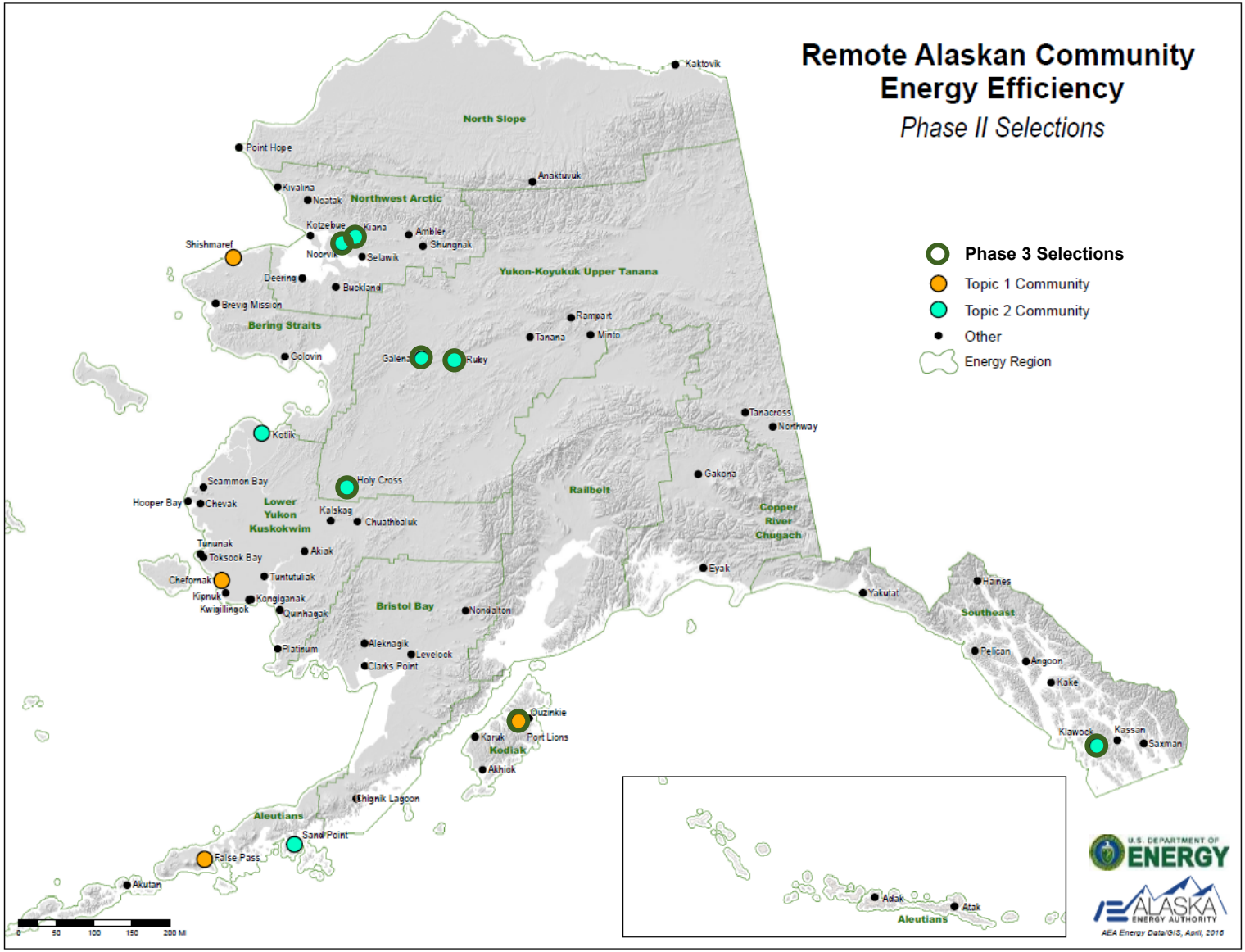
Remote Alaska Communities Energy Efficiency Peer Network

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy



Webinar Operations

- All participants have been automatically muted.
- If you have a question during the presentation, please type it into the Question panel on the right side of your computer screen. We will pose the question at the end.
- Please check the RACEE website after 5/18/17 for a link to the recording and transcription of this webinar.

http://energy.gov/eere/racee-competition-peer-exchange-network

- DOE plans to collect information for announcement on the next Peer Network call.
  - This can include useful information on funding and project ideas and opportunities
  - Email your input to Fletcher.Souba@ee.doe.gov for April's Webinar.

Welcome to the RACEE Peer Network

- The RACEE Peer Exchange Network is intended to provide a fundamental benefit to the 64 communities that pledged to reduce per capita energy usage by 15% by 2020.

- It will consist of three components:
  - RACEE website
  - Monthly technical webinars
  - In-person meetings
    - For, example, the RACEE Competition Summit at end of RACEE Phase 3

- For more details, see the RACEE Website:

http://energy.gov/eere/racee-competition-peer-exchange-network

RACEE Peer Exchange

- The goal of the network is to empower Alaskan communities and native Alaskan villages to develop effective tools to advance the use of reliable, affordable, and energy efficient solutions that are replicable throughout Alaska and other Arctic regions.

- The Department leverages the existing convening power of the AEA and other regional energy efficiency organizations to form the Peer Exchange Network to build a community of energy efficiency information sharing and action by peer exchange through webinars, and events.

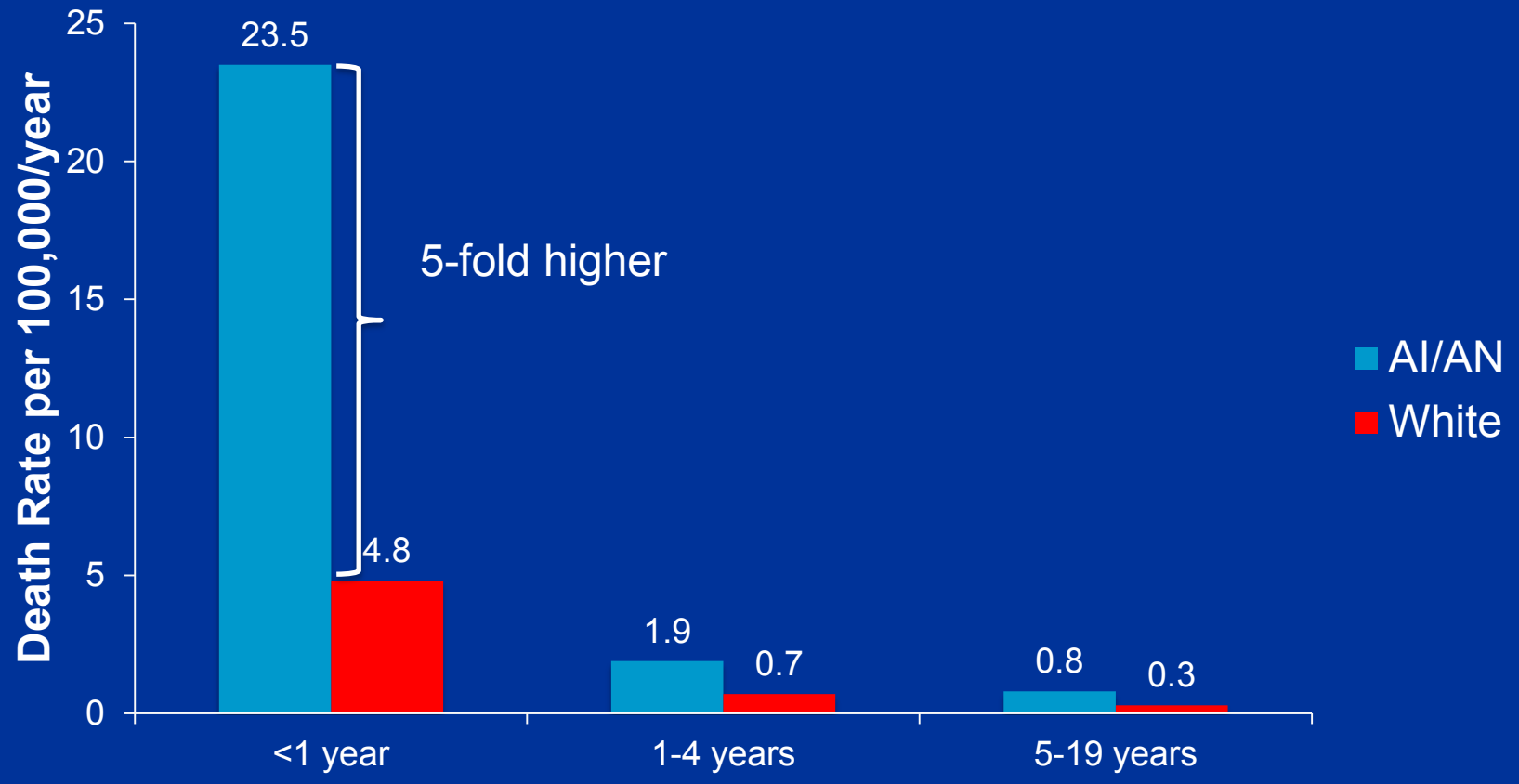
Future Webinar Topics

- **Cost of Delay & Project Financing**:
  - Cady Lister (Alaska Energy Authority)
- **Level 2 building Audits & Benchmarking Part 1:**
  - Jim Fowler (Energy Audits of Alaska) & Lee Bolling (Coffman Engineers)
- **Level 2 Building Audits & Benchmarking Part 2:**
  - Amber McDonough (Siemens) & Peter Beardsley (Nortech)
- **Community Experiences with Air Source Heat Pumps**:
  - Dr. Tom Marsik (Univ. of Alaska, Fairbanks) & Ingemar Mathiasson (Northwest Arctic Borough)
- **Indoor Air Quality Issues and How to Avoid Problems**
- **Biomass Heat Recovery Systems**
- **Water/Sanitation Efficiency in Alaska Communities**
- **Heat Recovery Systems and Benefits**
- **Diesel Part 1: Efficiency**
- **Diesel Part 2: Transition from 2-Stroke to 4-Stroke Engines**
- **Line Loss Mitigation**
- **AKEnergySmart - More about Renewable Energy in Alaska**

Environmental Health & Respiratory Disease: Indoor Air Quality

AJ Salkoski
Sr. Program Manager
Alaska Native Tribal Health Consortium

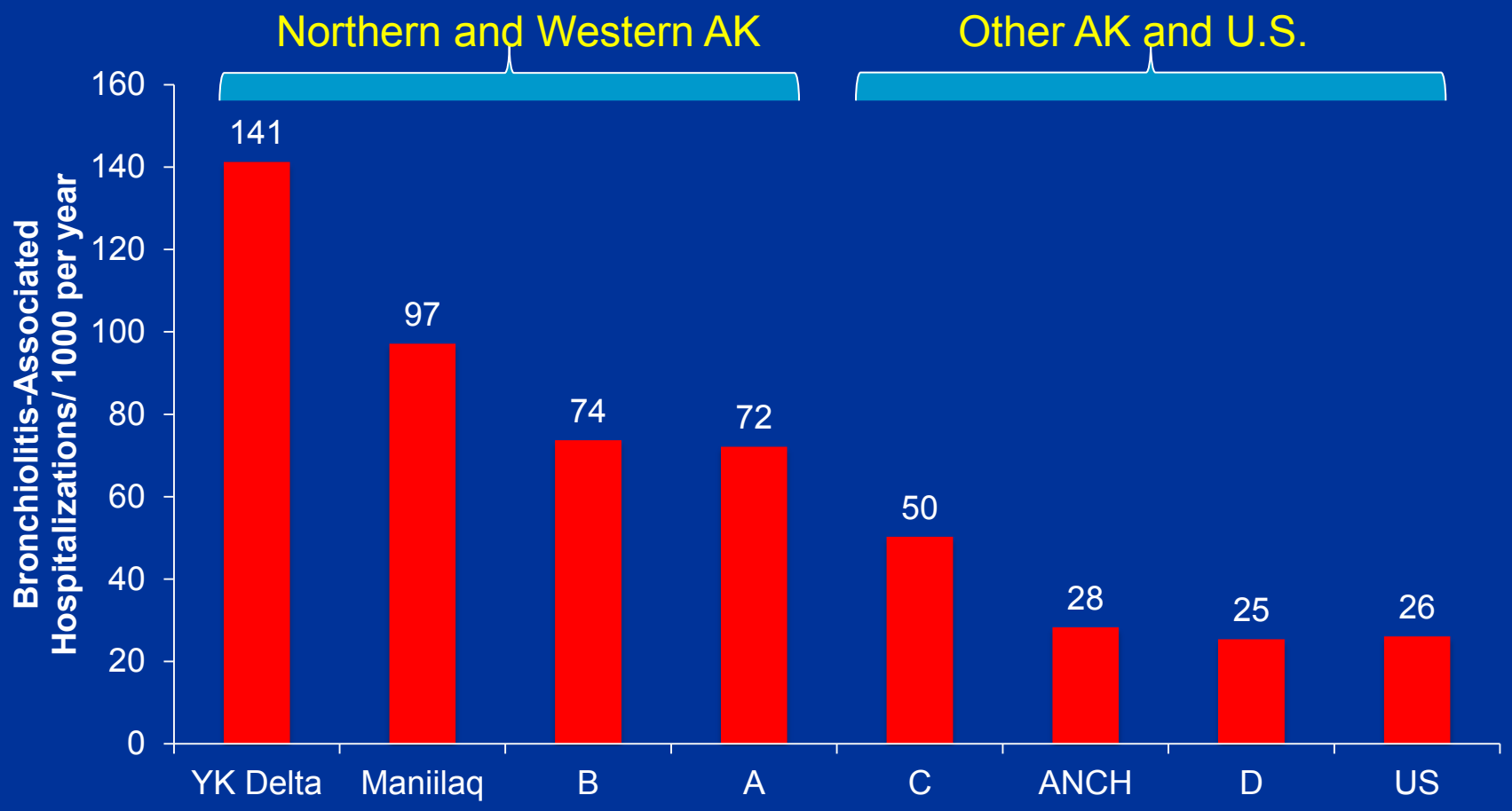
Pneumonia and influenza-associated child death rate by race and age group, 1999-2009



Groom AV et al. Pneumonia and Influenza Mortality Among American Indian and Alaska Native People, 1990-2009. AJPH 2014

Bronchiolitis Hospitalizations/1000/yr

Alaska Native infants by region, 2009-2011



Unpublished data, Singleton RJ, AIP-CDC, from IHS NIPRS data

Asthma & Cough in Alaska Kids

- American Indian/Alaska Native children have asthma prevalence similar to other U.S. children.

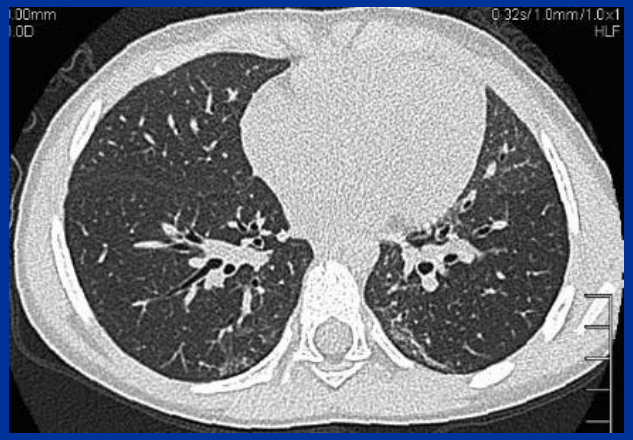
- Alaska Native children have a high prevalence of asthma or asthma-like symptoms or chronic cough

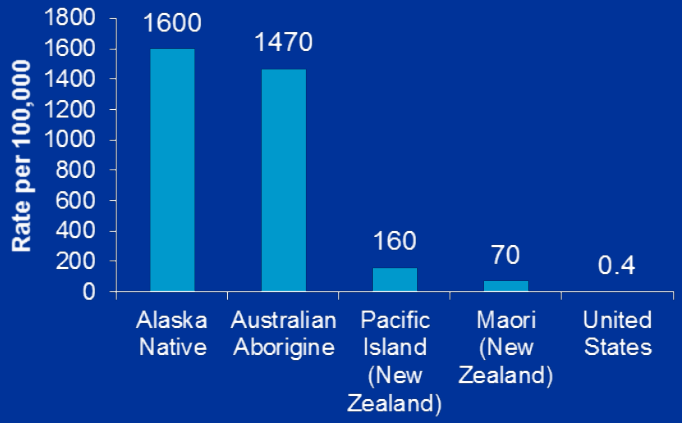
  Lewis et al – Interviewed 377 middle school children in Southwest Alaska
  - 40% reported one categories of chronic respiratory disease:
    - 7.4% - physician-diagnosed asthma,
    - 11.4% - asthma-like symptoms without asthma diagnosis,
    - 21.5% chronic productive cough without asthma diagnosis,

Lewis T et al. Prevalence of asthma and chronic respiratory symptoms among Alaska Native children. Chest. 2004 May;125(5):1665-73.

Long Term Effects of Pneumonia

- **Chronic Suppurative Lung Disease/Bronchiectasis**
  - Airway damage leads to loss of elasticity ("ectasia") of bronchi
  - Chronic Wet Cough ⇨ CSLD ⇨ Bronchiectasis
  - 1:63 Y.K. children w/ bronchiectasis vs. 1:2,000 U.S. children w/ CF





- **Decreased lung function and COPD in Adulthood**
  - Adults with childhood pneumonia have decreased lung function

Respiratory Infection: Environmental Risk Factors

- Household crowding
  - Persons/ room, # children in house
- Daycare attendance
- Smoke exposure
  - Tobacco exposure
  - Wood/coal fuels for heat, cooking
- Indoor Air Quality
  - PM2.5 (particulates)
  - Volatile Organic Compounds (VOCs)
- Lack of in-home running water
- Socioeconomic factors
  - Parental education; poverty

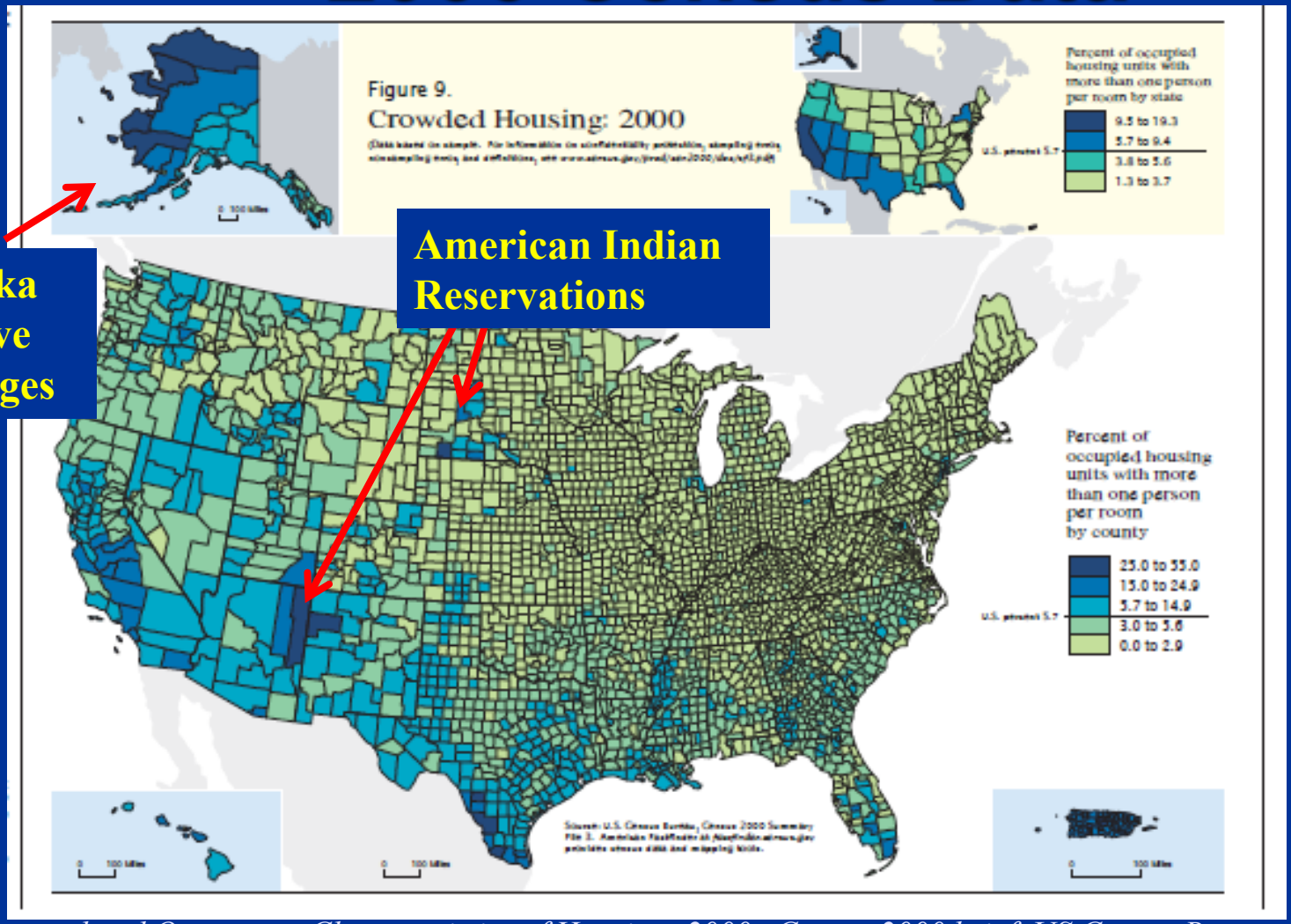
Alaska Rural vs U.S. homes:

Healthy Homes Study homes compared with general U.S. homes

Housing	Study houses	US houses
Mean # occupants	7.3 ↑	2.6
Median sq. feet	920 ↓	2,465
% >1 person/room	73% ↑	3%
% with woodstove primary heat	16% ↑	2%
% w/ smokers	49% ↑	26%
% no running water	60% ↑	0.5%

U.S. data from 2008-2012 Census, American Community Survey

Household Crowding in the U.S. 2000 Census Data



Structural and Occupancy Characteristics of Housing: 2000. Census 2000 brief. US Census Bureau,

Indoor Air Pollution:
Navajo and Alaska Native Children

- Any wood burning stove in the home increased odds of childhood lower respiratory tract infection (LRTI) by 4.9 times in Navajo children
- Household particulate matter concentration >65 $\mu g/m^3$ resulted in an increase of odds of LRTI by 7 times in Navajo children
- Risk Factors for LRTI hospitalizations in rural Alaska included household crowding and woodstove use.

Robin LF et al. Wood-burning stoves and lower respiratory illness in Navajo children. Pediatr Infect Dis J 1996.
Morris K, et al. Wood-burning stoves and LRTI in American Indian children. Am J Dis Child 1990.
Bulkow LR et al. Risk Factors for Hospitalization With LRTIs in Children in Rural Alaska. Pediatrics 2012

What Works?
Evidence-based Interventions

- **Wood-stoves: HEPA filters,** changeout wood stove, best burn practice
- **Ventilation:** install or fix vents, install range exhausts and bathroom fans, Heat recovery ventilators, air exchange
- **Dust and Dust mite**: impermeable pillow/mattress covers, wash bedding, remove carpet, cleaning/vacuuming
- **Pets**: remove pets, keep pets out of bedroom
- **Mold:** address moisture, ventilation, remove carpet
- **Irritants:** HEPA filters, increase ventilation

Strong evidence for home-based multi-trigger, multi-component interventions in reducing symptoms and missed school in children with asthma

CDC Task Force Findings Interventions for Children and Adolescents with Asthma
http://www.thecommunityguide.org/asthma/rrchildren.html

The Healthy Homes Study

Background

- Alaska Native children have high rates of pneumonia and bronchiolitis hospitalizations and chronic lung disease

Partners

- Alaska Native Tribal Health Consortium (lead)
- Yukon Kuskokwim Health Corporation
- Bristol Bay Area Health Corporation
- Arctic Investigations Program - CDC

Goal

- Evaluate whether simple home renovations can reduce indoor air pollutants and improve respiratory health in children with lung disease

Methods

- Identify homes of children with lung problems
- Assess homes for indoor air quality concerns
- Simple home renovations and education
- Measure indoor air quality (PM2.5, VOC, CO2, humidity), respiratory visits and symptoms before and after interventions

New and/or Improved Vents

Ventilation intake plugged with a rag

New ventilation intake

Woodstove Replacement

Old woodstove

New EPA-certified, low-emission woodstove

Cooking Stove Exhaust

Cooking stove with no range exhaust

New range exhaust

Indoor Air Measures: Study Homes at Baseline

Measure	Cut-off
PM 2.5 (ug/m3)	**51% over the cutoff**
CO2 (ppm)	**70% over the cutoff**
Ave. Rel Humidity (%)	<30 over half of time (**30%**) >60 over 1% of time (**18%**)
Temperature (ºF)	Average 74, Max 84
Volatile Organic Compounds Benzene m,p Xylene	 **23% over the cutoff*** **8% over the cutoff**

* ATSDR MRL Agency for Toxic Substances and Disease Registry minimum risk levels

Healthy Homes Study: Baseline findings

- **Indoor Air Quality**
  - High Volatile Organic Compounds (VOCs) and Particulates (PM2.5)
- **Respiratory symptoms in study household children**
  - high rates of cough between colds, hospitalization for lung infections, history of pneumonia, and wheezing.
- **Household factors and child symptoms**
  - VOCs
  - Primary wood heat
  - PM2.5

  Related to
  - Cough between colds

  - VOCs

  Related to
  - Wheeze between colds
  - Asthma diagnosis

Summary: Alaska

- Houses in rural Alaska are much smaller and crowded that average U.S. houses.
- Some indoor pollutants like PM2.5 and VOCs occur at high levels in homes.
- Indoor air pollutants contribute to respiratory symptoms in children with lung problems and their siblings
- We are analyzing the results of the Healthy Homes interventions on pollutants and child respiratory health

Next Step: Environmental Health Hospital Consultation Study

Year: 2016-2019

Organizations: ANTHC, SCF, YKHC, other THOs

Objectives: Pilot project to determine the feasibility of a hospital-based environmental consultation program at ANMC.

Methods: Environmental Health staff provide consult to caregivers, equip them with techniques/ tools to improve indoor air quality, make referrals to village housing if needed.

Evaluate: Home modification completion, changes in household behaviors, child resp. visits and hospitalizations.

Other Interventions to Reduce PM2.5

- University of Montana
  - Initial community-wide wood stove changeout program resulted in reduced wintertime ambient PM2.5 and childhood wheeze and respiratory infections.
  - However, team observed variable and uncertain effects on PM2.5 following the introduction of new wood stoves.
  - In randomized intervention trial of asthmatic children living in wood stove homes, HEPA air filtration units were less costly and more consistent in reducing PM2.5 (~60%) than wood stove changeout (no significant change)
  - Current study is evaluating whether home-based education is as effective and less costly than HEPA filter in reducing indoor PM2.5 and lung infections.

Noonan C. Assessing the impact of a wood stove replacement …Research Report 162. Boston:Health Effects Institute, 2011.
Ward TJ, Lessons learned from a woodstove changeout on the Nez Perce Reservation. Sci Total Environ 2010.
3Ward TJ. Results of a residential indoor PM2.5 sampling program before/after a woodstove... Indoor Air 2008;18(5):408-15.

Energy Concerns

- Heating homes can be expensive
  - Costs of traveling to gather wood and time involved
  - Costs of fuel for Toyo stoves
- Electrical costs can be expensive
  - HRV use
  - Air purifiers

Result of Energy Concerns

- Residents close or disable ventilation systems to conserve heat
- Residents turn off ventilation system to conserve electricity
- Residents are choosing between health and the costs associated with energy consumption

Questions?