hennessy TW, Meltzer MI. Cost-effectiveness of preventing dental caries and full mouth dental reconstructions among Alaska Native children in the Yukon-Kuskokwim delta region of Alaska. *J Public Health Dent.* 2016;**76**(3): 228-40.
- Gessner BD, Beller M, Middaugh JP, Whitford GM. Acute fluoride poisoning from a public water system. *N Engl J Med.* 1994;**330**(2):95-9.
- Batliner TS. American Indian and Alaska Native access to oral health care: a potential solution. *J Health Care Poor Underserved.* 2016;**27**(1):1-10.
- Nash DA, Friedman JW, Kardos TB, Kardos RL, Schwarz E, Satur J, Berg DG. Dental therapists: a global perspective. *Int Dent J.* 2008;**58**(2):61-70.

18. Pew Charitable Trusts. Expanding the dental team: increasing access to care in public settings [Internet]. c2014 [cited 2017 June 6]. Available from: [http://www.pewtrusts.org/~media/assets/2014/06/27/expanding\\_dental\\_case\\_studies\\_report.pdf](http://www.pewtrusts.org/~media/assets/2014/06/27/expanding_dental_case_studies_report.pdf)
19. Koppelman J, Singer-Cohen R. A workforce strategy for reducing oral health disparities: dental therapists. *Am J Public Health*. 2017;**107**(S1):S13-7.
20. Bolin KA. Assessment of treatment provided by dental health aide therapists in Alaska: a pilot study. *J Am Dent Assoc*. 2008;**139**(11):1530-5; discussion 1536-9.
21. Bader JD, Lee JY, Shugars DA, Burrus BB, Wetterhall S. Clinical technical performance of dental therapists in Alaska. *J Am Dent Assoc*. 2011;**142**(3):322-6.
22. Wetterhall S, Burrus B, Shugars D, Bader J. Cultural context in the effort to improve oral health among Alaska Native people: the dental health aide therapist model. *Am J Public Health*. 2011;**101**(10):1836-40.
23. Treadwell HM, Northridge ME. Oral health is the measure of a just society. *J Health Care Poor Underserved*. 2007;**18**(1): 12-20.
24. Sheskin DJ. *Handbook of parametric and nonparametric statistical procedures*. 2nd ed. New York: Chapman & Hall/CRC; 2000.
25. Hardin J, Hilbe J. *Generalized estimating equations*. London: Chapman and Hall/CRC; 2003.
26. Heidenreich JF, Kim AS, Scott JM, Chi DL. Pediatric dentist density and preventive care utilization for Medicaid children. *Pediatr Dent*. 2015;**37**(4):371-5.
27. Osborne PB, Haubenreich JE. Underserved region recruitment and return to practice: a thirty-year analysis. *J Dent Educ*. 2003;**67**(5):505-8.
28. Silva M, Phung K, Huynh W, Wong H, Lu J, Aijaz A, Hopcraft M. Factors influencing recent dental graduates' location and sector of employment in Victoria. *Aust Dent J*. 2006;**51**(1):46-51.
29. Hayashi AS, Selia E, McDonnell K. Stress and provider retention in underserved communities. *J Health Care Poor Underserved*. 2009;**20**(3):597-604.
30. Hill H, Macey R, Brocklehurst P. A Markov model assessing the impact on primary care practice revenues and patient's health when using mid-level providers, lesson learned from the United Kingdom. *J Public Health Dent*. 2017;**77**(4):334-43.

## OHA Clinical Chart Review Form Guidelines

Sources: IHS Oral Health Program Guide, OHA DPP#100 Advisory Committee input, Western Regional Examining Board, Kalenderian E. Classifying Adverse Events in the Dental Office. Journal of Patient Safety. 2017

### Reminders:

- N/A (Not Applicable) and Unable to Determine are always additional answer options
- Please provide additional comments whenever possible. Comments are required when rating below the minimum standard of care.
- Please note in comment sections whenever images are not sufficient for dependable evaluation.

CRITERIA	Description			Assessment	Comments
<b>Diagnosis</b>					
1. Diagnosis Description Appropriate	<b>Yes:</b> Falls within minimum standard of care.		<b>No:</b> Must indicate deficiency in comments.		
2. Treatment appropriate	<b>Yes:</b> Falls within minimum standard of care.		<b>No:</b> Must indicate deficiency in comments.		
<b>Images</b>					
1. Radiographs available and sufficient for diagnosis	<b>1:</b> Radiographs are present and adequate for evaluation	<b>2:</b> Radiographs are present, but not adequate for evaluation. Please describe why.	<b>3:</b> Radiographs are not present for this procedure		
2. Intra-Oral Images are sufficient for evaluation.	<b>1:</b> Intra-oral images are present and adequate for evaluation	<b>2:</b> Intra-oral images are present, but not adequate for evaluation. Please describe why.	<b>3:</b> Intra-oral images are not present for this procedure		
<b>Administration of Drugs</b>					
1. Anesthetic used appropriate for procedure	<b>Yes:</b> Appropriate anesthetic, location, and dosage		<b>No:</b> Grossly inappropriate anesthetic, location, or dosage		
2. Within recommended Limits	<b>Yes:</b> Drug dosages are within limits recommended by the Physician's Desk Reference or American Hospital Formulary Service. Dosage notation includes quantity, type, concentration and strength	<b>No:</b> Drug dosages are outside recommended limits.	<b>Unable to Determine</b>		

CRITERIA	Description				Assessment	Comments		
3. Entered in Progress Notes (including anesthetic)	<b>Yes:</b> All drugs and dosages are entered in the medical and/or dental progress notes (including local anesthetic).		<b>No:</b> Must indicate deficiency in comments.					
4. Antibiotic Prophylaxis Given When Needed	<b>1:</b> Prophylaxis is called for and appropriately administered.	<b>2:</b> Prophylaxis is called for but is <b>not</b> appropriately administered. I.e. not given at all or an inappropriate amount or drug is given. Please comment.	<b>3:</b> Prophylaxis is not needed in this case and is not administered.					
5. Any previous history of anesthetic/drug/allergy/reactions noted	<b>Yes:</b> Reactions and allergies to drugs are documented in dental record. "NKDA" is considered acceptable		<b>No:</b> Must indicate deficiency in comments.					
6. Requisite vital stats considered	<b>Yes:</b> Pre and post op vitals (including but not limited to) blood pressure for oral surgery procedures. Weight noted for all anesthetics and analgesics administered to minors age 10 and under.		<b>No:</b> Must indicate deficiency in comments.					
<b>Evaluation of Procedure – Reviewer must use appropriate chart rubric to answer corresponding questions. Posterior Restorations (page 5), Anterior Restorations (page 7), SSC (page 9)</b>								
1. Overall impression of procedure quality – used for all procedures	<b>1:</b> Significant deficiencies exist. Procedure can be considered a failure	<b>2:</b> Significant deficiencies exist, procedure falls under absolute minimum standard of care	<b>3: Minimum</b> standard of care. Only minor deficiencies present.	<b>4:</b> Procedure quality is adequate to good. Only minor deficiencies present.	<b>5:</b> Procedure is highly successful, no deficiencies present.			
2. Extractions – Treatment is appropriate for diagnosis	<b>Yes:</b> Minimum standard of care, tooth removed successfully with no complications		<b>No:</b> Extraction does not follow stipulated guidelines.					
<b>Miscellaneous Documentation</b>								
1. Rubber Dam or Isolation Documentation	<b>Yes:</b> Isolation is noted		<b>No:</b> Isolation is not noted					
2. Complications Noted	<b>1:</b> Any complications are sufficiently noted	<b>2:</b> No complications evident and none noted	<b>3:</b> No: Any complications that are present are not noted					

CRITERIA	Description	Assessment	Comments
<b>Adverse Events</b>			
1. Adverse Events	<b>Yes:</b> There were any Adverse Events noted during the review associated with this procedure. Please comment	<b>No:</b> There were no adverse events.	
2. AE Category	Select Dental AE Type Classification Category, if applicable. See Table 1. <b>Must be completed if response to Adverse Events #1 is "Yes"</b>		
3. AE Severity	Review Dental Adverse Severity Tree and assign an appropriate category. See Table 2. <b>Must be completed if response to Adverse Events #1 is "Yes"</b>		
4. Errors	<b>Yes:</b> There were any Errors noted during the review associated with this procedure. Please comment	<b>No:</b> There were no Errors.	
5. Error Category	Select Dental AE Type Classification Category, if applicable. See Table 1. <b>Must be completed if response to Errors #4 is "Yes"</b>		
6. Error Severity	Review Dental Adverse Severity Tree and assign an appropriate category. See Table 2. <b>Must be completed if response to Errors #4 is "Yes"</b>		

**Adverse Events are categorized according to the following Dental AE Type Classification:**

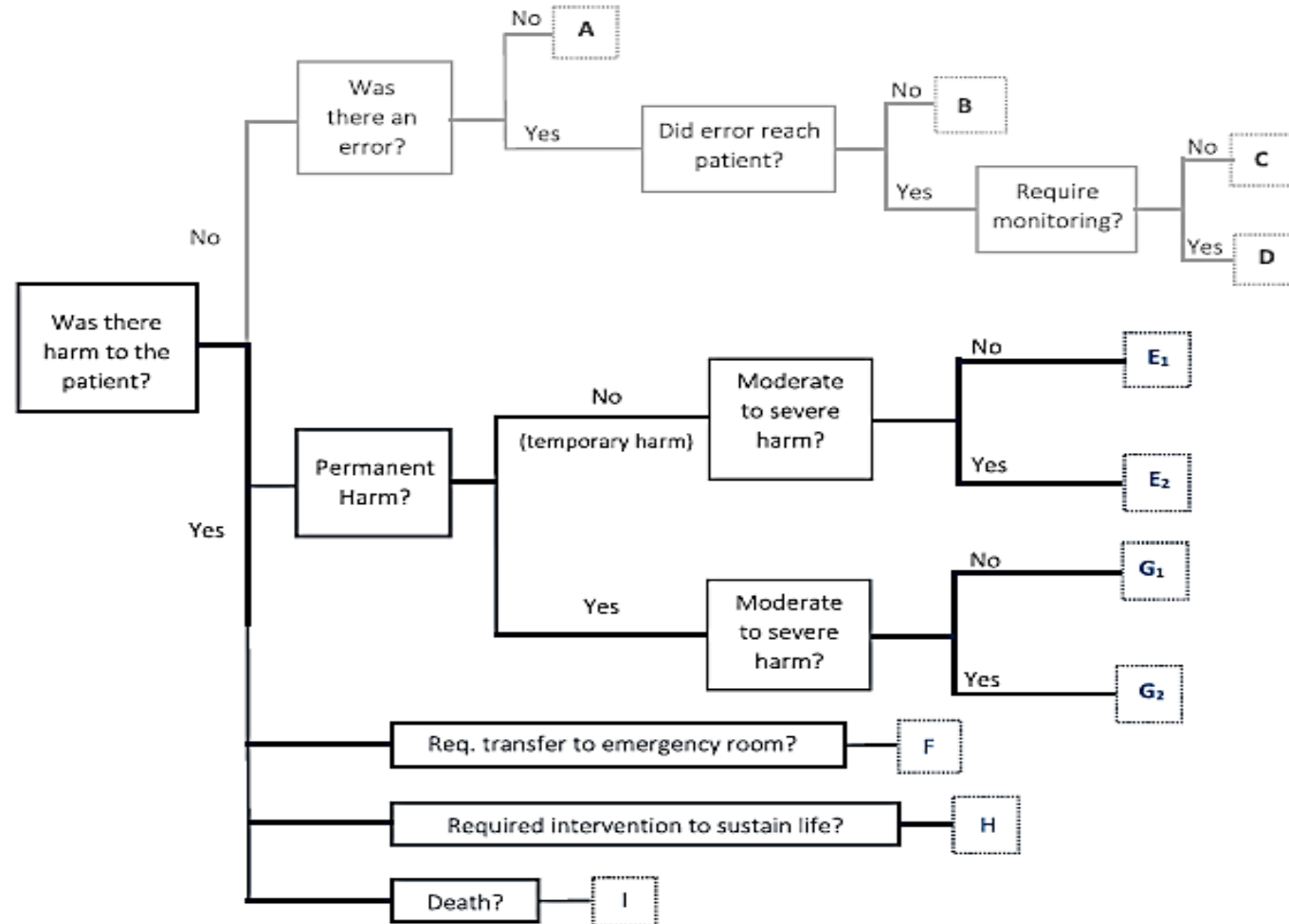
**Table 1. Dental AE Type Classification<sup>1, 2</sup>**

<b>AE Categories:</b> 1. Allergy/Hypersensitivity reactions 2. Aspiration of foreign body 3. Delayed appropriate treatment/Disease progression and/or unnecessary treatment associated with misdiagnosis 4. Foreign body response/rejection 5. Hard-tissue damage 6. Harm, not otherwise specified 7. Ingestion of foreign body 8. Nerve damage or injury 9. Ocular damage 10. Orofacial infection 11. Other orofacial complications	12. Other systemic complications including adverse reactions to device/materials/procedure 13. Other Wrong/unnecessary treatment 14. Poor aesthetic results post-dental treatment 15. Poor hemostasis/prolonged bleeding 16. Procedure on wrong patient 17. Procedure on wrong site 18. Psychological distress/disorder (including suicide) 19. Retention of foreign object(s) in patient with sequela 20. Soft tissue injury/inflammation 21. Systemic infection 22. Toxicity-drug overdose 23. Missed pathology
---	--

<sup>1</sup> Adapted from: Kalenderian E, Obadan-Udoh E, Maramaldi P, Etolue J, Yansane A, Stewart D et al. Classifying Adverse Events in the Dental Office. Journal of Patient Safety. 2017 Jun 30. Available from, DOI: 10.1097/PTS.0000000000000407

<sup>2</sup> Adapted from: Kalenderian E, Obadan-Udoh E, Ramoni R, Lessons learnt from Dental Patient Safety Case Reports. J Am Dent Assoc. 2015 May; 146(5): 318–326.e2. doi: 10.1016/j.adaj.2015.01.003

**Table 2. Dental Adverse Event Severity Categories.**



Category	Description of Dental Adverse Event Severity Categories using the Dental AE severity tree
A	No errors
B	Error with no impact on patient
C	Error with minimal/mild impact to patient; does not require monitoring
D	Error with moderate to severe impact to patient; requires monitoring
E1	Temporary (reversible or transient) minimal/mild harm to the patient
E2	Temporary (reversible or transient) moderate to severe harm to the patient
F	Harm to the patient that required transfer to emergency room and/or prolonged hospitalization.
G1	Permanent minimal/mild patient harm.
G2	Permanent moderate to severe patient harm.
H	Intervention required to sustain life
I	Patient death.

## Scoring Criteria – Amalgam/Composite Restorations – Posterior<sup>3</sup>

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Comments</b>
	<b>Unacceptable</b>	<b>Inadequate</b>	<b>Acceptable – Minimum Standard of Care</b>	<b>Appropriate</b>	<b>Optimal</b>	
<b>P.1</b> Prep: Outline and Extension	<ul style="list-style-type: none"> <li>• Outline is grossly and improper and lacks any definite form.</li> <li>• Caries remains in the enamel or is not completely accessed.</li> <li>• Cavosurface angles are grossly improper. Cavosurface has multiple major areas of roughness and/or enamel weakness that will cause the restoration to fail.</li> </ul>	<ul style="list-style-type: none"> <li>• Outline severely weakens marginal ridge or a cusp. Outline is misshapen and/or forces improper angle of exit.</li> <li>• Improper cavosurface angles or rough cavosurface will cause the final restoration to fail.</li> </ul>	<ul style="list-style-type: none"> <li>• Outline moderately weakens marginal ridge or a cusp. Isthmus is too wide or too narrow for lesion.</li> <li>• Cavosurface angles possibly compromise the integrity of the tooth or restoration. Cavosurface is moderately rough but will not adversely affect the final restoration.</li> </ul>	<ul style="list-style-type: none"> <li>• Outline is slightly irregular but does not weaken tooth.</li> <li>• Isthmus is slightly wider than required for lesion.</li> <li>• Cavosurface angles are not optimal but do not compromise the integrity of the tooth or restoration. Cavosurface has small areas of minor roughness.</li> </ul>	<ul style="list-style-type: none"> <li>• Outline is generally smooth and flowing and does not weaken tooth in any manner.</li> <li>• Proximal cavosurface angles are equal to or slightly greater than 90°. The integrity of both tooth and restoration is maintained.</li> </ul>	N/A: Unable to Determine:
<b>P.2</b> Prep: Internal Form	<ul style="list-style-type: none"> <li>• Walls and/or floors are grossly deep with total lack of concern for the pulp.</li> <li>• Caries remains in the dentin or is not completely accessed. (All caries must be removed except in the area of imminent pulp exposure, evidence based partial caries removal protocol, and must be noted in chart)</li> </ul>	<ul style="list-style-type: none"> <li>• Pulpal floor and/or axial wall is critically shallow or critically deep.</li> <li>• Affected dentin remains. (All caries must be removed except in the area of imminent pulp exposure, evidence based partial caries removal protocol, and must be noted in chart)</li> </ul>	<ul style="list-style-type: none"> <li>• Pulpal floor and/or axial wall is moderately shallow or deep.</li> </ul>	<ul style="list-style-type: none"> <li>• Pulpal floor and/or axial wall is slightly shallow or deep.</li> </ul>	<ul style="list-style-type: none"> <li>• Pulpal floor depth as determined by the lesion or defect does not exceed 2.0 mm from the cavosurface. Enamel may remain on the pulpal floor. Axial wall depth at the gingival floor is appropriate.</li> </ul>	N/A: Unable to Determine:

<sup>3</sup> Adapted for review of radiograph and intraoral imagery from Western Regional Examining Board, Central Regional Testing Service, American Board of Dental Examiners, The Commission on Dental Competency Assessments



	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Comments</b>
	<b>Unacceptable</b>	<b>Inadequate</b>	<b>Acceptable – Minimum Standard of Care</b>	<b>Appropriate</b>	<b>Optimal</b>	
<b>P.3</b> Prep: Operative Environment	<ul style="list-style-type: none"> <li>• Damage to the adjacent tooth will definitely require restoration.</li> </ul>	<ul style="list-style-type: none"> <li>• Damage to the adjacent tooth will be difficult to polish out and still maintain appropriate proximal contour. The adjacent tooth will likely require restoration.</li> </ul>	<ul style="list-style-type: none"> <li>• Damage to the adjacent tooth can be removed by polishing, but the shape of the contact will be changed.</li> <li>• Management of any damage is appropriate</li> <li>• Documentation of difficult behavior if necessary to explain excessive damage</li> </ul>	<ul style="list-style-type: none"> <li>• Minor damage to the adjacent tooth can be removed by polishing without changing the shape of the contact.</li> </ul>	<ul style="list-style-type: none"> <li>• No damage to the adjacent tooth.</li> </ul>	N/A: Unable to Determine:
<b>P.4</b> Finish: Anatomical Form	<ul style="list-style-type: none"> <li>• There is gross lack of anatomical form</li> <li>• Grossly improper proximal contour or shape.</li> </ul>	<ul style="list-style-type: none"> <li>• Anatomical form is improper. Marginal ridge is poorly shaped.</li> <li>• Anatomy is too deep or too flat.</li> <li>• Proximal contour is poor. Embrasures are severely over or under contoured</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate variation in normal anatomical form is present. Marginal ridge is improperly shaped.</li> <li>• There is moderate variation of proximal contour and shape.</li> </ul>	<ul style="list-style-type: none"> <li>• Slight variation in normal anatomical form is present.</li> <li>• There is slight variation of proximal contour and shape.</li> </ul>	<ul style="list-style-type: none"> <li>• Anatomical form is consistent and harmonious with contiguous tooth structure.</li> <li>• Proper proximal contour and shape are restored.</li> </ul>	N/A: Unable to Determine:
<b>P.5</b> Finish: Margins	<ul style="list-style-type: none"> <li>• Multiple open margins, or gross excesses or deficiencies, are present.</li> </ul>	<ul style="list-style-type: none"> <li>• A deep open margin is present, or critical excesses or deficiencies are present.</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate marginal excesses and/or deficiencies are present.</li> </ul>	<ul style="list-style-type: none"> <li>• Slight marginal excesses and/or deficiencies are present.</li> </ul>	<ul style="list-style-type: none"> <li>• There are no excesses or deficiencies anywhere along margins.</li> </ul>	N/A: Unable to Determine:
<b>P.6</b> Finish: Damage	<ul style="list-style-type: none"> <li>• Gross mutilation of hard or soft tissue is evident.</li> </ul>	<ul style="list-style-type: none"> <li>• Severe damage to hard or soft tissue is evident.</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate damage to hard or soft tissue is evident.</li> </ul>	<ul style="list-style-type: none"> <li>• Minor damage to hard or soft tissue is evident.</li> </ul>	<ul style="list-style-type: none"> <li>• There is no damage to hard or soft tissue.</li> </ul>	N/A: Unable to Determine:

### Scoring Criteria: Anterior Composite Restorations<sup>4</sup>

	1	2	3	4	5	Comments
	Unacceptable	Inadequate	Acceptable – Minimum Standard of Care	Appropriate	Optimal	
<b>A.1</b> Prep: Outline and Extension	<ul style="list-style-type: none"> <li>• Cavosurface has multiple gross irregularities and/or enamel weaknesses that will cause the restoration to fail.</li> <li>• Cavosurface angles are grossly inappropriate for the situation and will lead to fracture of the restoration.</li> </ul>	<ul style="list-style-type: none"> <li>• Cavosurface angles will lead to enamel fracture or fracture of the restoration.</li> </ul>	<ul style="list-style-type: none"> <li>• Cavosurface angles possibly compromise the integrity of the tooth or restoration. Cavosurface is moderately rough but will not adversely affect the final restoration.</li> <li>• Cavosurface angles possibly compromise the integrity of the tooth or restoration.</li> </ul>	<ul style="list-style-type: none"> <li>• Cavosurface angles are not optimal but do not compromise the integrity of the tooth or restoration.</li> </ul>	<ul style="list-style-type: none"> <li>• Proximal cavosurface angles are equal to or slightly greater than 90°. The integrity of both tooth and restoration is maintained.</li> <li>• Cavosurface forms a smooth continuous curve with no sharp angles.</li> <li>• There are no acute cavosurface angles.</li> </ul>	N/A: Unable to Determine:
<b>A.2</b> Prep: Shape and Extension	<ul style="list-style-type: none"> <li>• Caries remains in the dentin or is not completely accessed. (All caries must be removed except in the area of imminent pulp exposure, evidence based partial caries removal protocol, and must be noted in chart)</li> <li>• Outline is grossly improper and/or lacks any definite form.</li> <li>• Gingival wall is grossly overextended.</li> </ul>	<ul style="list-style-type: none"> <li>• Affected dentin remains. (All caries must be removed except in the area of imminent pulp exposure, evidence based partial caries removal protocol, and must be noted in chart)</li> <li>• Outline is severely over or underextended.</li> <li>• Gingival wall is in contact or obviously overextended.</li> <li>• Incisal extension has broken contact.</li> </ul>	<ul style="list-style-type: none"> <li>• Outline is moderately over or under extended. Outline is moderately irregular but does not weaken the tooth.</li> <li>• Gingival margin is moderately overextended.</li> <li>• Any overextension that severely weakens tooth is properly documented</li> </ul>	<ul style="list-style-type: none"> <li>• Outline is slightly over or under extended.</li> <li>• Outline is slightly irregular but does not weaken the tooth.</li> </ul>	<ul style="list-style-type: none"> <li>• Outline provides optimal access for caries removal and insertion of restorative material.</li> </ul>	N/A: Unable to Determine:

<sup>4</sup> Adapted for review of radiograph and intraoral imagery from Western Regional Examining Board, Central Regional Testing Service, American Board of Dental Examiners, The Commission on Dental Competency Assessments

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Comments</b>
	<b>Unacceptable</b>	<b>Inadequate</b>	<b>Acceptable – Minimum Standard of Care</b>	<b>Appropriate</b>	<b>Optimal</b>	
<b>A.3</b> Operative Environment	<ul style="list-style-type: none"> <li>• Damage to the adjacent tooth will definitely require restoration.</li> </ul>	<ul style="list-style-type: none"> <li>• Damage to the adjacent tooth will be difficult to polish out and still maintain appropriate proximal contour. The adjacent tooth will likely require restoration.</li> </ul>	<ul style="list-style-type: none"> <li>• Damage to the adjacent tooth can be removed by polishing, but the shape of the contact will be changed.</li> </ul>	<ul style="list-style-type: none"> <li>• Minor damage to the adjacent tooth can be removed by polishing without changing the shape of the contact.</li> </ul>	<ul style="list-style-type: none"> <li>• No damage to the adjacent tooth.</li> </ul>	N/A: Unable to Determine:
<b>A.4</b> Finish: Anatomical Form	<ul style="list-style-type: none"> <li>• There is gross lack of anatomical form</li> <li>• Grossly improper proximal contour or shape.</li> </ul>	<ul style="list-style-type: none"> <li>• Anatomical form is improper. Marginal ridge is poorly shaped.</li> <li>• Anatomy is too deep or too flat.</li> <li>• Proximal contour is poor. Embrasures are severely over or under contoured</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate variation in normal anatomical form is present. Marginal ridge is improperly shaped.</li> <li>• There is moderate variation of proximal contour and shape.</li> </ul>	<ul style="list-style-type: none"> <li>• Slight variation in normal anatomical form is present.</li> <li>• There is slight variation of proximal contour and shape.</li> </ul>	<ul style="list-style-type: none"> <li>• Anatomical form is consistent and harmonious with contiguous tooth structure.</li> <li>• Proper proximal contour and shape are restored.</li> </ul>	N/A: Unable to Determine:
<b>A.5</b> Finish: Margins	<ul style="list-style-type: none"> <li>• Multiple open margins, or gross excesses or deficiencies, are present.</li> </ul>	<ul style="list-style-type: none"> <li>• A deep open margin is present, or critical excesses or deficiencies are present.</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate marginal excesses and/or deficiencies are present.</li> </ul>	<ul style="list-style-type: none"> <li>• Slight marginal excesses and/or deficiencies are present.</li> </ul>	<ul style="list-style-type: none"> <li>• There are no excesses or deficiencies anywhere along margins.</li> </ul>	N/A: Unable to Determine:
<b>A.6</b> Finish: Damage	<ul style="list-style-type: none"> <li>• Gross mutilation of hard or soft tissue is evident.</li> </ul>	<ul style="list-style-type: none"> <li>• Severe damage to hard or soft tissue is evident.</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate damage to hard or soft tissue is evident.</li> </ul>	<ul style="list-style-type: none"> <li>• Minor damage to hard or soft tissue is evident.</li> </ul>	<ul style="list-style-type: none"> <li>• There is no damage to hard or soft tissue.</li> </ul>	N/A: Unable to Determine:

## Scoring Criteria: Stainless Steel Crowns

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Comments</b>
	Unacceptable	Inadequate	Acceptable	Appropriate	Optimal	
<b>SSC.1</b> Prep: Occlusal Reduction/ Incisal Reduction /Proximal reduction	<ul style="list-style-type: none"> <li>Sharp angles would preclude adequate crown adaptation.</li> <li>Reduction is insufficient to allow full seating of the crown and results in the SSC being in moderate-severe hyperocclusion</li> <li>Reduction is excessive and results in compromise of the tooth due to insufficient tooth structure remaining or pulpal exposure</li> </ul>	<ul style="list-style-type: none"> <li>Sharp angles will affect crown prognosis.</li> <li>Reduction is insufficient to allow full seating of the crown and results in the SSC being in mild-moderate hyperocclusion</li> </ul>	<ul style="list-style-type: none"> <li>Deviates up to 1.0 mm from optimal.</li> <li>Sharp angles may affect the restoration.</li> </ul>	<ul style="list-style-type: none"> <li>Slightly deviates from optimal.</li> <li>Occlusal reduction is sufficient.</li> <li>Interproximal reduction sufficient.</li> </ul>	<ul style="list-style-type: none"> <li>Occlusal Reduction/Incisal Reduction 1-1.5 mm compared to adjacent teeth.</li> <li>Sharp cusp tips removed, line angles are rounded.</li> <li>Bevel occlusal 1/3 of buccal and lingual.</li> </ul>	N/A: Unable to Determine:
<b>SSC.2</b> Prep: Caries Removal	<ul style="list-style-type: none"> <li>Caries remains in the enamel or dentin or is not completely accessed.</li> <li>(All caries must be removed except in the area of imminent pulp exposure, evidence based partial caries removal protocol)</li> </ul>	<ul style="list-style-type: none"> <li>Affected dentin remains. (All caries must be removed except in the area of imminent pulp exposure, evidence based partial caries removal protocol)</li> </ul>			<ul style="list-style-type: none"> <li>Complete Caries Removal</li> </ul>	N/A: Unable to Determine:
<b>SSC.3</b> Prep: Operative Environment	<ul style="list-style-type: none"> <li>Damage to the adjacent tooth will definitely require restoration.</li> <li>Gross mutilation of hard or soft tissue is evident.</li> </ul>	<ul style="list-style-type: none"> <li>Damage to the adjacent tooth will be difficult to polish out and still maintain appropriate proximal contour. The adjacent tooth will likely require restoration.</li> <li>Severe damage to hard or soft tissue is evident.</li> </ul>	<ul style="list-style-type: none"> <li>Damage to the adjacent tooth can be removed by polishing, but the shape of the contact will be changed.</li> <li>Moderate damage to hard or soft tissue is evident.</li> </ul>	<ul style="list-style-type: none"> <li>Minor damage to the adjacent tooth can be removed by polishing without changing the shape of the contact.</li> <li>Minor damage to hard or soft tissue is evident.</li> </ul>	<ul style="list-style-type: none"> <li>No damage to the adjacent tooth.</li> <li>There is no damage to hard or soft tissue.</li> </ul>	N/A: Unable to Determine:

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Comments</b>
	Unacceptable	Inadequate	Acceptable	Appropriate	Optimal	
<b>SSC.4</b> Adaptation, Cementation, Occlusion	<ul style="list-style-type: none"> <li>• Fit of crown not appropriate (too large, small, short, or long)</li> <li>• Crown is positioned incorrectly.</li> <li>• Excessive cement remains.</li> <li>• Crown in obvious hyperocclusion.</li> </ul>		<ul style="list-style-type: none"> <li>• Fit of crown is good (good contacts, length, and occlusion)</li> <li>• Correct position</li> <li>• Slight evidence of cement remaining radiographically</li> <li>• Occlusion appears good.</li> </ul>		<ul style="list-style-type: none"> <li>• Fit and contours of crown good.</li> <li>• Correct position</li> <li>• All remaining cement removed</li> <li>• Occlusion appears good</li> </ul>	N/A: Unable to Determine:
<b>SSC.5</b> Finish: Function	<ul style="list-style-type: none"> <li>• Occlusion is grossly in hyper occlusion.</li> </ul>		<ul style="list-style-type: none"> <li>• Occlusion is slightly in hyper-occlusion.</li> </ul>	<ul style="list-style-type: none"> <li>• Occlusion is restored to proper centric but there are some lateral interferences.</li> </ul>	<ul style="list-style-type: none"> <li>• Occlusion is restored to proper centric with no lateral interferences.</li> </ul>	N/A: Unable to Determine:

Final Comments:

Reviewer Name

Time Spent on Review

Chart ID