Oral Health Surveillance in western Alaska using the Electronic Dental Record

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Background

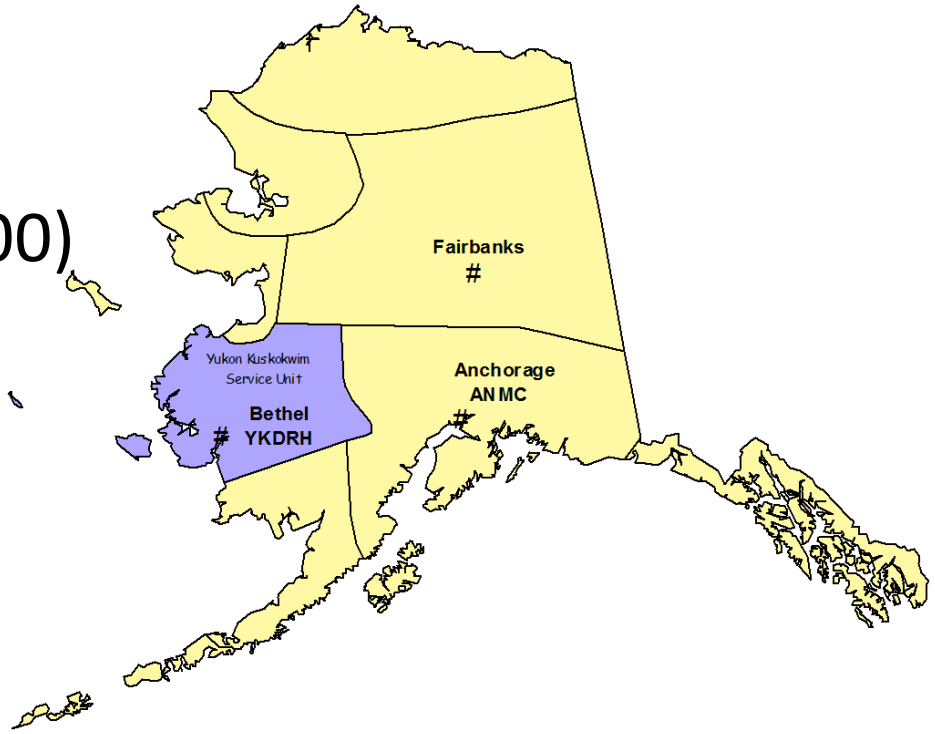
- 2008 Yukon Kuskokwim Health Corporation (YKHC) requested help to investigate pediatric dental caries
- Concern about high rates of Full Mouth Dental Rehabilitation
  - 400/yr in <6yrs
  - $ 9,000 US
- Survey of 348 children age 4-15 yrs in 5 villages:
  - High rates of untreated decay
  - Recommended establishing an ongoing surveillance system

Centers for Disease, C. and Prevention, *Dental caries in rural Alaska Native children--Alaska, 2008.* MMWR Morb Mortal Wkly Rep, 2011. **60**(37): p. 1275-8.

Yukon Kuskokwim Health Corporation (YKHC)

- Provides comprehensive healthcare including dental
- 58 communities (pop: 25-1000)
- 75,000 square miles

  (size of Oregon)
- Pop (2017):
  - Total = 23,500
  - Age < 6 years = 2960
- YKHC has had an electronic dental record system since 2005



Objectives of Surveillance Project

- Adapt electronic dental software to provide information on the dental health of the YK Delta population
- Create an automated report of dental health for targeted age groups

Advantages of Ongoing Electronic Record Surveillance

- More timely and less expensive than intermittent surveys
  - IHS conducts surveys every 4 years (last done 2014)
  - 1083 Alaska Native children aged 1-5 years;
    - few from YK, 282 5-year olds
  - Paper based
  - Resource intensive
- Local or regional data
- Allows comparison across communities e.g. fluoridation, piped water status
- Allows assessment of interventions and across time

Limitations of Using Electronic Dental Record for Surveillance

- Reflects oral health of those who have interacted with the dental health care system
  - may be biased toward the children who have the earliest and most severe disease.

Methods (dental records)

- Electronic dental record
  - date of service
  - service codes (including comprehensive exam codes)
  - status of each tooth (n= 20 primary teeth)
    - dft and dmft score established for each child
    - Validated scores for 50 patients through chart review
  - date of birth
    - Age reported as Age (years) at the end of the calendar year
  - community of residence

d = decayed

m = missing

f = filled

Methods

- Focused initially on children less than 6 years of age with primary teeth only
- Examined Electronic Dental Record for 2011-2019
- Assessed full mouth dental rehabilitations by 6 years of age (i.e. born 2009-2013)
- Population data
  - State of Alaska Dept. of Labor and Statistics
  - Census number by race, year, census designated borough and age

Methods

Captured Community data

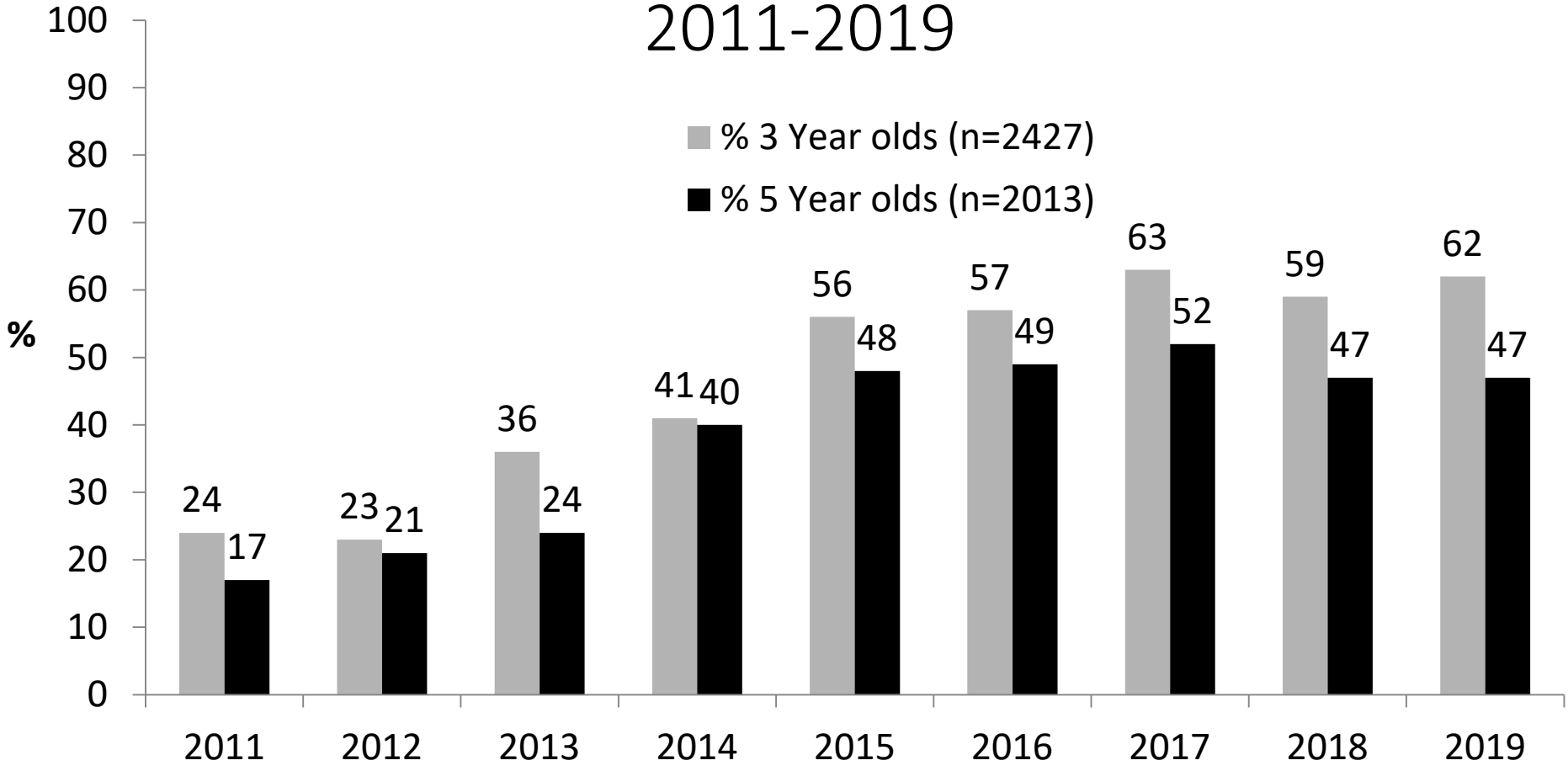
- Piped water status in year of exam
  - Piped ≥ 80% homes served
  - Un-piped ≤ 20% homes served
- Dental Health Aide Therapist (DHAT) status in year of exam
  - No DHAT, Itinerant or permanent

Results

Average number of 0-5 year olds/year	3090 (NS)
Average number of dentists and dental health aide therapists	33.1 (NS)
Average annual dental FTEs	14.6 (NS)

NS = no significant change over the 9 years

Percentage of *3 and 5 year olds* who received a comprehensive dental exam each year 2011-2019



Oral Health Status of *3 year olds* who received a comprehensive dental exam, 2011-2019

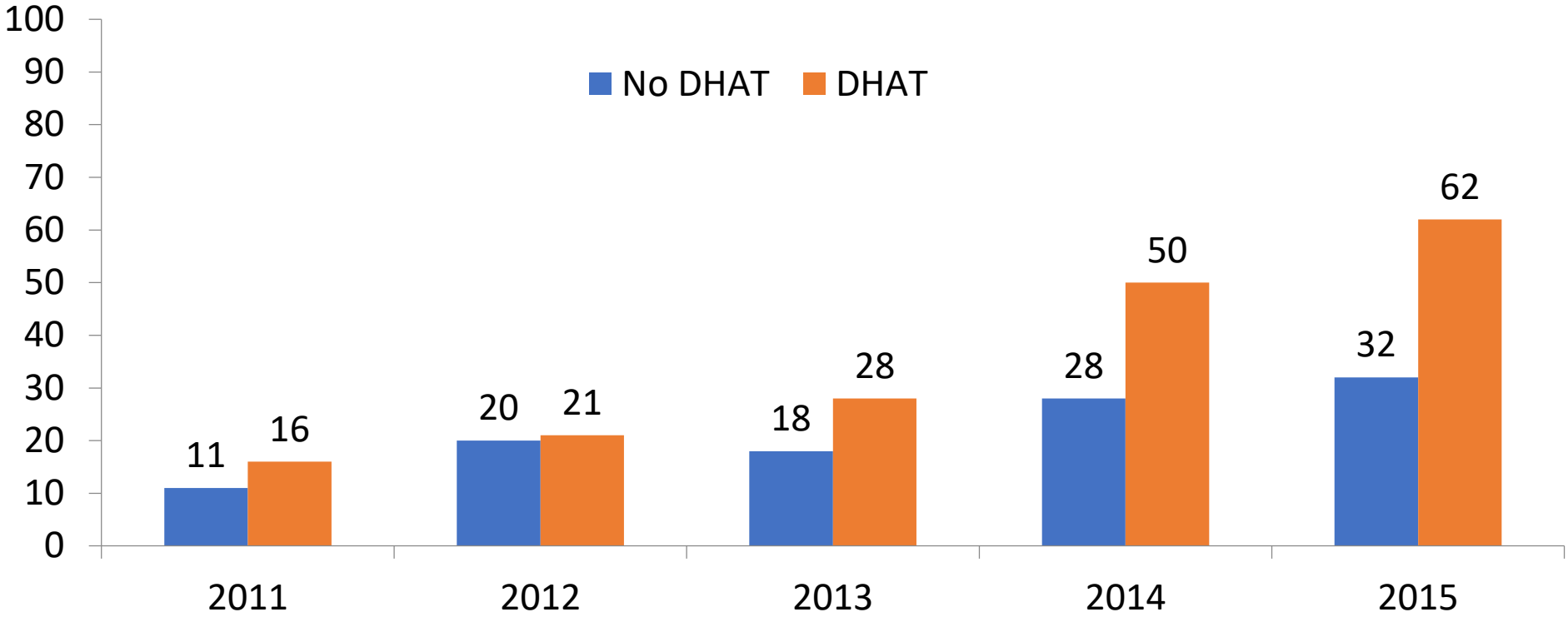
Year	No. of children n (%)	Presence of any cavities %	Mean decayed, missing, filled teeth score (dmft)	f/dft (%)
2011	141 (24%)	87%	8.9	64%
2012	132 (23%)	80%	7.3	61%
2013	217 (36%)	84%	7.4	43%
2014	246 (41%)	84%	7.5	35%
2015	331 (56%)	82%	7.6	33%
2016	328 (57%)	70%	5.9	35%
2017	359 (63%)	62%	4.7	66%
2018	332 (59%)	64%	4.7	52%
2019	341 (62%)	82%	6.6	36%
Trend test	↓ <0.001	↓ <0.001	↓ 0.003	↓ 0.02

Oral Health Status of *3 and 5 year olds* who received a comprehensive dental exam, 2011-2019

Year	3 year old mean dmft	5 year old mean dmft
2011	8.9	10.3
2012	7.3	9.8
2013	7.4	9.0
2014	7.5	10.1
2015	7.6	10.2
2016	5.9	10.4
2017	4.7	10.5
2018	4.7	10.0
2019	6.6	11.0
Trend test	↓ 0.03	NS

Among U.S. all races, average dmft score for 5 year olds was 1.7

Percentage of *5 year olds* receiving Comprehensive Exams in Communities with **DHATs versus No DHATs**



Mean dmft scores for *5 year olds* by Community DHAT Status

	DHAT			No DHAT			
Year	**Total 5 year old Pop**	**Dental Exam n (%)**	**dmft**	**Total 5 year old Pop**	**Dental Exam n (%)**	**dmft**	**p-value**
2011-2015	1369	507 (37%)	**10.5**	811	184 (23%)	**12.1**	0.002

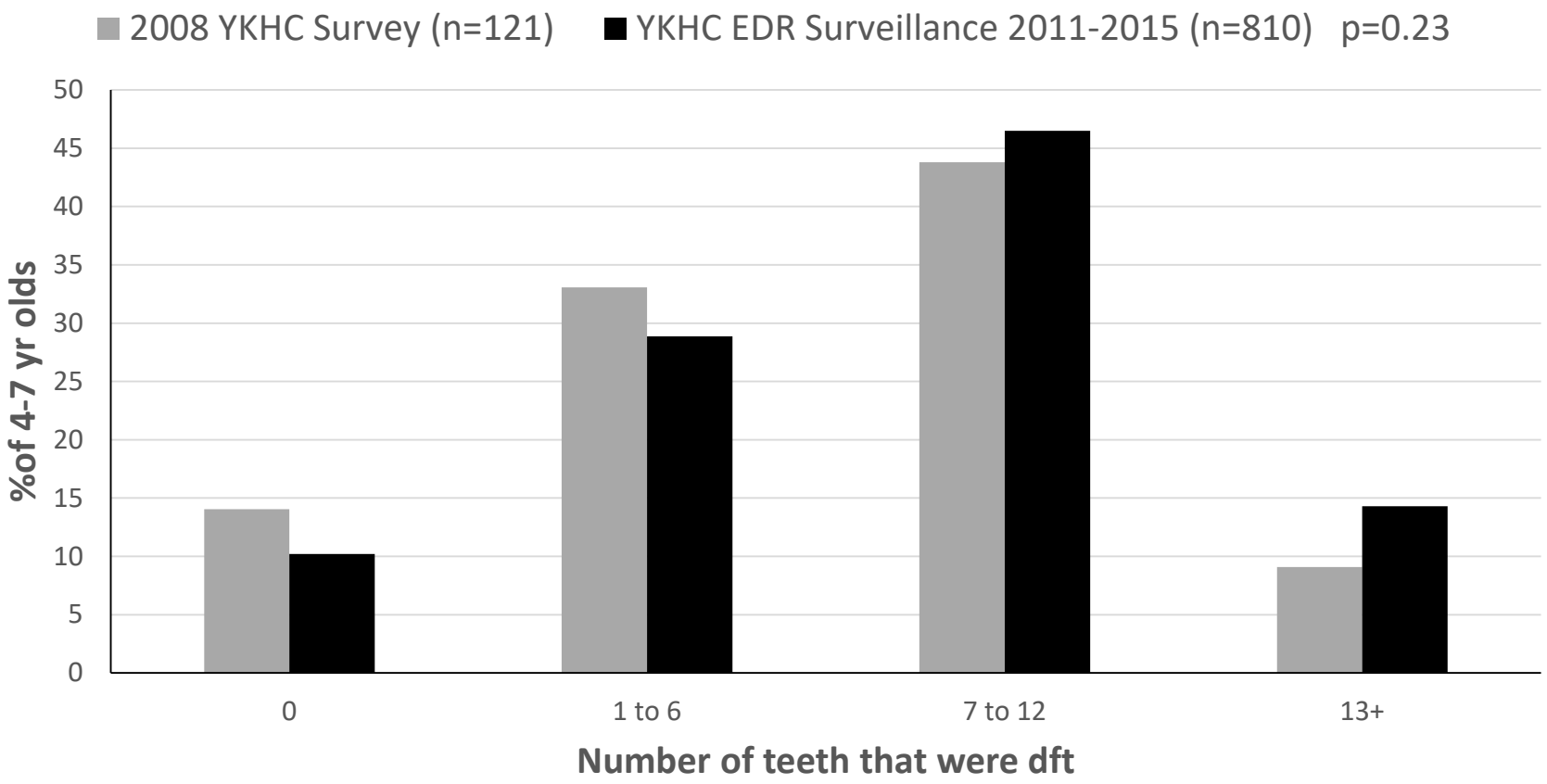
***2190 fewer decayed, missing, or filled teeth over 5 years**

Full Mouth Dental Rehabilitation 2011-2019

Year of Birth		2009	2010	2011	2012	2013	Total
Total Births		660	666	649	651	641	3267
Age (years) at FMDR	1	3	7	6	14	3	33
	2	66	40	82	90	101	379
	3	110	154	194	206	175	839
	4	168	194	134	111	123	730
	5	89	70	56	45	61	321
Number (%) of Children		436 (66%)	465 (70%)	472 (73%)	466 (72%)	463 (72%)	**2302 (70%)**
Cochran-Armitage Trend Test p=0.01							

Analysis of New York State Medicaid data, 1996-1999 showed 0.2% children <6yrs underwent FMDR

2008 Survey vs EDR surveillance (2011-2015): Proportion of 4-7 yr olds with given dft, same 4 communities



Measures of a Surveillance System

- Representative
  - Increasing: 47% of 5 year olds in 2019
  - Larger number of 1-5 yr olds than IHS surveys
  - Similar distribution of disease (2007 survey vs electronic record)
- Timeliness
  - With EDR, available in real time
  - Can run report at any time (at least annually)
- Completeness
  - 100% concurrence on validity check
- Systematic
  - Some subjectivity in reporting condition of tooth
- Sustainability
  - YK staff in training; can run report with change of date parameters

Vitamin D deficiency in Prenatal Women and Severe Early Childhood Cavities in their Infants

Rosalyn Singleton

Background:

- Alaska Native prenatal women have low vitamin D levels leading to risk for rickets in their infants.
- Vitamin D is important in development of tooth enamel.
- Some studies show an association between low prenatal vitamin D and early childhood caries.

Objective:

- Determine if there is an association between low vitamin D levels in prenatal women, and early childhood caries in their children

Method:

- We analyzed **maternal vitamin D levels** collected in the "Maternal Organics Monitoring Study (MOMS)“ in prenatal and in cord blood.
- We evaluated YKHC electronic dental records for decayed, missing, filled, primary teeth (dmft) scores in MOMs infants at 12-60 months

Results: Association between Vitamin D and ECC

Age	Mean dmft		P-value
	25(OH)D ≤12 ng/ml	25(OH)D >12 ng/ml	
12-35 months (cord blood)	9.3	4.7	P=0.002
>36 months (cord blood)	10.9	8.7	P=0.140

Key Findings

- Children 12-35 months with deficient cord blood vitamin D level had a mean dmft score twice as high as children who were not deficient.
- No difference in dmft score of children > 36 months who were deficient vs. non-deficient.

Conclusions

- Vitamin D deficiency in prenatal women may contribute to early childhood caries.

ECC = early childhood caries; dmft = decayed missing and filled teeth; 25(OH)D – vitamin D concentration
Journal Dental Research, 2019.

Summary

- Demonstrated the use of electronic dental record feasible for oral health surveillance
  - Very little literature on this in USA
- While certain limitations exist:
  - Demonstrated increased proportion of children getting comprehensive exams
    - Higher proportion in communities with DHATs
  - Demonstrated persistence of extensive disease in a large proportion of children in this region
    - Children experience huge disease burden early in life

Future

- Expansion to other Tribal health organizations
  - Use different EDR systems
- Assess impact of interventions
  - Improving access
  - Initiating exams at early age (childhood vaccination visits?)
  - Prenatal vitamin D supplementation
  - Reducing soda consumption!!!
  - Expanding DHAT
  - Installing piped water
  - Expanding communities with fluoridation

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