Features of Respiratory Infections in Alaskan children

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DISCLAIMER: The results and conclusions presented herein are those of the author and do not necessarily reflect those of the sponsoring agencies.
References

- Karron R et al. Severe RSV disease in Alaska Native children. JID. 1999;180:41-9
- Hennessy TW et al. The relationship between in-home water service and the risk of respiratory tract, skin, and gastrointestinal tract infections among rural Alaska Natives. AJPH 2008;98:1-7
Lower respiratory infection is the leading cause of global child mortality.

RSV is the most important virus causing respiratory infections (mostly bronchiolitis) in young children
  - Estimated 3.4 million RSV-associated hospitalizations
  - Estimated 66,000-199,000 deaths from RSV - 99% of deaths in developing countries

Pneumococcus (Strep. Pneumoniae) is the most important bacteria causing pneumonia in young children (covered in separate talk)

Before 1965, pulmonary TB was a major cause of morbidity among Alaska Native children.

High rates of respiratory infections and sequelae like bronchiectasis have been reported in Alaska Native children since the 1960s.

Periodic outbreaks of influenza in Alaska have been reported.

Relationship between respiratory infections and in-home running water.
• Most cases were in younger persons – rates of hospitalization in <25 year olds (37/100,000) was higher than >25 years (17/100,000)
• Alaska Native people and Asian Pacific Islanders were 2-4 times more likely to be hospitalized than white Alaskans.
• h1N1 cases in Southwest Alaska were more likely to be children < 5 years old.
• Increased crowding, especially during cold months may facilitate transmission of respiratory viruses and bacteria.

AIP-CDC and State of Alaska DHSS, unpublished data
 Linked birth/infant death database for 1999-2004

* AI/AN = American Indian/Alaska Native; A/PI = Asian/Pacific Islanders

Singleton et al. PEDIATRICS 2009;124:e768-e776.
Methods

- Retrospective analyses of hospital discharges and outpatient visits for LRTIs and RSV in infants and children <5 years of age using
  - Direct and Contract Health Service Inpatient Dataset - Indian Health Service
  - National Hospital Discharge Survey – U.S.
AI/AN infants had a higher % of infectious disease hospitalizations coded as Lower Respiratory Tract Infection than US infants in 1998-99 and 2005-2007.

In 2005-2007, LRTI’s accounted for 43% of all hospitalizations in AI/AN infants compared with 27% in U.S. infants.

Among Al/AN infants, Alaska Natives had the highest rate of RSV and bronchiolitis hospitalizations. Data from administrative data sets showing ICD-9 coded visits.

RSV-coded Hospitalization Rate/1000/yr: Alaska Native infants by region, 2002-2008

YK Delta: 107
Rural region A: 73
Rural region B: 66
Rural region C: 60
Rural region D: 58
Urban region: 23
Urban/rural: 21

Indian Health Service, National Patient Information Reporting System
Background: YK Delta, Alaska

- 195,000 square km
- Population – 27,000
- Birth cohort - 600
- 52 villages ranging in size 50 to 1,000 persons
- Regional Hub-Bethel ~6,000 persons
- Subsistence lifestyle
- High poverty level
RSV Surveillance, YK Delta
Children < 3 years old

1993-96 - active RSV surveillance
- After informed consent, children with ARI tested for RSV
- Rapid antigen EIA testing for RSV of nasopharyngeal aspirate

1997-present – passive RSV surveillance
- Computerized medical records at ANMC and YKDRH are used to ascertain RSV admissions
- RSV test results are obtained from hospital laboratory records
RSV Surveillance Study 1993-1996: YK Delta RSV hospitalization rate

<table>
<thead>
<tr>
<th>Group</th>
<th>Rate per 1,000 infants</th>
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<tbody>
<tr>
<td>YK Delta</td>
<td>156</td>
</tr>
<tr>
<td>YK Delta high risk</td>
<td>439</td>
</tr>
<tr>
<td>IMPACT Placebo</td>
<td>80</td>
</tr>
<tr>
<td>Anchorage AK Native</td>
<td>33</td>
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<tr>
<td>U.S. estimate</td>
<td>30</td>
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</tbody>
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Cause of Hospitalization
YK Delta children < 3 years old, 1993-96

Respiratory: non-RSV
37%

Non Respiratory
32%

RSV infection
31%

RSV hospitalizations by age and gestational age

(pre-palivizumab data, five seasons of data: 1993-1998)
The RSV hospitalization rate reported in YK And Navajo infants is comparable to rates in High risk infants in the Synagis trial.
Sequelea of RSV Hospitalizations
Mean # of visits with wheezing per child by year

Singleton RJ et al. PEDIATRICS 2003;112:285-90.
YK Delta Respiratory Virus Study, 2005-7
Positive PCR in hospitalized and comparison children

RSV remains the most important virus associated with respiratory hospitalizations

Parainfluenza & Metapneumovirus were also common

Rhinovirus and adenovirus were common in both healthy and hospitalized and were not associated with hospitalization
Hospitalization rate for Alaska Natives 5 times higher than for Whites

Most hospitalizations in children and young adults

73% of hospitalizations were in persons in the H1N1 priority groups

[Links to further reading]

### Long-term Chronic Respiratory Disease

**Non-CF Bronchiectasis in YK Delta**

<table>
<thead>
<tr>
<th>Alaska Natives (YK)</th>
<th>11-20 per 1,000 births</th>
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</thead>
<tbody>
<tr>
<td>Australian Aborigines</td>
<td>14.7 per 1,000 children</td>
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*Compared with:*

| Non-indigenous Finland | 0.4 per 100,000 children |

- Alaska Native children from YK Delta and other indigenous children have extremely high rates of non-CF bronchiectasis.

- Early/Recurrent pneumononias in childhood is the major risk factor.
Summary

• Respiratory Infections are a significant cause of outpatient visits and hospitalizations

• Alaska Native (and Asian Pacific Islanders) are at increased risk for severe respiratory infections

• High rates of pneumonia in YK children contribute to long-term sequelae such as bronchiectasis

• In the next talk we will learn about factors that contribute to high rates of respiratory infections