

## **Infrastructure, Policy, and Access: The effects of Improved Water and Sewer Systems on the Health of Alaskan Residents**

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### **Introduction:**

Alaska faces a huge water and sewer problem: 22% of Alaskan villages lack access to delivered drinking water and sewage disposal services. Instead, these communities have to rely on water hauled from central watering points or untreated sources such as rivers to drink, bathe, cook, and clean and the use of "honey buckets," a bucket lined with a plastic bag to collect feces (1). These types of conditions are what many consider to be third world and increase the likelihood that members of these communities will develop infections and diseases from unsafe water use. This policy brief will examine how different types of interventions, specifically improved infrastructure, could improve access to clean water and there for increase individual and community wide health.

### **Background:**

Over 3,300 homes in rural Alaska do not have running water or flush toilets (1). Many of these homes are in "unserved" villages, or villages that completely lack the necessary infrastructure to provide these services, forcing residents into unideal situations when using water or disposing of waste (1). Lack of adequate clean water access promotes water rationing and unsafe practices that compromise health, such as reusing washbasin water (2). Consuming water from untreated sources has been shown to increase risks of pneumonia, influenza, and heightened rates of gastrointestinal infections, skin infections and respiratory diseases (3). A lack of running water also makes actions such as proper hand washing much more difficult.

The use of honey buckets is associated with negative health affects as well. Because these buckets must be transported to be disposed of, human waste often gets spilled around the villages exposing residents to harmful bacteria such as E.coli (1). In a study done comparing homes in rural Alaska that had and didn't have running water, children in homes without running water were ten times more likely to have viral pneumonia, bacterial infections, and severe skin infections and adults were more likely to have pneumonia, influenza, and skin infections such as boils (1). In an attempt to tackle this huge problem, efforts to create piped and hauled water systems in these rural communities have been made. However, because of decreased funding and increased costs the infrastructure that was installed is quickly deteriorating and many villages were not reached, leaving thousands of rural residents still lacking running water and flush toilets (1). The construction of these projects are logistically challenging and expensive because of village location, extreme weather, and terrain like permafrost. Without increased funds, there will be no way to continue the construction of these projects, leaving many Alaska villages underserved.

### **Research Findings:**

Currently, several studies have found an association between poorer health outcomes and the lack of running water and sewage disposal systems in rural homes (2,3,4). Additionally, these studies found that the poor infrastructure in rural communities must be addressed in order to increase the health the health in these communities. When moving forward with these projects there are a few important things to consider such as the type of water being provided, how the lack of infrastructure actually affects health and what better infrastructure will do to negate

these effects, and if certain types of infrastructure will be more successful in improving health outcomes.

### *Water Supply*

When addressing the issue of the lack of clean, running water in several rural Alaskan communities it is important to assess what type of water is needed to actually maintain good health. According to a study done on water supply and health, six factors determine if a water supply can actually support good health: the quality of the water, the quantity available and used, fair access to the water, the reliability of the source, the cost, and the ease of management (5). Without these things, the water supply will either be unsanitary, insufficient, or unable to be accessed by the population in need.

### *Effect of Lack of Infrastructure on Health*

As previously discussed, the absence of in home piped water has been correlated with increased risk of pneumonia, influenza, and heightened rates of gastrointestinal infections, skin infections and respiratory diseases.

In one of the first studies done examining this association, researchers looked at the correlation between water service and hospitalization rates for pneumonia and influenza, skin and soft tissue infections, MRSA infections, and childhood RSV. When compared to regions with high levels of in home water service, people in regions with low rates of service were 2 to 4 times more likely to face hospitalization. In addition, villages with the lowest levels of water service had the highest hospitalization rates for respiratory infections among infants and for skin and soft tissue infections among persons of all ages (2).

Furthering on this research, studies were done to find the association between

the frequency of lower respiratory tract infections and the lack of piped water and sewage services in Alaska. Many of these studies found a strong relationship between having access to piped water and lower risk for getting a respiratory tract infection (4, 6). For example, researchers in one study found a strong association between modern water services in communities and outpatient and inpatient lower respiratory tract infection incidence rates, specifically in children (4). LRI incidence was found to be 3 to 4 fold higher in communities with the lowest levels of modern water service compared to the highest, and long term chronic respiratory problems were found in children who had severe LRI during early childhood (4).

### *Policy Ideas and Outcomes*

Currently, initiatives have been put in place to try and modernize the water systems in rural Alaskan communities. The State of Alaska's Department of Environmental Conservation, Indian Health Service, U.S. Environmental Protection Agency, and Alaska's Tribal Health Organizations have increased the mean level of households in Alaskan communities with modern water service to 69%, but many rural communities still lack access to this modern service (4). To address this continued issue a few different approaches have been taken.

The Alaska Department of Environmental Conservation, with help from other state and federal agencies began a worldwide competition called the Alaska Water and Sewer Challenge in an effort to lead research to find ways to construct modern water systems in rural Alaska (1). This project focuses on decentralized water and wastewater treatment, recycling, and water minimization (1), all important factors in creating a successful water system in rural Alaska because of the difficult logistics of such a project. Currently, the State is testing

three pilot systems around the state and will evaluate the success, based on cost efficiency and increased access, of these projects later in the year (1).

In 2010, the United Nations declared that access to clean drinking water and sanitation facilities was a basic human right and was essential in obtaining other basic rights (7). Because billions of people still lack this basic right the UN Sustainable Development goals were extended to help solve these inequalities (8) as well as call upon state international organizations to provide financial resources, along with other resources, to help these extensions happen (7). The 8 Arctic Nations, including Alaska, are all considered developed but because many face extreme gaps in water, sanitation and hygiene access and infrastructure are a group of focus for these development expansions (9). The Arctic Council, and subsets of this council, have spearheaded these efforts and started the “Improving Health through Safe and Affordable Access to Household Running Water and Sewer in Arctic and Sub-Arctic communities” project with the objectives to promote innovation in water and sewer technologies and service provision, document the status of water and sewer service and associated health outcomes, and describe climate-related vulnerabilities and adaptation strategies related to community water and sewer systems, including source water protection (9). At conferences held for this project, a series of next steps were created but none of these steps had direct policy implications or solutions on how to better infrastructure (10).

### **Policy Implications:**

There has been an influx of knowledge about the effects of something as simple as handwashing, an action that happens more frequently when running water is available (11), on health. More

frequent handwashing decreases chance of gastrointestinal and respiratory infections (12), pneumonia, diarrhea, and impetigo (13). The availability of sewage systems helps prevent coming into contact with fecal matter therefore lowering the risk of getting infections like hepatitis A (14). The implementation of modern water systems in rural Alaska would both promote hand washing, prevent contact with fecal matter, and help households have more water so that their water use amount is no longer a “very high health concern” (9).

A lack of funding is one of the main issues stopping immediate water and sanitation interventions. In Alaska, the difference between existing funds and needs is over \$660 million (3). While funding is an issue and cost is a concern, water and sanitation interventions have been shown to be cost effective across all world regions and even promote economic benefit up to \$46 per dollar invested (15).

Both the Arctic Council and the Alaska Department of Environmental Conservation are key parties in ensuring that the current plans, projects, and organizations continue to actually work toward implementing water and sewer systems in rural Alaska. The IHS could also play a key role in obtaining funding for these projects, as most of the rural communities’ population are Native Alaska people. A recommendation for this issue, is that one of the current projects being tested by the Alaska Water and Sewer Challenge be implemented, even if it is not ideal. This implementation will bring immediate increased access to clean water and availability of modern sewage systems. As shown by past projects, the economic benefit brought from the projects could help repay the enormous amount of funds that will initially be needed for construction.

While it has to be acknowledged that the implementation of modern water

systems will not fully fix the inequality and health concerns in rural Alaska because of other factors, such as the cost of living and lack of access to large hospitals, it will be an effective start to negating these issues and increasing the standard of living of rural Alaska residents.

### Links to Further Resources of Interest

Alaskan village fights for clean water before it disappears:

- <https://www.eenews.net/stories/1060043394>

Water and Sanitation:

- <https://www.cdc.gov/ncezid/dpei/aip/water-sanitation.html>

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