Oral Health Surveillance in the Yukon-Kuskokwim Delta

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Background

• 2008 Yukon Kuskokwim Health Corporation (YKHC) requested CDC to help investigate pediatric dental caries

• Concerned at YKHC about high rates of Full Mouth Dental Rehabilitations (FMDR)
  – In 2007, 400 procedures on YKHC children ≤ 6 years old
  – Yearly birth cohort ~ 600

• Convenience sample of 348 children age 4-15 yrs in 5 villages
Full Mouth Dental Rehabilitation
Decayed, Missing, Filled Teeth (dmft)

Decayed

Missing

Filled
Mean decayed, missing or filled (dmf) Teeth by Age Group, YKHC and Total United States

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>YKHC</th>
<th>Total U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 – 5</td>
<td>7.3</td>
<td>1.6</td>
</tr>
<tr>
<td>6 – 11</td>
<td>4.1</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Dental Caries in Rural Alaska Native Children --- Alaska, 2008. MMWR. September 23, 2011 / 60(37);1275-1278
Findings of CDC Study

• High rates of untreated decay
• Two factors significantly associated with higher prevalence of dental caries
  – Increased soda consumption
  – Lack of fluoridated water
• Recommended establishing an ongoing surveillance system
Advantages of Ongoing Electronic Record Surveillance

• Less expensive than intermittent oral health surveys
  – IHS conducts surveys every 4 years (last done 2014)
  – 1083 Alaska Native children aged 1-5 years; few from YK
  – Paper based
Advantages of Ongoing Electronic Record Surveillance

• Provides mechanism to assess population health over time
  – Examples
    • Yearly comparison of dft scores
    • Treated vs. untreated decay
    • Severe outcomes: Full Mouth Dental Rehabilitation
Advantages of Ongoing Electronic Record Surveillance

• More timely than intermittent surveys
• Local or regional data
• Allows comparison of communities e.g. presence of DHATs, fluoridation
Limitation of Using Electronic Dental Record for Surveillance

Only reflects oral health of those who have interacted with the dental health care system. This group may be biased toward the children who have the earliest and most severe disease.
Objectives of Surveillance Project
(Funded through ANTHC Strategic Initiative)

• Adapt 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.
• Train staff at YKHC to continue surveillance.
Methods (1)

• Three tables:
  – dfm_data: date (of comprehensive exam), ID#, status of each tooth (n = 20 primary teeth)
    • dft and dmft score established for each child
    • Validated scores for 50 patients through chart review
  – Patientinfo: ID#, date of birth, community of residence
  – Trandatecodes: ID#, dates of service, dental service codes (including comprehensive exam codes)
Methods (2)

• Community information
  – Piped water and fluoridation status
    • (provided by DEHE)
  – Presence of dental health aide therapist (DHAT)
    • (provided by YK dental unit and DHAT program)

• Population data
  – State of Alaska Dept. of Labor and Statistics
  – Census number by race, year, census designated borough and age

• Age reported as Age (years) at the end of the calendar year
Results of Electronic Record Oral Health Surveillance in the Y-K Delta
## Numbers of AN children Age 1-5 Years Referred for Full Mouth Dental Rehabilitation 2011-2015

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>6</td>
<td>14</td>
<td>2</td>
<td>12</td>
<td>466</td>
</tr>
<tr>
<td>2</td>
<td>67</td>
<td>41</td>
<td>82</td>
<td>86</td>
<td>102</td>
<td>276</td>
</tr>
<tr>
<td>3</td>
<td>169</td>
<td>110</td>
<td>154</td>
<td>186</td>
<td>210</td>
<td>499</td>
</tr>
<tr>
<td>4</td>
<td>146</td>
<td>81</td>
<td>168</td>
<td>189</td>
<td>142</td>
<td>551</td>
</tr>
<tr>
<td>5</td>
<td>77</td>
<td>38</td>
<td>80</td>
<td>88</td>
<td>75</td>
<td>541</td>
</tr>
<tr>
<td><strong>Completed</strong></td>
<td><strong>381</strong></td>
<td><strong>302</strong></td>
<td><strong>305</strong></td>
<td><strong>403</strong></td>
<td><strong>375</strong></td>
<td><strong>1766</strong></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>466</strong></td>
<td><strong>276</strong></td>
<td><strong>499</strong></td>
<td><strong>551</strong></td>
<td><strong>541</strong></td>
<td><strong>2333</strong></td>
</tr>
</tbody>
</table>
Full Mouth Dental Rehabilitation

Between 2011 and 2015, 73% of children in the YK Delta received an FMDR by the time they were 6 years old.
Percent of AN Children Receiving Any Dental Services and Percent Receiving Full Exams 2011-2015

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Any dental service</th>
<th>Full exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 12mo</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>39</td>
<td>19</td>
</tr>
<tr>
<td>2</td>
<td>64</td>
<td>36</td>
</tr>
<tr>
<td>3</td>
<td>81</td>
<td>37</td>
</tr>
<tr>
<td>4</td>
<td>86</td>
<td>33</td>
</tr>
<tr>
<td>5</td>
<td>82</td>
<td>31</td>
</tr>
</tbody>
</table>
Percentage of 3 and 5 year olds who received a comprehensive dental exam each year 2011-2015

<table>
<thead>
<tr>
<th>Year</th>
<th>% 3 Year olds</th>
<th>% 5 Year olds</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>2012</td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td>2013</td>
<td>37</td>
<td>24</td>
</tr>
<tr>
<td>2014</td>
<td>44</td>
<td>41</td>
</tr>
<tr>
<td>2015</td>
<td>59</td>
<td>49</td>
</tr>
</tbody>
</table>

n=331
n=285
Oral Health Status of 3 year olds who received a comprehensive dental exam 2011-2015  
(denominator is from census population)

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of children n (%)</th>
<th>Presence of any cavities %</th>
<th>Mean decayed, missing, filled teeth score (dmft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>141 (24%)</td>
<td>87%</td>
<td>9.2</td>
</tr>
<tr>
<td>2012</td>
<td>132 (23%)</td>
<td>86%</td>
<td>8.2</td>
</tr>
<tr>
<td>2013</td>
<td>217 (37%)</td>
<td>92%</td>
<td>9.0</td>
</tr>
<tr>
<td>2014</td>
<td>248 (44%)</td>
<td>91%</td>
<td>9.4</td>
</tr>
<tr>
<td>2015</td>
<td>331 (59%)</td>
<td>91%</td>
<td>9.8</td>
</tr>
</tbody>
</table>
Oral Health Status of 3 and 5 year olds who received a comprehensive dental exam 2011-2015

<table>
<thead>
<tr>
<th>Year</th>
<th>3 year old mean dmft</th>
<th>5 year old mean dmft</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>9.2</td>
<td>10.1</td>
</tr>
<tr>
<td>2012</td>
<td>8.2</td>
<td>9.8</td>
</tr>
<tr>
<td>2013</td>
<td>9.0</td>
<td>9.3</td>
</tr>
<tr>
<td>2014</td>
<td>9.4</td>
<td>10.8</td>
</tr>
<tr>
<td>2015</td>
<td>9.8</td>
<td>10.8</td>
</tr>
</tbody>
</table>
Percent of 5 year olds who had comprehensive exam with UNtreated decay, 2011-2015

- 2011: 85%
- 2012: 83%
- 2013: 83%
- 2014: 77%
- 2015: 70%
Mean dmft scores for 5 year olds by Community Water Service Status

<table>
<thead>
<tr>
<th>Year</th>
<th>Piped</th>
<th></th>
<th>Un-piped</th>
<th></th>
<th></th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total 5 year old Pop</td>
<td>Dental Exam n (%)</td>
<td>dmft</td>
<td>Total 5 year old Pop</td>
<td>Dental Exam n (%)</td>
<td>dmft</td>
</tr>
<tr>
<td>2011-2015</td>
<td>1195</td>
<td>333 (28%)</td>
<td>10.8</td>
<td>985</td>
<td>233 (24%)</td>
<td>12.2</td>
</tr>
</tbody>
</table>

Each additional year of piped water exposure resulted in a 1/4 point decrease in dmft.

No change after adjusting for presence of DHAT.
Mean dfmt scores for 5 year olds by Fluoridation Status for Piped Communities

<table>
<thead>
<tr>
<th>Year</th>
<th>Total 5 year old Pop</th>
<th>Dental Exam n (%)</th>
<th>dmft</th>
<th>Total 5 year old Pop</th>
<th>Dental Exam n (%)</th>
<th>dmft</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-2015</td>
<td>356</td>
<td>108 (30%)</td>
<td>10.2</td>
<td>838</td>
<td>301 (36%)</td>
<td>10.4</td>
<td>0.76</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Year</th>
<th>DHAT</th>
<th>No DHAT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total 5 year old Pop</td>
<td>Dental Exam n (%)</td>
</tr>
<tr>
<td>2011-2015</td>
<td>1369</td>
<td>507 (37%)</td>
</tr>
</tbody>
</table>

*2190 fewer decayed, missing, or filled teeth over 5 years
Comparison to CDC survey
Proportion of 4-7 yr olds with given dft (same 4 villages)

- Epi-Aid (n=121)
- YKHC Surveillance 2011-2015 (n=810)  \( p=0.23 \)
Measures of a Surveillance System

• Representative
• Timeliness
• Completenessness
• Systematic
• Sustainability
Measures of a Surveillance System

• Representative
  – Increasing: 49% of 5 year olds in 2015
  – Larger number of 1-5 yr olds than IHS surveys
  – No change in 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
Summary

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

• Expansion to other Tribal health organizations
  – Use a different EDR software
• Use of these data for research
  – Birth cord blood vitamin D levels and early caries
• Publication
• Challenges remain regarding interventions
  – Regular access and exams starting at 6 mo
  – Soda consumption
  – DHAT expansion
  – Piped water
  – Fluoridation
Acknowledgements

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• Tom Hennessy (CDC)
• Joseph Klejka (YKHC)
• Brian Hollander (YKHC)
• Ros Singleton (ANTHC)
OUR VISION:
Alaska Native people are the healthiest people in the world.