



Department of Health and Social Services
Karleen Jackson, Commissioner

3601 C Street, Suite 540, PO Box 240249
Anchorage, AK 99524-0249 <http://www.epi.Alaska.gov>

Division of Public Health
Jay C. Butler, MD, Director

Local (907) 269-8000
24 Hour Emergency 1-800-478-0084

Editors:

Jay C. Butler, MD
Joe McLaughlin, MD, MPH
Bulletin No. 09 March 22, 2007

Relationship between In-Home Water Service and Lower Respiratory Infections—Alaska, 1999-2002

Introduction

Alaska has the lowest proportion of homes with piped water and wastewater disposal service in the United States (93.7% for Alaska vs. 99.4% for the United States). In rural Alaska, some communities lack these services entirely. This report examines the relationship between modern water service and pediatric lower respiratory infection (LRI) incidence rates by community. LRI includes illnesses such as bronchiolitis due to RSV and other viruses and viral or bacterial pneumonia.

Methods

The Alaska Division of Public Health (DPH) and the Centers for Disease Control and Prevention, Arctic Investigations Program (AIP) conducted the following independent analyses. DPH staff evaluated a statewide Medicaid database for children aged <2 years enrolled from 1999-2002 and determined community-level inpatient and outpatient LRI incidence rates. AIP staff abstracted clinical and laboratory information from computerized hospital records (in Bethel and Anchorage referral hospitals) for Alaska Native children aged <1 year residing in communities served by the Yukon-Kuskokwim health corporation to determine LRI, pneumonia, and respiratory syncytial virus (RSV) hospitalization rates. In both analyses, outcomes were compared with the proportion of homes with water service, defined as availability of piped water or water received from covered haul vehicles. Water service by community for the DPH analysis was based on an annual survey conducted by the Alaska Department of Environmental Conservation,¹ while the AIP analysis used the Rural Alaska Housing Sanitation Inventory.²

Results

Among the 117 communities with at least 15 children aged <2 years who were enrolled in Medicaid during 1999-2002, for all census areas except Wade Hampton and Bethel, the mean community-level inpatient LRI incidence rate was 4.0 per 100 child-years of follow-up (range, 0 to 10). For the Bethel and Wade Hampton census areas, rates were 21 and 25 per 100 child-years of follow-up, respectively.

Statewide, a lower percentage of households with piped water in a community predicted higher LRI hospitalization rates ($p < 0.001$). This strong association remained in numerous models that controlled for community level poverty status, the proportion of adults with specific levels of education attainment, household crowding, local unemployment, community location in the Bethel and Wade Hampton census areas, and proportion of residents that were Alaska Native. A similar association occurred with outpatient LRIs. Likewise, in the AIP analysis of communities served by the Yukon-Kuskokwim Health Corporation, the incidence rates of Alaska Native infant hospitalizations were progressively lower with higher water service levels (Figure).

Discussion

Availability of water service is related in a dose-dependent fashion with LRI hospitalization rates, even after controlling for potential confounding variables. This is true within and outside the Yukon-Kuskokwim region, where LRI hospitalization rates are five times higher than national rates. The current evaluation could not confirm a causal relationship, but the strength of the association, dose-dependence, and biological plausibility suggest that water availability is causally related to LRI risk, probably because the ease and frequency of hand washing increases with piped water service.

Conclusions

Provision of piped water and wastewater disposal to rural, predominantly Alaska Native communities may decrease long-standing rural-urban and Alaska Native/non-Native infectious disease disparities.

References

1. Division of Water, Alaska Department of Environmental Conservation. Available at: <http://www.dec.state.ak.us/water/>.
2. Rural Alaska Sanitation Housing Inventory. Available at: <https://rahsi.ihs.gov>.

Figure. Infant Respiratory Hospitalizations According to Percent of Community Homes with In-home Water Service — Yukon-Kuskokwim (YK) Region, 1999-2004

