Using electronic dental records to monitor caries prevalence in Alaska Native children

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  - Clinic research services: Tim Thomas, Gretchen Day, Jonathan Newman
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  - Dane Lenaker, Joe Klejka
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Background

- 2008 Yukon Kuskokwim Health Corporation (YKHC) requested CDC to help investigate pediatric dental caries
- Concerned about high rates of Full Mouth Dental Reconstructions
Dental Caries in Rural Alaska Native Children — Alaska, 2008

In April 2008, the Arctic Investigations Program (AIP) of CDC was informed by the Alaska Department of Health and Social Services (DHSS) of a large number of Alaska Native (AN) children living in a remote region of Alaska who required full mouth dental rehabilitations (FMDRs), including extractions and/or restorations of multiple carious teeth performed under general anesthesia. In this remote region, approximately 400 FMDRs were performed in AN children aged <6 years in 2007; the region has approximately 600 births per year. Dental caries can cause pain, which can affect children’s normal growth and development (1). AIP and Alaska DHSS conducted an investigation of dental caries and associated risk factors among children in the remote region. A convenience sample of children aged 4–15 years in five villages (two with fluoridated water and three without) was examined to estimate dental caries prevalence and severity. Risk factor information was obtained by interviewing parents. Among children and presence of decayed teeth (untreated carious lesions) and filled and missing teeth (sequela of decayed teeth) in their primary and permanent teeth by one experienced dentist using a visual and tactile protocol modified from the World Health Organization’s oral health survey basic methods (5). The protocol was modified to match the diagnostic criteria used in surveys in the United States (2). Parents were interviewed, using questionnaires, to obtain risk factor information. All participants’ families completed the questionnaire, and more than one child per family was allowed to participate.

The number of decayed primary teeth (dt), decayed and filled primary teeth (dft), decayed permanent teeth (DT), and decayed, missing, and filled permanent teeth (DMFT) were determined for each participant. Prevalence (having one or more tooth affected) and severity (mean dt, dft, DT, and DMFT) were determined by age group (4–5, 6–8, 9–11, and 12–15 years) and whether fluoridation was present.
Recommendations

- Fluoridate village water systems
- Expand fluoride varnish use
- Decrease soda-pop consumption
- Address unmet dental needs
- Establish ongoing surveillance for caries
- Conduct cost effectiveness analysis of oral health interventions
What many people think of when they hear the word “Surveillance”
What many people think of when they hear the word “Surveillance”
Surveillance, defined

- Ongoing, systematic, collection, analysis and interpretation of health data

- For planning, implementation and evaluation of public health or clinical practices
Surveillance: “Data for decision-making”

- A tool for evaluating outcomes

- To help answer this question:
  - Is the health of the population better, the same, or worse because of the services we provide?
Available Caries Data in Alaska

- IHS Oral Health Survey
  - Last survey: 2014
  - Last published: 2012 for 2010 Survey
- Alaska Basic Screening Survey
  - Kindergarten and third graders
    - Last 2011
- Electronic dental records (EDR)
- Head Start dental exams
Why the IHS Oral Health Survey is not well-suited for local surveillance or evaluation

• “Snap shot”
  – A picture at one point in time
  – Useful for large-scale comparisons

• Periodic survey
  – Children under age 5 done every 5 years

• Sample size doesn’t allow local level analysis
  – Couldn’t be used to evaluate interventions at community level
Prevalence and severity of dental caries among American Indian and Alaska Native preschool children

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2 Nashville Area Indian Health Service, Nashville, TN
3 University of Michigan, Ann Arbor, MI
4 Indian Health Service, Division of Oral Health, Rockville, MD

Abstract

Objectives: To describe the Indian Health Service (IHS) oral health surveillance system and the oral health status of American Indian and Alaska Native (AI/AN) children aged 1-5 years.

Methods: A stratified probability sample of IHS/tribal sites was selected. Children were screened by trained examiners at community-based locations including medical clinics, Head Start, preschools, kindergarten, and Women, Infants, and Children (WIC). Data collection was limited to the primary dentition and included number of teeth present plus number of teeth with cavitated lesions, restorations, and extracted because of decay. Number of molars with sealants and urgency of need for dental care data were also obtained. Statistical analyses were performed with SAS (SAS Institute Inc., Cary, NC, USA). Sample weights were used to produce population estimates based on selection probabilities.

Results: A total of 8,461 AI/AN children 12-71 months of age were screened at 63 IHS/tribal sites, approximately 7 percent of the estimated IHS user population of the same age. Overall, 54 percent of the children had decay experience, 39 percent had untreated decay, 7 percent had primary molar sealants, 36 percent needed early or urgent dental care, and 5 percent needed urgent dental care. The mean of decayed, missing, or filled teeth was 3.5 (95 percent confidence interval, 3.1-3.9). The prevalence of decay experience increased with age; 21 percent of 1-year-olds and 75 percent of 5-year-olds had a history of caries. When stratified by IHS area, there were substantial differences in the oral health of preschool children.

Conclusions: The results confirm that in the United States, AI/AN children served by IHS/tribal programs are one of the racial/ethnic groups at highest risk of caries.
From Phipps, et al

<table>
<thead>
<tr>
<th>IHS area</th>
<th>Service units in sampling frame</th>
<th>Percentage of service units participating</th>
<th>1 year</th>
<th>2 years</th>
<th>3 years</th>
<th>4 years</th>
<th>5 years</th>
<th>Total</th>
<th>Percentage of user population</th>
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<td>Aberdeen</td>
<td>19</td>
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<td>84</td>
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<tr>
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<td>83</td>
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<td>190</td>
<td>175</td>
<td>115</td>
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</tr>
<tr>
<td>Phoenix</td>
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<td>41.7</td>
<td>73</td>
<td>77</td>
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<td>210</td>
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</tr>
<tr>
<td>Portland</td>
<td>16</td>
<td>43.8</td>
<td>75</td>
<td>62</td>
<td>148</td>
<td>222</td>
<td>87</td>
<td>594</td>
<td>16.9%</td>
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<tr>
<td>Tucson</td>
<td>2</td>
<td>100.0</td>
<td>5</td>
<td>13</td>
<td>112</td>
<td>165</td>
<td>66</td>
<td>361</td>
<td>6.7%</td>
</tr>
<tr>
<td>Total</td>
<td>149</td>
<td>42.3</td>
<td>890</td>
<td>1,112</td>
<td>2,398</td>
<td>2,827</td>
<td>1,234</td>
<td>8,461</td>
<td>6.7%</td>
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</tbody>
</table>

IHS, Indian Health Service.
Why Use Electronic Dental Records for Surveillance Instead of Survey Data?

• Less expensive than special studies
  – Data already collected for clinical use
• More up-to-date than special surveys
• More complete than surveys
  – All clinic users
• Provides local or regional data
• Can track patients or groups over time
What can be measured through electronic records?

- Basic descriptive information
  - Age, sex, residence
  - Clinic usage, procedures, exams
- Examples
  - dmft scores for children of a given age
  - Treated vs. untreated decay
  - Severe outcomes: full mouth dental reconstruction
Limitations of electronic dental records

- Using the data requires analysis capacity
- Data quality and completeness highly dependent on charting practices
- These practices limit usefulness:
  - Treatment plans without diagnostic codes
  - Limited exams instead of comprehensive exams
Limitations of electronic dental records, continued

- Clinic-based data may not be representative of entire population
- Data affected by number of clinical providers and access to care
Ongoing projects in Alaska

Yukon Kuskokwim Health Corp (QSI)
Alaska Native Medical Center
(Eaglesoft)
Dentrix-based Service Units
YKHC Dental Records

- EDR since 2005
  - QSI software
- Use EDR to calculate dmft scores for the population
- Measure impact of programs
  - In-home piped water service
  - Water fluoridation
  - Dental Health Aide Therapist Program
Current Status, YKHC

- Pilot study showed feasibility
  - Good quality, completeness since 2011
- QSI programmers created tool for custom data tables from EDR
  - Exported to SAS software for analysis
- Reporting dmft for
  - <2, 3 and 5 y.o.
  - By village and calendar year
- Measures FMDR
Next steps

- First full reports being prepared for YKHC leadership
- Plan for routine capture and reporting
  - Adjustments, as needed, for program planning and evaluation
Using EDR at Alaska Native Medical Center to describe pediatric caries
Prevalence Of Caries Among Southcentral Foundation Dental Clinic Pediatric Patients, 2006-2013, Anchorage, Alaska.

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Methods

- Data extracted from electronic dental records
  - Eaglesoft system

- Inclusion criteria
  - Children aged 0-5 years old
  - Comprehensive exam
  - Anchorage and surrounding areas
  - 2006-2013
Number of Children Seen by Year and Age Class
## Caries Experience and Mean dft

<table>
<thead>
<tr>
<th>Age in years</th>
<th>2010-2013</th>
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<tbody>
<tr>
<td></td>
<td>Mean Number of Teeth</td>
</tr>
<tr>
<td></td>
<td>decayed</td>
</tr>
<tr>
<td>0</td>
<td>0.08</td>
</tr>
<tr>
<td>1</td>
<td>0.49</td>
</tr>
<tr>
<td>2</td>
<td>0.83</td>
</tr>
<tr>
<td>3</td>
<td>1.04</td>
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<tr>
<td>4</td>
<td>0.89</td>
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<tr>
<td>5</td>
<td>0.92</td>
</tr>
</tbody>
</table>
Mean dft Scores by Age Class
Current Status

- Pulling caries data from Eaglesoft system is feasible
- Calculation of dmft can be done
- No plan for “front-end” data tool
- Current dental resident using data to evaluate outcomes related to sealant placement
Dentrix-based Systems

• Conversations with Dental Directors in
  – Fairbanks, Dillingham
• Interest but concerns about completeness of charting, time limits
• Next step is to get raw data for analysis
• Competing priorities make this unlikely in near term, without additional resources
Conclusions

- Electronic dental records can be used to
  - Evaluate prevalence of caries in a population
  - Link outcomes for individuals
  - Track outcomes over time

- Untapped resource that exists within all clinic systems
  - Pilot projects to demonstrate feasibility and develop methods that can be exported to other groups or systems
  - Application to Dentrix remains to be done

- Usefulness would be improved if
  - Diagnostic codes are used
  - Comprehensive exams are charted
Thank you!