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Health Indicators in the North Slope Borough

Monitoring the Effects of Resource Development Projects

June 2014



Habitat
HEALTH IMPACT CONSULTING

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1. Introduction

The North Slope Borough (NSB) Department of Health and Social Services (DHSS) is attempting to better understand how resource development projects affect the health and wellbeing of NSB residents. This report is the first in what is hoped to be a longitudinal series that reports on health indicators related to the potential effects of resource development. It is the intent that the NSB DHSS will track these indicators over time to better understand how resource development may be affecting health in their communities. This knowledge may allow for development of mitigation strategies to address health trends that arise and also acknowledge the ways in which important aspects of health are being supported. The report may also support other activities of the DHSS, such as supporting future Health Impact Assessment (HIA) work in the NSB or examining specific relationships of interest to the NSB (for example: asthma rates and air contaminants).

In addition to reporting on health indicators, the report also includes a brief description of the current status of resource development projects in the NSB, and provides a high-level overview of the link between health outcomes and resource development projects.

This report was prepared by Habitat Health Impact Consulting in collaboration with the North Slope Borough Department of Health and Social Services.

Context of the Report

There are several documents that have recently been published that present information on the health status of NSB residents. These include the *Baseline Community Health Analysis Report* produced by the DHSS and Jana McAninch and the NSB Census. This report differs from these other documents in that it is intended to provide health indicator data to support understanding of the linkages between resource development activities and the health and wellbeing of NSB residents.

Where possible, village-level data has been provided in the report. This allows for detection of differences among villages. This is particularly important in the context of resource development projects, which occur in a specific geographic location and may not affect all NSB communities equally. However, for some measures—and particularly for indicators of illness and injury—data is presented only at the level of the NSB. Health data is often aggregated at this level to provide more stable year-to-year estimates and to protect the anonymity of individuals.

Since one of the uses of this report is to track changes over time, the selection of indicators was based not only on their relevance to resource development, but also on whether the data collection for that indicator would be repeated in the future. Appendix A presents information about indicator collection and analysis that will be relevant for developing similar reports in the future.

2. Resource Development in the NSB Today

The oil and gas industry is a major economic driver in the NSB. North Slope-related oil and gas industry spending in Alaska totaled \$4.9 billion in the fiscal year 2011 and has been steadily climbing over time (McDowell Group, 2012). Table 1 shows the number of leases that have been sold in the North Slope, in terms of both on-shore and off-shore acreage.

Table 1. Number of leases and acreage by lease sale area (Current as of May 5, 2014)

Area	Number of Leases	On-shore acreage	Off-shore acreage	Total acreage
North Slope	991	2,318,209.44	101,393.22	2,419,602.66
North Slope Foothills	52	271,322.11	0	271,322.11
Beaufort Sea	223	40,215.01	611,143.24	651,358.25

Source: Alaska Department of Natural Resources, Division of Oil and Gas (2013)

Figure 1, produced by the Alaska Department of Natural Resources, shows the location of oil and gas projects across the NSB to illustrate which communities are more or less proximate to resource development activities. Currently, resource development is focused primarily around Prudhoe Bay, although this is expected to change in the future. Although cause-effect relationships cannot be established between the historical or current location of resource development activities and health outcomes at a individual or village level, it is still useful to understand village-specific indicators of health as they relate to the level of development depicted below.

3. Health and Industrial Resource Development

Industrial resource development projects such as oil and gas development or mining operations have the potential to affect local communities and the people who live there. Often, changes in the environment, social landscape or economy lead to direct or indirect health impacts for the local population. In order to fully understand the range of factors that have the potential to influence individual and community health, it is important to consider health in a broad and locally relevant manner.

Defining Health

“Health” is a multi-dimensional concept that represents more than just the absence of disease, and is widely recognized to also include physical, mental, spiritual and social wellbeing. Healthy people are able to cope with daily activities, as well as to adapt to their surroundings (WHO, 1986). This report uses the term “health” in its broad, multi-dimensional sense, in order to capture all factors that together comprise health among individuals, as well as communities.

Health is largely determined by where we live as well as our environment, income, education level, job, and our relationships with friends, family, and the larger community. These factors are called health determinants (or determinants of health) because of their roles in shaping or influencing the health of both individuals and communities.

How Resource Development Projects Affect Health

When thinking about the relationship between resource development projects and health effects, environmental contamination is traditionally highlighted as being a predominant concern. While environmental effects such as pollution, increased noise, or poor air quality are important problems, these represent only a small subset of possible health effects. As previously described, health is a broad and socially-determined concept; therefore, resource development effects on health are often similarly diverse and include both positive (beneficial) and negative (adverse) effects.

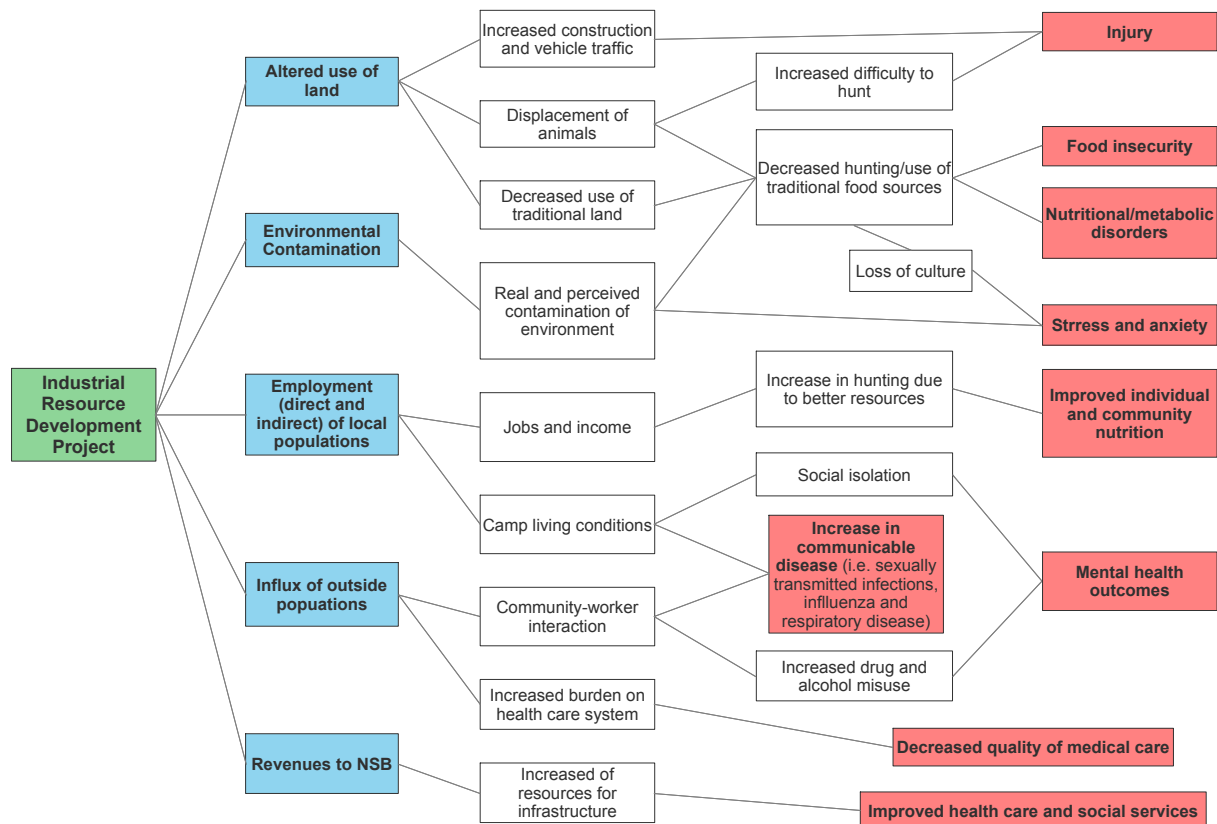
Health benefits may accrue through, for example, improvements to local services and infrastructure. Through taxes and royalties, companies may indirectly increase community revenue resulting in improvements to municipal infrastructure, such as new roads, schools, hospitals and clinics, as well as clean water access and improved sewage systems. In addition, industry projects also commonly hire local workers, providing employment and income to residents. This employment income can support subsistence hunting activities and individual and community consumption of traditional foods. Also through employment opportunities, workers might have access to job training that can allow them to attain work with future projects in their community, or in nearby communities. Finally, socio-economic benefit agreements, often developed in the environmental assessment process, can result in increased support for cultural programs and awareness in the communities that can encourage Iñupiat traditional lifestyles.

Unfortunately, not all impacts from resource development projects are positive. Socio-economic change in communities is associated with many detrimental health impacts, especially in communities that are balancing traditional ways of life with the wage economy. For example, employment in resource development industries can decrease time available for subsistence activities. This can lead to poor mental health

outcomes like depression, poor dietary intake and metabolic-related health effects for the individual and the community, and decreases in social interaction and cohesion. The money gained from employment has also been shown to increase gambling and alcohol and drug use among some individuals. Influx of a new workforce can also lead to increases in infectious diseases, strain on infrastructure and services and changes in the social landscape that can be detrimental for population health. Environmental changes, both real and perceived, also influence health. Resource development activities and structures can change animal migration patterns due to disturbance of hunting lands also affecting consumption of traditional foods and by possibly causing hunters to travel further out on the land, thereby increasing the risk of personal injury. Oil or gas spills could affect areas of traditional harvesting, and real or perceived contamination could impact people's desire to consume food off the land and increase the consumption of store bought foods.

This description is by no means exhaustive, and the effects of resource development projects on health vary in different communities and with different projects; however, this description provides examples of the complexity of resource development projects, health determinants and health outcomes. Figure 2 shows some common relationships between resource development projects and health that may be observed in the NSB context.

Figure 2. Common relationships between resource development project and health



Framework for Selected Health Indicators

The health indicators highlighted in this report are presented within a framework that supports the examination of health in a resource development context. Indicators are presented in the following categories:

- *Health Outcome Indicators* presents data that describe health conditions or health outcomes such as disease prevalence and injury rates.
- *Social and Wellbeing Indicators* addresses many of the social and economic determinants of health such as employment, housing conditions or food access.
- *Structural and Institutional Supports* addresses municipal and health infrastructure.
- *Environmental Supports* discusses environmental conditions that affect health.

As described in the Introduction, this report is intended to serve as the first in a longitudinal series of similar reports. Viewing changes over time provides an indication of whether any given health area is being affected by external factors. However, it is important to remember that while resource development is one possibility, there may be other social, economic, cultural and environmental factors at play that drive changes over time.

4. Indicators of Health Outcomes and Health Determinants in the NSB

Health Outcome Indicators

This section includes indicators on specific health conditions and outcomes, such as diseases, injuries and births. This category provides the most direct snapshot of a community's health status, but is targeted at a medical level and is not intended to address health determinants. The specific indicators chosen are all ones that have been shown to be responsive to the environmental and social changes brought about by development.

Overall Health

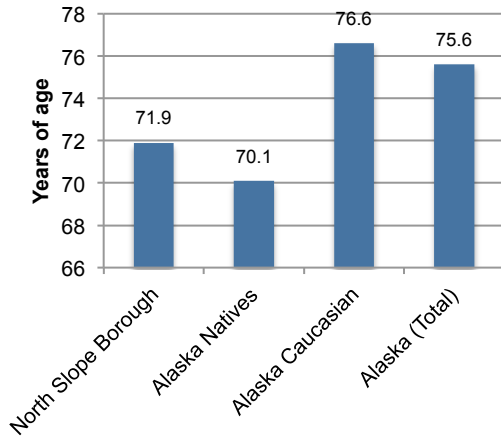
The tables below present several important indicators of overall health: self-reported health, life expectancy, infant mortality and leading causes of death. Together, these indicators show the health and wellbeing of NSB residents over time and in comparison to other jurisdictions. As shown in Table 2, self-reported health is not as high in the NSB as in Alaska overall, and there is considerable variation among villages. Life expectancy, infant mortality and leading causes of death can only be presented at the level of the NSB rather than individual villages due to small village population sizes. However, these indicators also support overall health being poorer in the NSB than in Alaska as a whole, although Figure 2 suggests that NSB residents may fare better than other Alaska Native populations.

Table 2: Self-reported health

	North Slope Borough	Anaktuvuk Pass	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	Alaska
Adults										
Self reported very good to excellent general health (%)	46%	32%	21%	53%	38%	39%	36%	52%	35%	56%
Self reported fair to poor general health (%)	16%	4%	34%	13%	19%	22%	21%	10%	54%	--
Children (0-17 years)										
Self reported very good to excellent general health (%)	63%	41%	38%	68%	66%	55%	66%	70%	54%	--

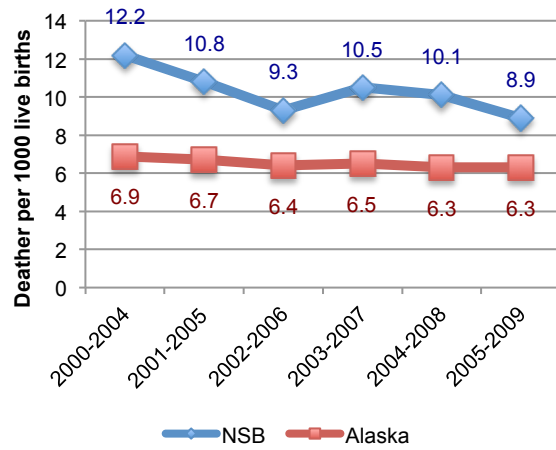
Source: North Slope Borough, Department of Health and Social Services (2012)

Figure 2: Life expectancy at birth



Source: North Slope Borough, Department of Health and Social Services (2012)

Figure 3: Infant mortality rate



Source: Alaska Department of Health and Social Service, Bureau of Vital Statistics (2012)

Note: Data for the NSB should be interpreted with caution, as for all time point there were less than 20 infant deaths total.

Table 3: Leading causes of death, 2007-2009

Cause of Death	NSB			Alaska	
	Rank	Number of Deaths	Rate*	Rank	Rate*
Malignant Neoplasms	1	36	354.2	1	182.9
Diseases of the Heart	2	25	256.7	2	151.2
Unintentional Injuries	3	16	129.1*	3	55.3
Chronic Lower Respiratory Diseases	4	10	137.6*	4	46.5
Intentional Self-Harm (Suicide)	5	9	43.6*	6	22.7
TOTAL DEATHS		143	1413.1		764.3

Source: Alaska Department of Health and Social Service, Bureau of Vital Statistics (2012)

Note: Rates have been age adjusted, per 100 000 U.S. year 2000 population

*Rates are for less than 20 deaths, and statistics should be used with caution

Chronic Conditions

While a number of chronic conditions such as thyroid problems, high blood pressure and heart disease appear to have a lower prevalence in the NSB than across Alaska as a whole as shown in Table 4, these conditions can impair quality of life and comprise an important part of the burden of disease for the population.

Table 4: Chronic health problems

	North Slope Borough	Anaktuvuk Pass	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	Alaska	
Ever told by a health professional they have:	Thyroid problems	4%	4%	7%	4%	2%	3%	3%	2%	4%	9%
	Diabetes	6%	4%	4%	7%	5%	2%	5%	2%	4%	6%
	High blood pressure	20%	17%	23%	21%	17%	17%	22%	12%	14%	25%
	High cholesterol	13%	16%	17%	14%	15%	12%	10%	6%	10%	38%
	Heart disease	5%	5%	4%	2%	4%	7%	5%	6%	5%	12%
Chronic breathing problems, Adults	8%	9%	5%	7%	9%	7%	10%	8%	10%	--	
Chronic breathing problems, ages 0-17	5%	5%	7%	6%	7%	8%	5%	*	*	--	

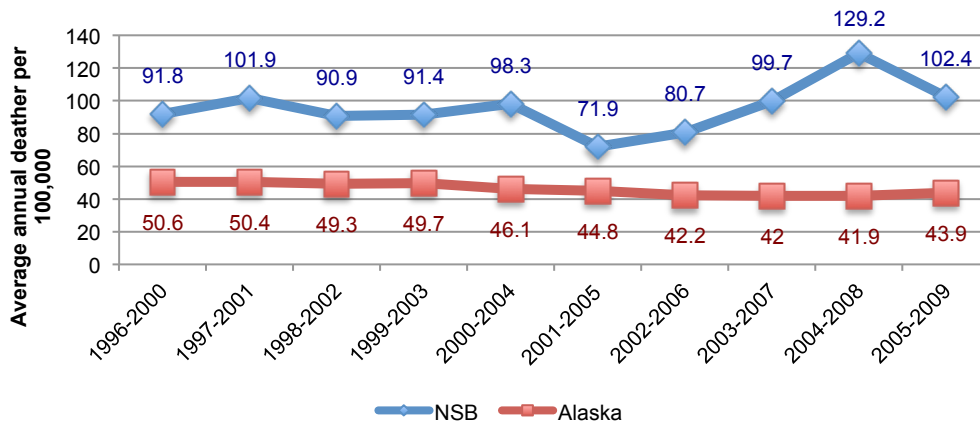
Source: North Slope Borough, Department of Health and Social Services (2012)

Notes: Chronic breathing problems include asthma, emphysema or a cough that won't go away.

* cell count <5

Lower respiratory disease can be aggravated by air pollutants and is commonly linked to industrial development activities as well as air quality in homes. The NSB has had consistently higher rates of death due to respiratory disease since at least 1996 (Figure 4). Rates are highest in the NSB during the 2004-2008 period, although they are shown to decrease in the following four year period.

Figure 4: Lower respiratory disease mortality rates

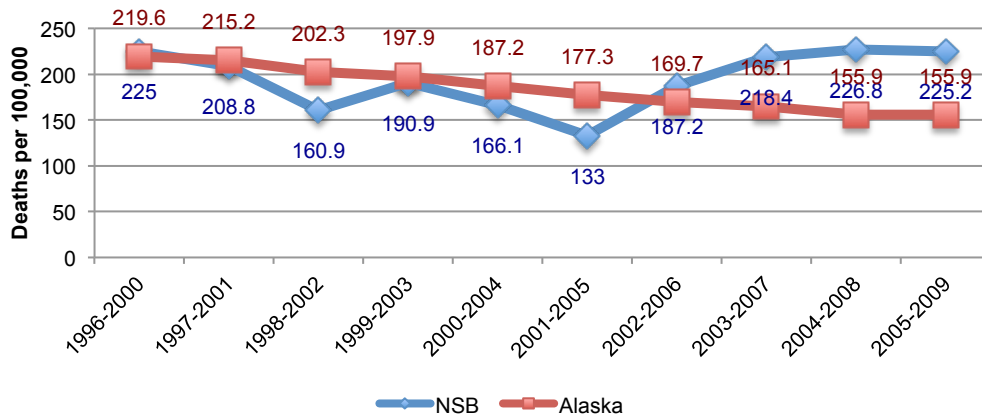


Source: North Slope Borough, Department of Health and Social Services (2012)

Notes: NSB rates are based on fewer than 20 deaths, and so should be interpreted with caution

Although heart disease is the second leading cause of death in the NSB, Figure 5 shows a decreasing trend of heart disease mortality rates since 1996.

Figure 5: Heart disease mortality rate



Source: North Slope Borough, Department of Health and Social Services (2012)

Notes: NSB rate for 2001-2005 are based on fewer than 20 deaths, and so should be interpreted with caution

Overweight and obesity are important health conditions that have been increasing over time across the nation, likely tied to changes in diet and physical activity. As shown in Table 5, the prevalence of overweight and obesity is high among both children and adults. As shown in Figure 6, the crude rate of Type 2 diabetes for Alaska Natives, which is strongly related to overweight, has increased over time in the NSB, similar to trends seen statewide and across the country. The 2006 age-adjusted rate of diabetes for the Barrow Indian Health Service (IHS) service area for Alaska Natives is 28 per 1,000, slightly higher than the 2008 crude rate shown in Figure 6.

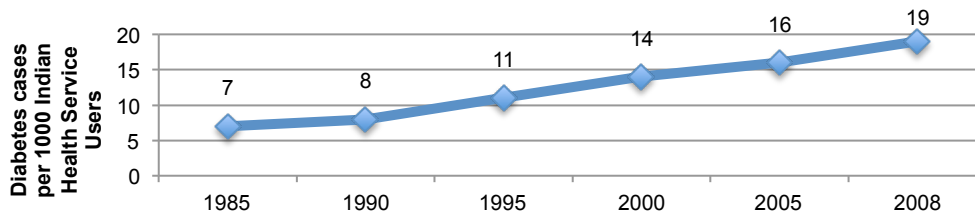
Table 5: Overweight and obesity among NSB household heads

	North Slope Borough	Anaktuvuk Pass	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	Alaska
Adults										
Overweight	33%	32%	26%	34%	34%	28%	29%	17%	36%	37%
Obese	39%	23%	38%	40%	32%	33%	48%	46%	41%	28%
Children										
Overweight	21%	--	--	--	--	--	--	--	--	20%
Obese	31%	--	--	--	--	--	--	--	--	20%

Source: North Slope Borough, Department of Health and Social Services (2012)

Notes: For children, Alaska data reflects 2000-2005 for children 3-18 years old, while NSB data reflects August 2008-August 2009 for children 3-19 years old.

Figure 6: Type 2 diabetes prevalence in the NSB

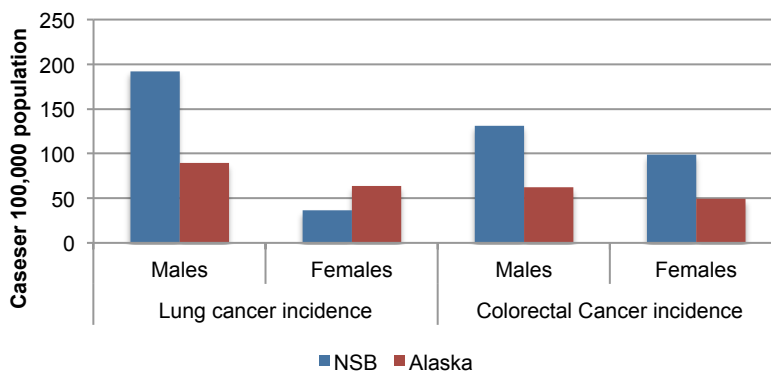


Source: North Slope Borough, Department of Health and Social Services (2012)

Notes: Data represent crude prevalence (not age-adjusted). Includes Alaska Native patients who have visited the Indian Health Service unit in within the last three years

The two most common cancers in the NSB are lung cancer and colorectal cancer. As shown in Figure 7, males have higher rates of these cancers than females, and incidence rates are considerably higher for the NSB than for Alaska as a whole.

Figure 7: Age- Adjusted incidence of cancers in the NSB, 1996-2009



Source: North Slope Borough, Department of Health and Social Services (2012)

Table 6 shows the number of patient visits seen in all clinics run by the NSB as well as the Samuel Simmonds Memorial Hospital (SSMH) in Barrow for the year 2013. This information is different than what is presented in Table 4 in that it doesn't describe the prevalence of these conditions across the population, but does describe the level of service delivery that was required in 2013 to address chronic conditions in the NSB. In Table 6, patients refers to the number of people attending the clinic for the specified condition, whereas visits refers to the number of total visits for the condition, meaning there could be multiple visits per patient.

Table 6: Chronic conditions reported by NSB run clinics and the SSMH, 2013

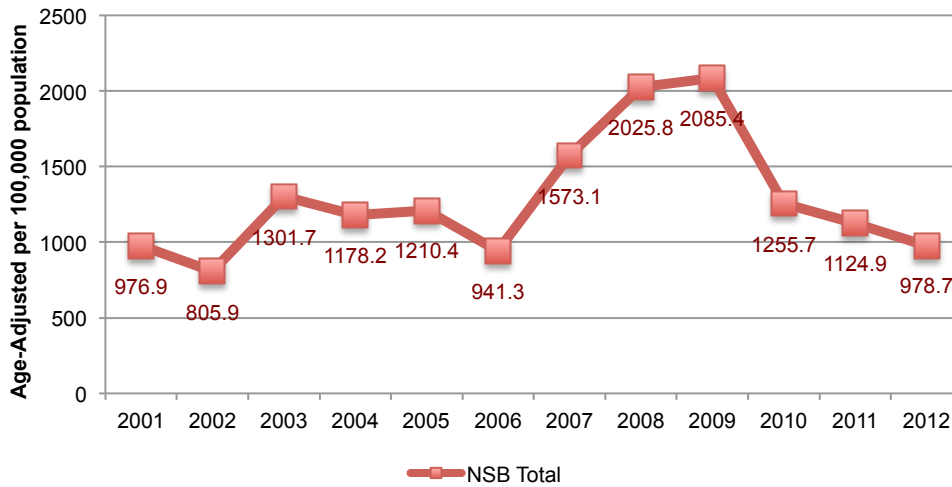
		Visits	Patients	Gender	
				Female	Male
Hypothyroid		175	67	152	23
Hyperthyroid		11	9	10	1
Diabetes		734	218	422	312
Hypertension		2204	795	1148	1056
Hypercholesterolemia		121	70	70	51
Heart Disease		5	4	0	5
Colorectal Cancer	Malignant	27	4	25	2
	Benign	43	39	27	16
Thyroid Cancer	Malignant	193	226		
	Benign	NO DATA TO REPORT			
Lung Cancer	Malignant	30	12	22	8
	Benign	1	1	1	0
Breast Cancer	Malignant	12	3	12	
	Benign	NO DATA TO REPORT			
Asthma		474	284	249	225

Source: North Slope Borough, Resource Patient Management System Database (2013)

Communicable Diseases

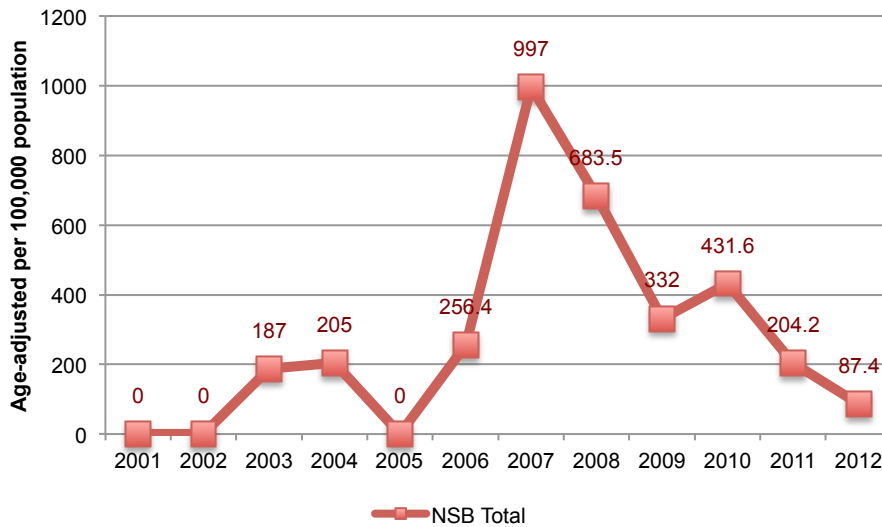
Figure 8 and Figure 9 show time trends for chlamydia and gonorrhea, the two most common sexually transmitted diseases in relation to North American resource development. Rates of chlamydia in Alaska are consistently among the highest in the United States; however Alaska Natives and northern regions disproportionately see some of the highest rates. Rates of gonorrhea are lower than chlamydia in the NSB. In 2007 the NSB experienced a spike in gonorrhea; however, rates have decreased since that time.

Figure 8: Chlamydia Rates in the NSB



Source: Alaska Department of Health and Social Services, Epidemiology (2010)

Figure 9: Gonorrhea Rates in the NSB



Source: Alaska Department of Health and Social Services, Epidemiology (2010)

Infectious diarrheal illnesses and tuberculosis are two important communicable illnesses that are exacerbated by close contact and crowded living conditions. Table 7 shows rates of these diseases for 1986-2009. Table 8 shows patients and patient visits for a number of important communicable diseases. As with Table 6 this information speaks to service delivery that is required to meet the needs of the population.

Table 7: Number of reported cases of select infectious diseases in the NSB from 1986-2009

	Infectious diarrheal illnesses	Tuberculosis
1986-1990	19	4
1991-1995	11	1
1996-2000	4	5
2001-2005	8	4
2006-2009	2	2

Source: North Slope Borough, Department of Health and Social Services (2012)

Note: Infectious diarrheal illnesses include Campylobacter, Salmonella, Shingella, E. Coli O157:H7 and Giardia

Table 8: Communicable diseases reported by NSB run clinics and the SSMH, 2013

		Visits	Patients	Gender	
				Female	Male
Sexually Transmitted Infections	Chlamydia	19	19	12	7
	Gonorrhea	19	18	11	8
	HIV	No data to report			
	Syphilis	1	1	0	1
Influenza		13	11	11	2
Tuberculosis		1	1	0	1
Gastroenteritis		1	1	0	1
Campylobacter		No data to report			
Salmonella		No data to report			
Shingella		No data to report			
E. Coli		39	35	36	3
Giardiasis		No data to report			

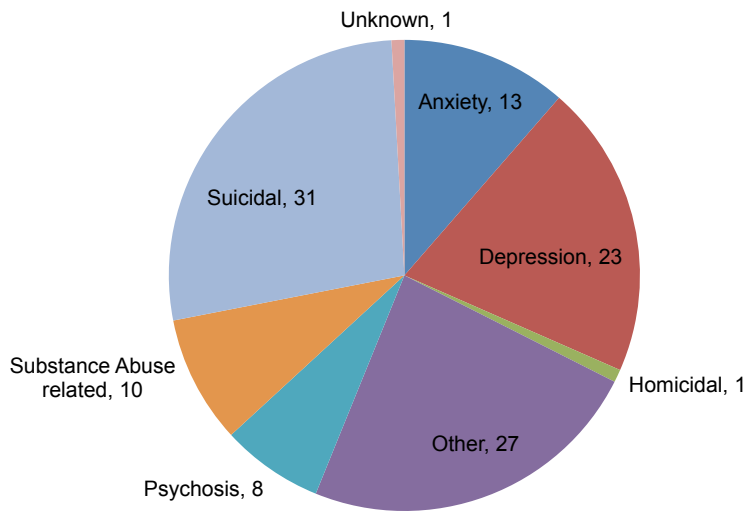
Source: North Slope Borough, Regional Patient Management System (2013a)

Mental Health

The World Health Organization defines mental health as “a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community (World Health Organization 2014).” Mental health can be affected by many determinants related to resource development such as employment and working conditions, income, access to services, physical environments, housing quality, food security, personal health practices, and cultural supports. This section looks at social service calls related to mental health and manifestations of poor mental health, suicide and alcohol and drug misuse.

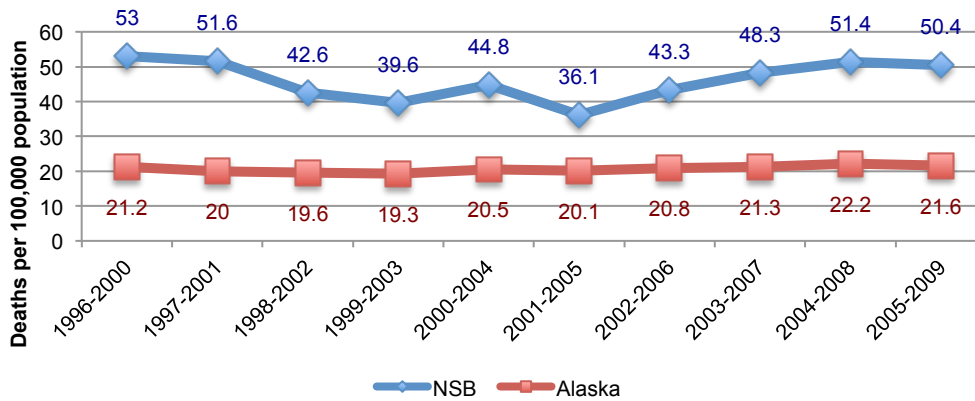
In 2013, there were 114 emergency service calls to the NSB Department of Health and Social Services related to poor mental health (Figure 10). Twenty-seven percent of these calls were due to suicidality, an indication of serious mental health challenges. Age-adjusted suicide mortality rates are consistently higher in the NSB compared to the State of Alaska (Figure 11); however, small case numbers make these data difficult to interpret.

Figure 10: Emergency service symptoms related to request for service, for the NSB's Department of Health and Social Services by number of calls in 2013



Source: North Slope Borough, Department of Health and Social Services (2013)

Figure 11: Age-adjusted suicide mortality rates



Source: North Slope Borough, Department of Health and Social Services (2012)

Note: NSB data are based on less than 20 deaths per time period, and should be interpreted with caution

Alcohol and drug misuse is another indication of poor mental health. Rates of binge drinking amongst adults are similar for NSB and Alaska residents, as is marijuana use amongst indigenous populations (Table 9). High school students in the NSB are more likely to use marijuana than binge drink. Self-reported marijuana use amongst high school students is double that of high school students across Alaska.

Table 9: Self-reported alcohol and drug use

Indicator	NSB	Alaska
Adults who report binge drinking in the past 30 days	17% (2005-2007)	17% (2006)
High school students who report binge drinking in the past 30 days	22% (2005)	26% (2007)
Self reported marijuana use among indigenous populations	34% (2007)	28% (2007)
Self reported marijuana use among high school students, in the past 30 days	40% (2005)	21% (2007)

Source: North Slope Borough, Department of Health and Social Services (2012)

Note: The frequency of marijuana use among indigenous populations was not specified, and could be less than once a month, 2-3 times per week, or left unspecified by respondents (Poppel, 2007)

The NSB Census states that 33% to 57% of household heads reported that the effects of drugs/alcohol had hurt a household member often in the year preceding the survey. This statistic speaks to the wider effects of alcohol and drug abuse, impacting not only the individual but also family and the community.

Table 10: Impact of drugs and alcohol, household heads

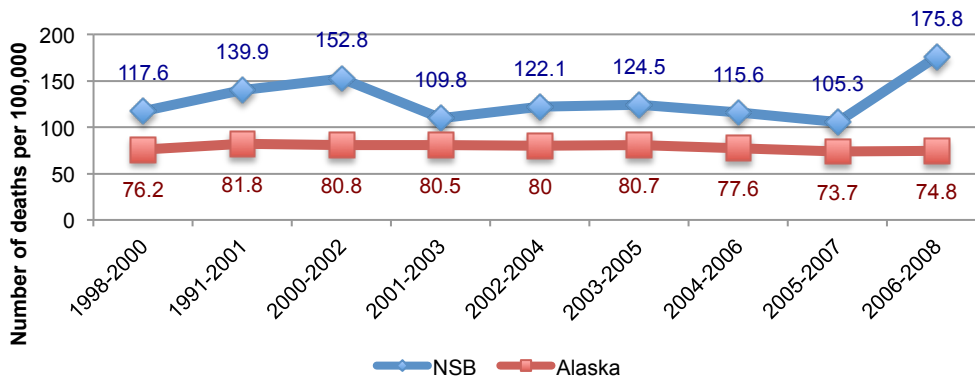
	Anaktuvuk Pass	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright
Felt that a household member had been hurt by the effects of drugs/alcohol in the last year	24%	31%	35%	44%	28%	24%	16%	15%
Never	3%	28%	8%	14%	5%	11%	11%	13%
Sometimes	41%	39%	36%	45%	48%	44%	49%	39%
Often	55%	33%	57%	41%	47%	45%	41%	49%

Source: North Slope Borough, Department of Health and Social Services (2012)

Maternal and Child Health

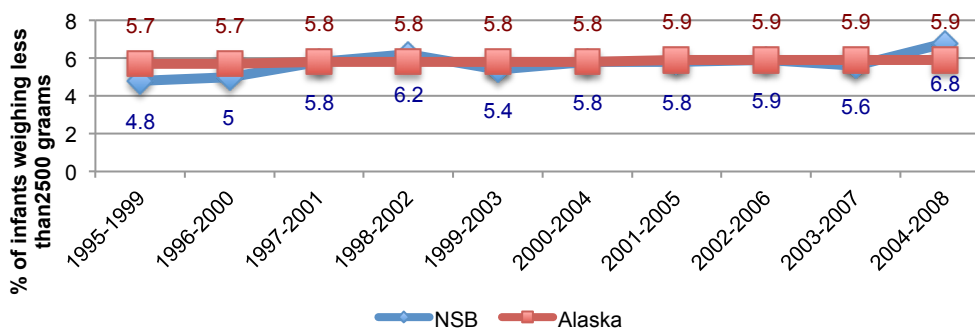
Maternal and child health provide an indication of overall population health. Healthy child development can be influenced by resource development projects via changes to food security or family material conditions or by changes in access to health care. Child mortality rates have been consistently higher in the NSB compared to Alaska since 1998 (Figure 12). It is unknown what caused the spike in child mortality for the last time point in the NSB; however, it is common to see this type of data fluctuation when population numbers are small and the number of cases is rare. Low birth weight has been relatively stable and comparable to Alaska rates since 1995 (Figure 13).

Figure 12: Child mortality rate, ages 0-19 years old



Source: North Slope Borough, Department of Health and Social Services (2012)

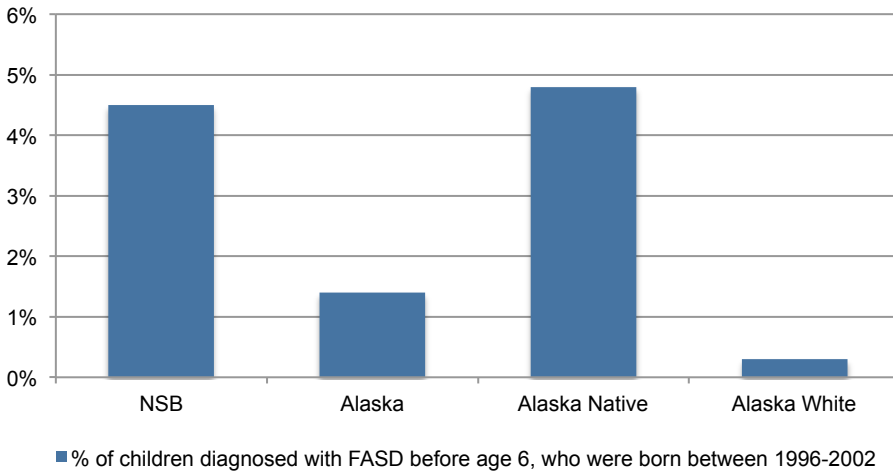
Figure 13: Low birth weight



Source: North Slope Borough, Department of Health and Social Services (2012)

Fetal alcohol spectrum disorder (FASD) includes infants with various physical, mental, learning or behavioral disabilities related to maternal consumption of alcohol during pregnancy. Alaska Native children in the NSB and in Alaska in general have disproportionately higher rates of FASD than non-Alaska Native children. Variations in screening, diagnosis and reporting between the Alaska Native Health Services and other health services may explain some of the racial discrepancy.

Figure 14: Fetal Alcohol Spectrum Disorder (FASD)



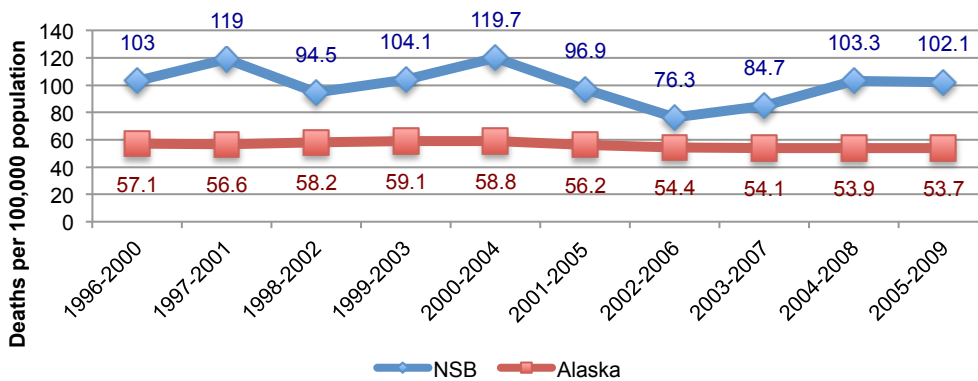
Source: North Slope Borough, Department of Health and Social Services (2012)

Injuries

Injuries are a major cause of death and disability in the US, but rural and northern areas tend to have especially high rates as illustrated by rates of unintentional injury mortality in the NSB (Figure 15). Resource development projects can alter the landscape potentially increasing or decreasing risk of injury when travelling on the land and can increase traffic potentially increasing risk of traffic accidents and injuries.

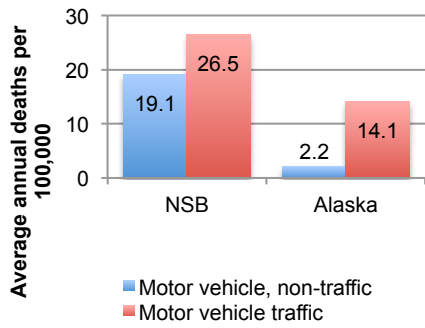
As shown in Figure 16, the NSB has much higher rates of motor vehicle injury deaths than the state of Alaska. Water, air and other transport unintentional injury deaths are also higher as are accidental drowning and submersions (Figure 17).

Figure 15: Unintentional injury mortality rate



Source: North Slope Borough, Department of Health and Social Services (2012)

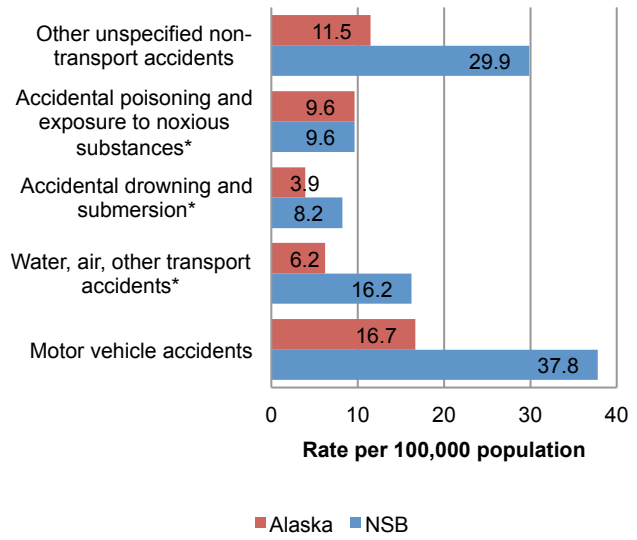
Figure 16: Motor vehicle injury deaths, 1999-2008



Source: North Slope Borough, Department of Health and Social Services (2012)

Notes: Non-traffic accidents include vehicle accidents that occur away from the highway, generally involving a snowmobile or ATV. Few snowmobile or ATV accidents occurring on the highway are also included.

Figure 17: Unintentional injury deaths by cause, 1994-2008



Source: North Slope Borough, Department of Health and Social Services (2012)

Social and Wellbeing Indicators

Social and wellbeing indicators represent key health determinants that strongly influence health outcomes at the personal and community level. The indicators presented in this section also have the potential to be affected by local and regional resource development activities.

Personal Income and Employment

Employment and income can be measured in a number of different ways, each of which reveals a different facet of this important area. Table 11 and Table 12 present information on employment; Figure 18 and Table 13 describe household income, and Table 14 and Figure 19 describe levels of poverty among families and children. Resource development has the potential to influence each one of these areas, either beneficially, adversely, or (most likely) in both directions for different subsets of people.

The employment data in Table 11 and Table 12 reveal that unemployment has increased substantially across the NSB between 2003 and 2010, although the percent of the labor force that considers themselves to be underemployed has decreased. Full-time employment rates vary between villages, although the employment rate across villages became more consistent between 2003 and 2010.

Table 11: Employment among people ages 16-64

		North Slope Borough	Anaktuvuk Pass	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright
2003	Permanent Full-Time	57.5%	34.9%	58.0%	52.0%	57.2%	45.4%	42.2%	50.0%	39.8%
	Temporary Seasonal	14.6%	26.6%	19.3%	10.7%	9.0%	17.2%	13.4%	19.8%	16.3%
	Part-time	8.5%	11.2%	4.6%	5.6%	8.0%	17.2%	14.6%	7.5%	10.2%
	Unemployed	19.4%	20.1%	14.8%	16.4%	14.5%	20.2%	17.7%	15.1%	17.4%
	Percent of labor force that perceive themselves to be underemployed	27.4%	32.5%	67.2%	25.3%	37.8%	13.6%	26.3%	13.7%	26.7%
2010	Permanent Full-Time	53.0%	43.4%	45.5%	54.1%	45.1%	40.5%	37.5%	41.7%	41.5%
	Temporary Seasonal	10.4%	7.4%	14.4%	8.0%	4.9%	14.2%	7.0%	28.1%	16.9%
	Part-time	8.2%	9.1%	8.3%	5.2%	14.6%	12.5%	13.2%	8.3%	7.4%
	Unemployed	28.9%	34.9%	28.8%	25.7%	22.6%	32.8%	31.9%	19.8%	22.3%
	Percent of labor force that perceive themselves to be underemployed	18.8%	36.5%	25.9%	16.3%	25.7%	12.3%	11.7%	22.0%	12.3%

Source: North Slope Borough (2010)

Note: Data for all villages represents all ethnicities, however NSB overall data in the first column includes only Iñupiat respondents.

Table 12: Percentage of people employed by select industries in the NSB

		North Slope Borough	Anaktuvuk Pass	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright
Government	Iñupiat	41.0%	49.4%	44.2%	38.5%	38.1%	46.2%	30.0%	51.5%	40.5%
	Caucasian	29.9%	28.6%	0.0%	34.8%	28.6%	21.4%	13.0%	7.7%	4.6%
NSB School District	Iñupiat	10.5%	13.8%	14.0%	7.8%	10.7%	5.3%	17.1%	16.7%	12.9%
	Caucasian	38.0%	50.0%	100.0%	27.2%	42.9%	60.7%	82.6%	76.9%	81.8%
Oil Industry	Iñupiat	2.0%	--	1.2%	1.8%	1.2%	9.1%	1.1%	--	0.6%
	Caucasian	1.2%	--	--	1.1%	--	7.1%	--	--	--
Private construction firm	Iñupiat	1.7%	1.2%	1.2%	1.9%	2.4%	0.8%	2.1%	1.5%	1.2%
	Caucasian	0.8%	--	--	1.1%	--	--	--	--	--
ASRC or subsidiary	Iñupiat	4.1%	1.2%	4.7%	5.5%	1.2%	2.3%	4.3%	3.0%	1.8%
	Caucasian	0.4%	--	--	0.3%	--	--	--	--	4.6%
Village corporation or subsidiary	Iñupiat	19.9%	17.2%	20.9%	17.0%	17.9%	22.7%	35.3%	19.7%	25.8%
	Caucasian	3.3%	14.3%	--	2.9%	--	3.6%	4.4%	7.7%	4.6%

Source: North Slope Borough (2010)

Household income is important for the purchase of material goods and services needed to support healthy families and a high quality of life. As shown in Table 13, there are large differences in average household income between villages in the NSB and also between Iñupiat and non-Iñupiat households. These differences are further illuminated by the graphs in Figure 18, which show, for each village and for Iñupiat and Caucasian households, the percent of the population at specific income levels.

Table 13: Total average household income, 2010

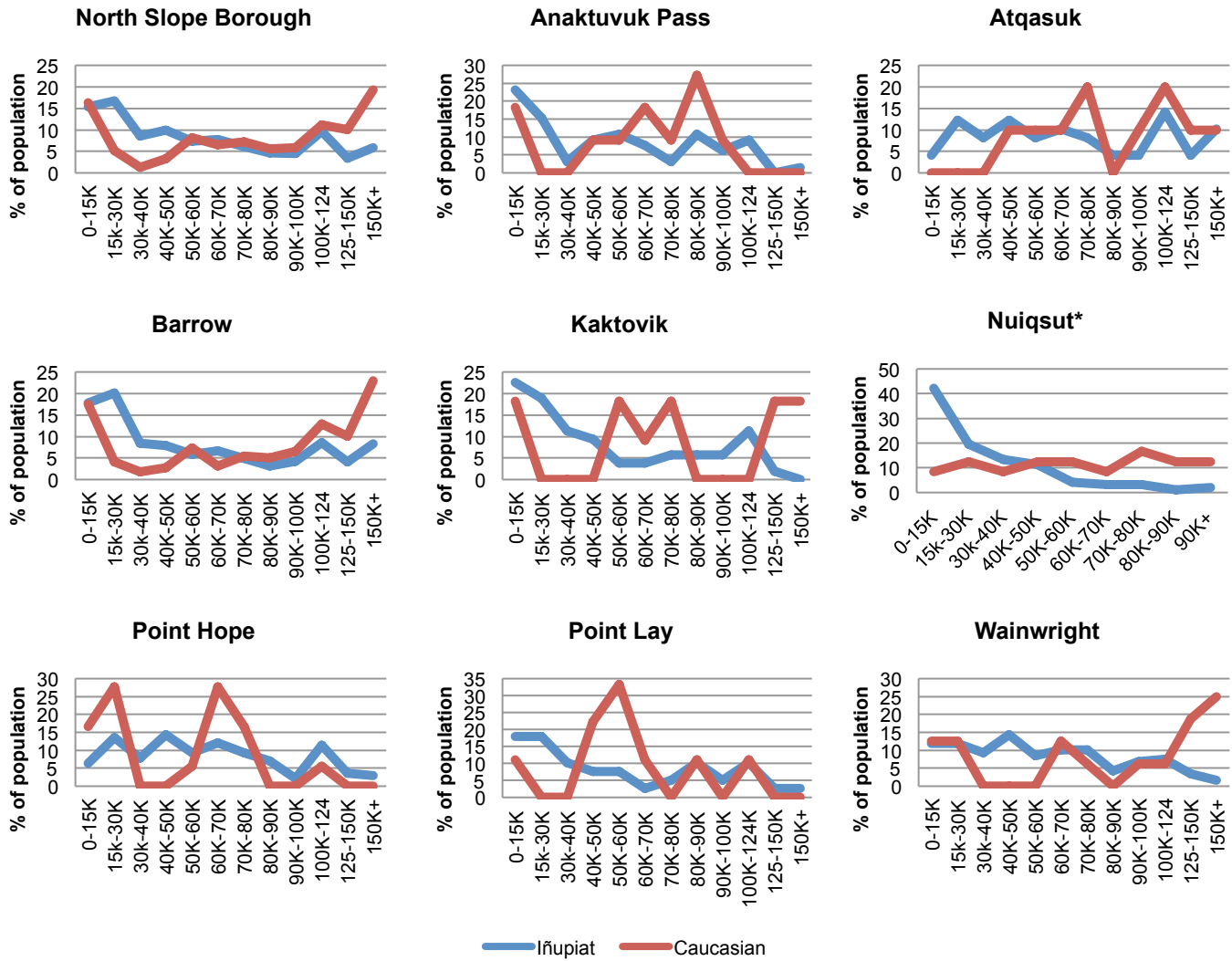
		North Slope Borough	Anaktuvuk Pass	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	Alaska
Average calculated total household income	Iñupiat	\$60,699	\$53,010	\$76,294	\$76,395*	\$46,861	--	--	\$54,708	--	--
	Caucasian	\$102,438	\$58,624	\$94,254		\$90,060	--	--	\$57,423	--	--
	Other	\$75,388	\$70,323	\$72,605		\$27,243	--	--	--	--	--
Median household income	Iñupiat	--	--	--	--	--	\$54,912	\$58,498	--	\$50,000	--
	Non-Iñupiat	--	--	--	--	--	\$83,113	\$62,000	--	\$101,500	--
Average per capita income (all ethnicities)		\$33,640	\$15,339	--	\$23,082	\$15,313	\$18,800**	\$24,000	\$15,274	\$28,000	\$29,382

Source: North Slope Borough (2010)

Notes: *Data for Barrow not separated by ethnicity

** The only per capita income available for Point Hope is a median value, not average.

Figure 18: Calculated total household income among NSB residents, by ethnicity



Source: North Slope Borough (2010)

There are high levels of poverty in the NSB, as shown in Table 14 especially among Iñupiat families. Atkasuk experienced notably lower rates of poverty in 2010 compared with the other NSB communities.

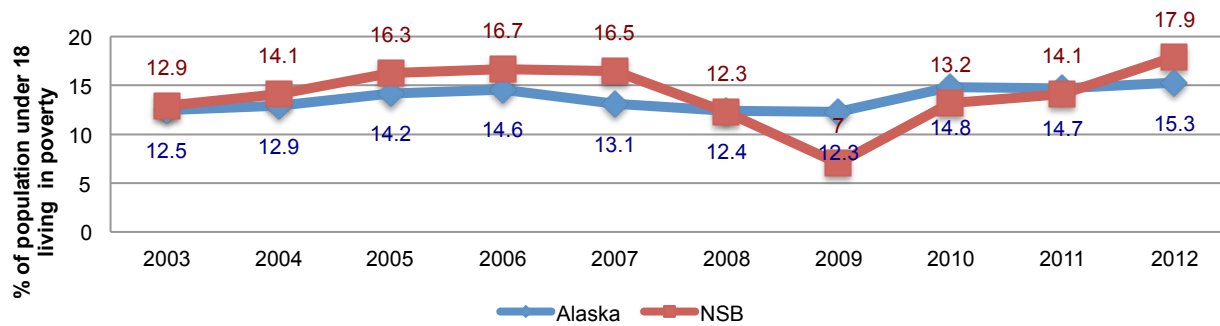
Figure 19 shows the rates of child poverty between 2003 and 2012. Over that period, child poverty increased across both Alaska and the NSB, although there was a large dip in the NSB for the years 2008 and 2009.

Table 14: Percent of population living below the poverty line

	North Slope Borough	Anaktuvuk Pass	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	Alaska
Iñupiat	23%	29%	8%	15%	25%	16%	16%	18%	13%	--
Non-Iñupiat	--	27%	10%	9%	6%	4%		2%	2%	--

Source: North Slope Borough (2010)

Figure 19: Child poverty, from 2003-2012



Source: United States Census Bureau (2013)

Eligibility for a free or reduced-price lunch is another indicator of child economic hardship. Across the NSB, 35.7% of students enrolled in school were eligible for a free lunch in 2010. A further 8.8% were eligible for a reduced-price lunch. The rates varied widely by school and village, with the highest rates appearing in Kaktovik, Wainwright and Point Hope (Alaska Department of Education and Early Development, 2010).

Living Conditions

The two tables below on living conditions present indicators related to housing availability, affordability and quality. Housing availability and affordability are particularly affected by resource development.

Table 15 shows that in recent years, a substantial number of houses lack basic facilities such as a kitchen or running water. Similarly, crowding levels are high. Table 16 shows the increase in rental, mortgage and utility costs that were experienced between 1998 and 2010. The affordability of rent, mortgage payments and utilities is strongly tied to household income indicators described above.

Table 15: Housing quality indicators

Indicator	North Slope Borough	Anaktuvuk Pass	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	Alaska
Houses rated as <i>overcrowded</i> (more than 1 person per room) ¹	12.3%	17.4%	10.6%	9.3%	4.2%	29.6%	19.6%	1.6%	18.9%	3.8%
Houses rated as <i>severely overcrowded</i> (more than 1.5 people per room) ¹	7.4%	8.1%	18.2%	3.7%	12.7%	14.8%	8.9%	25.0%	14.6%	2.4%
Houses lacking kitchen facilities ¹	9.1%	18.6%	0.0%	8.7%	4.2%	0.0%	5.6%	17.2%	20.7%	3.7%
Houses without running water ²	1998	--	75.0%	13.2%	8.0%	10.0%	--	--	38.5%	--
	2003	--	10.0%	3.7%	8.0%	10.0%	--	--	21.1%	--
	2010	--	14.0%	4.9%	5.6%	1.5%	6.0%	8.0%	38.0%	0.0%

Sources: 1. North Slope Borough (2010)
2. United States Census Bureau (n.d.)

Table 16: Monthly rental, mortgage and utility costs

Indicator		Anaktuvuk Pass	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright
Rental Costs ¹	1998	\$272	\$99	\$807	\$335	\$290	--	\$213	\$173
	2003	\$370	\$513	\$824	\$391	\$456	--	\$284	\$284
	2010	\$458	\$469	\$799	\$508	\$587*	--	\$608	\$531*
Mortgage Costs ¹	1998	\$250	\$257	\$730	\$247	\$211	--	\$154	\$186
	2003	\$415	\$339	\$912	\$354	\$175	--	\$492	\$267
	2010	\$524	\$927	\$1,066	\$467	\$268*	--	\$252	\$348*
Total average utility costs ¹	1998	\$324	\$410	\$196	\$424	\$324	\$408	\$299	\$318
	2003	\$459	\$499	\$296	\$556	\$508	\$445	\$398	\$445
	2010	\$598	\$426	\$293	\$636	\$381	\$567	\$465	\$461
Average percent of income spent on energy costs ^{2**}	2010	9.4%	8.5%	1.9%	12.0%	0.4%	4.1%	10.2%	6.9%

Source: 1. North Slope Borough (2010)
2. Alaska Housing Finance Corporation (2014)

Notes: *Data for 2009

** This number was calculated using median income from the 2007-2011 Alaska Community survey estimates, and energy costs from the Alaska Housing Finance Corporation Alaska Retrofit Information System

Food Environment

Subsistence foods comprise a key part of both diet and culture for most NSB residents. The importance of subsistence foods is reinforced in Table 17, which shows that for a majority of residents in all NSB communities, more than half of people’s diets came from subsistence foods. Furthermore, as shown in Table 18, for a substantial portion of residents, all or nearly all of their diet came from subsistence food sources. These figures emphasize the importance of understanding how future resource development activity affects plants, animals and other key species that the Iñupiat rely on.

Table 17: Subsistence foods

		North Slope Borough	Anaktuvuk Pass	Atqasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright
Households for which at least half of diet came from subsistence foods in previous year	2003	--	79%	67%	66%	76%	67%	75%	79%	82%
	2010	67%	77%	67%	60%	76%	79%	72%	67%	75%

Source: North Slope Borough, Department of Health and Social Services (2012)

Table 18: Percent of household's diet that is comprised of subsistence foods

		Anaktuvuk Pass	Atqasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright
1998	None	2%	0%	--	2%	0%	3%	5%	0%
	Very little	6%	18%	--	2%	13%	8%	9%	10%
	Less than half	17%	12%	--	13%	14%	17%	11%	24%
	Half	27%	18%	--	18%	31%	25%	21%	26%
	More than half	27%	21%	--	30%	23%	25%	32%	13%
	Nearly all	8%	30%	--	20%	11%	14%	9%	24%
	All	13%	0%	--	15%	8%	7%	14%	3%
2003	None	1%	19.0%	5%*	0%	0%	7%	0%	0%
	Very little	13%	13%	13%*	15%	18%	11%	16%	5%
	Less than half	15%	15%	16%*	17%	20%	16%	5%	11%
	Half	24%	31%	20%*	20%	23%	20%	25%	29%
	More than half	24%	8%	17%*	7%	18%	21%	14%	21%
	Nearly all	15%	13%	14%*	24%	17%	11%	18%	29%
	All	7%	2%	15%*	17%	5%	14%	18%	5%
2010	None	0%	0.0%	7%	0%	1%	2%	5%	0%
	Very little	24%	13%	25%	10%	13%	18%	14%	16%
	Less than half	9%	28%	24%	24%	20%	16%	21%	17%
	Half	19%	27%	21%	29%	30%	26%	25%	27%
	More than half	20%	20%	13%	22%	19%	17%	25%	22%
	Nearly all	28%	12%	9%	14%	12%	16%	9%	17%
	All	0%	0%	2%	2%	6%	4%	2%	2%

Source: Source: North Slope Borough (2010)

Notes: * 2003 data for Barrow include only Iñupiat residents

Food security is another key issue linked to resource development. Food security is defined as access to sufficient, nutritious and healthy food. People who are food insecure report that they can't afford enough food and they commonly skip meals, or eat less than they need. It is closely tied both to the availability of subsistence foods and also to income and housing costs.

As shown in Table 19, a substantial portion of households in all NSB communities faced food insecurity in the year before the survey. Part of this is attributable to sufficient access to subsistence food sources; another part is attributable to sufficient access to (i.e. affordability of) store foods. As shown in Figure 20, the cost of food and other essential items is substantially higher in NSB villages than in Anchorage – more than twice as

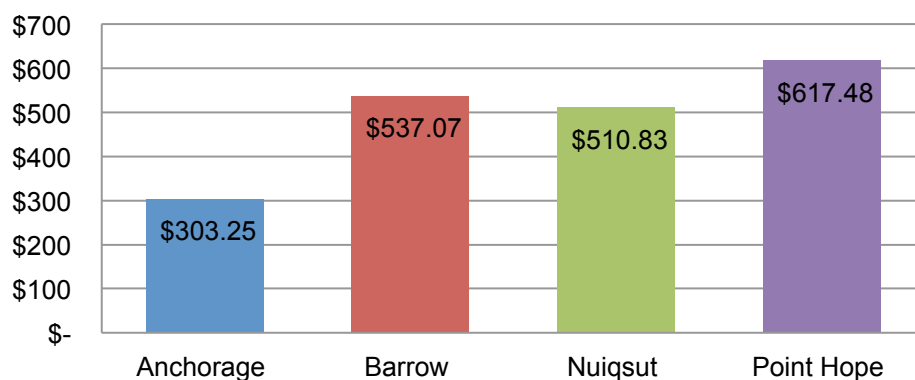
much for Point Hope. This difference, coupled with lower employment and income, is likely to strongly contribute to the observed food insecurity rates. Future resource development has the potential to either beneficially or adversely affect this important issue. Unfortunately, it was not possible to obtain data on food cellars for this report. However, in the future it would be a useful measure to have, as it is integral to food security but viability has been changing in recent years with the melting of the permafrost.

Table 19: Food insecurity in households with Iñupiat household heads, 2010

	North Slope Borough	Anaktuvuk Pass	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright
Households that found it difficult to get the foods they needed to eat healthy meals at times last year	46%	62%	56%	33%	39%	38%	38%	50%	47%
If yes, because not able to get enough subsistence foods	57%	83%	41%	43%	58%	63%	64%	47%	41%
If yes, because not able to get enough store foods	88%	78%	100%	87%	84%	84%	85%	100%	94%
Households that had members who did not have enough to eat at times last year	30%	49%	25%	22%	23%	28%	26%	26%	33%

Source: North Slope Borough, Department of Health and Social Services (2012)

Figure 20: Market basket comparisons among four Alaska cities



Source: North Slope Borough (2010)

Notes: See Appendix A: Methods for a description of items included within market basket comparison. Generally speaking, baskets include fresh and preserved foods as well as some essential non-food items.

Community Well-Being

Table 20 and Figure 21 present measures related to educational attainment. Educational attainment can be affected by resource development either positively (e.g., providing revenue to improve school facilities, providing training programs and the incentive to complete them) or negatively (drawing students into the

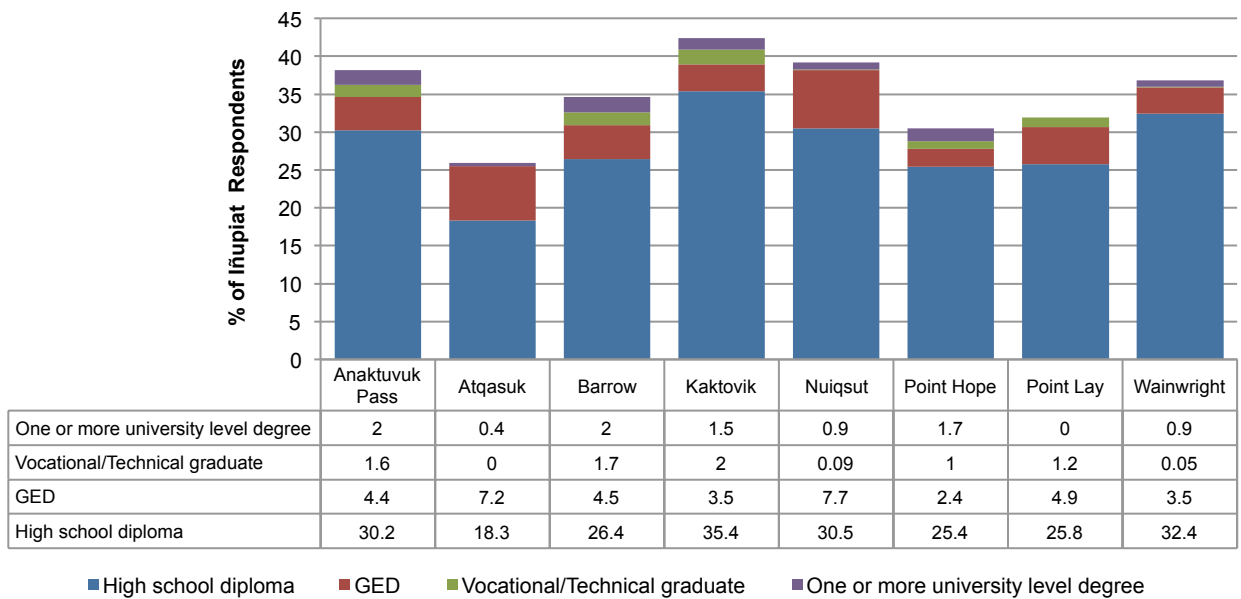
workforce instead of completing high school or post-secondary education). As shown in the table and figure, rates of high school and post-secondary education completion vary substantially across villages in the NSB.

Table 20: High school graduation rates

	Anaktuvuk Pass	Atqasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright
2003-2009 High School Graduation	54%	53%	60%	90%	30%	64%	58%	54%

Source: North Slope Borough, Department of Health and Social Services (2012)

Figure 21: Highest level of education achieved among Iñupiat respondents



Source: North Slope Borough (2010)

Crime rates, including sexual offenses, drinking and violence are undesirable outcomes that have been linked to boomtown and energy development contexts. Table 21 shows the number of reported cases of sexual offenses, domestic violence, and drug and alcohol related cases for a one-year period in 2013-14. Table 22 reports on the extent to which survey respondents in the NSB 2010 census (household heads) felt that drinking and violence had increased, decreased or stayed the same over time (the time frame referenced was not provided).

Table 21: Reported police crimes in the NSB, from June 16 2013 to June 16 2014

Category		Number of Reported Cases
Sexual Offenses	Sexual Assault (types I, II and III)	12
	Sexual Abuse of a Minor (Types I-IV)	11
	Total number of Sex Offenses	23
Domestic Violence Related Cases		171
Drug Related Cases		76
Alcohol Related Cases		427

Source: NSB Police Department (2014)

Table 22: Perception of household heads to changes of drinking and violence in the community

		Anaktuvuk Pass	Atqasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright
Household heads believed the amount of drinking and violence in the community...	Decreased a lot	3%	7.7%	2%	2%	NA	NA	4%	NA
	Stayed the same	31%	53.8%	39%	45%	NA	NA	47%	NA
	Increased a lot	19%	7.7%	15%	13%	NA	NA	4%	NA

Source: North Slope Borough (2010)

Notes: Census data does not specify specific time period, responses indicate general perceived trends in the community.

Cultural Well-Being and Traditional Economy

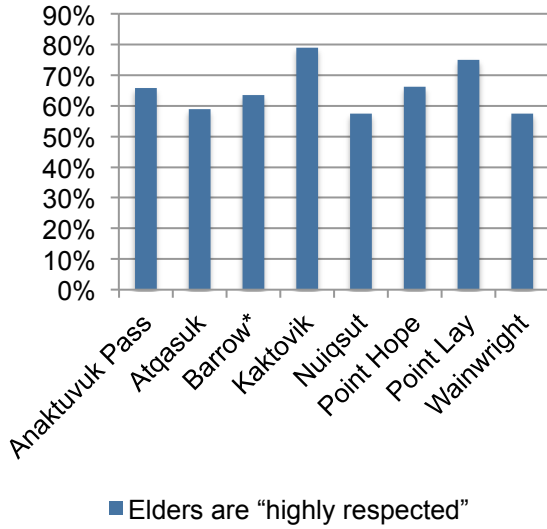
Traditional culture has been strongly tied to health in Indigenous communities in Alaska and elsewhere. (Curtis, Kvernmo, & Bjerregard, 2005; Shephard & Rode, 1996; Smylie, 2009) Table 23, Figure 22 and Figure 23 show the continuing strength of several indicators of traditional culture across the NSB: competency in speaking Iñupiaq, respect for elders and participation in subsistence activities. Across all communities, these cultural traditions remain strong.

Table 23: Iñupiat household members' competency in Iñupiaq

		North Slope Borough	Anaktuvuk Pass	Atqasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright
2003	Fluent	NA	20.8%	30%	60%	30.9%	36.3%	31.1%	18.2%	66.6%
	Medium Proficiency	NA	18.7%	12.4%	15%	24%	26.5%	19.1%	16.5%	13.7%
	Limited proficiency	NA	25.6%	27.7%	16%	33.5%	27.1%	29.6%	35.3%	5.2%
2010	Fluent	18.2%	16.2%	20.6%	47%	21%	43.8%	18.2%	9.8%	48.8%
	Medium Proficiency	20.3%	23.5%	21.1%	23%	34.9%	28.8%	31.4%	15.9%	19.5%
	Limited proficiency	32%	35%	27.3%	21%	27.5%	20.8%	26.3%	37.4%	17.4%

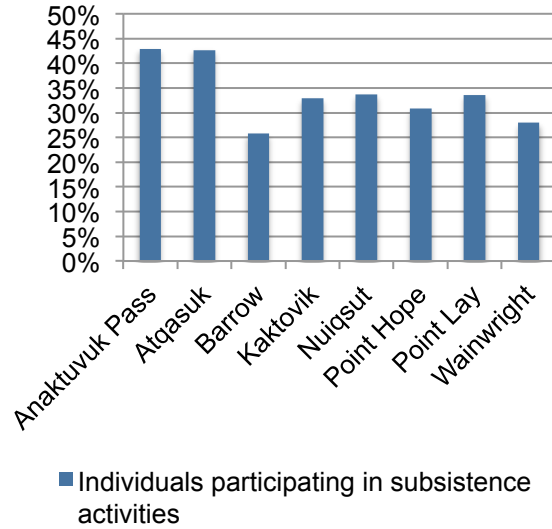
Source: North Slope Borough (2010)

Figure 22: Household head's opinion of respect for elders within the community



Source: North Slope Borough (2010)
Notes: *Data only for Iñupiat households

Figure 23: Individual community members' participation in subsistence activities



Source: North Slope Borough (2010)

Structural and Institutional Supports

This section includes data on structural and institutional supports: essential services and facilities that are provided by the NSB or other governments and that directly affect the quality of life and health outcomes of NSB residents. Structural and institutional supports have the potential to be (and have been in the past) strongly affected by resource sector activities, both beneficially and adversely.

Municipal Infrastructure

Water, waste disposal and heating are essential services for all NSB residents. Table 24 describes the extent and delivery systems that are currently in place by village. There is considerable variation between communities. In terms of water supply, all communities other than Anaktuvuk Pass are using a surface water source with a water treatment system; Anaktuvuk Pass was (as of 2005) using one community well as the water supply. All communities had a combination of piped and trucked water. All communities (other than Wainwright, which did not report the statistic) had a maximum water flow of 1,250 gallons per minute; this would not meet the need of a large fire, which would require more than 2,000 gallons per minute (NSB Comprehensive Plan, 2005). While the majority of houses in most villages had sewage facilities, up to 10% used holding tanks, and a substantial portion relied on “honey buckets”.

Table 24: Water, sewage and heating indicators for all villages in the NSB, as of 2005

	Anaktuvuk Pass	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	
Water	Communities using surface water source and treatment plant	No	Yes	Yes	Yes	Yes	Yes	Yes	
	Do houses receive water by pipe system, or trucks?	Both	Both	92% piped	90% piped, 8% trucked	88% piped, 12% trucked	Piped exists, unclear how many houses are connected	60% piped, 40% trucked	All receive running water, 9% use trucked in water.
	Volume of water piped in 2003	2,534,000 gallons	2,131,000 gallons	50 million gallons**	775,900 gallons to residential facilities (1,008,000 gallons to commercial facilities)	2,900,000 gallons	NA	1,750,000 gallons	NA
	Maximum water flow	1,250 gallons per minute	1,250 GPM	1,250 GPM	1,250 GPM	1,250 GPM	1,250 GPM	1,250 GPM	NA
	Volume of water trucked in 2003	74,000 gallons	72,700 gallons	NA (this is available privately in Barrow)	NA	116,000 gallons	NA	81,000 gallons	NA
	Frequency of water delivery (where water is trucked to houses)	4-8 days	4-8 days	4-8 days	450-750 gallons per month	NA	NA	408 days	NA
	Typical capacity of household water holding tank	250 gallons	250 gallons	250 gallons	250 gallons	NA	NA	250 gallons	NA
	# of fire hydrants	17*	17*	131	22	31*	15*	12*	NA
	Sewage	Houses with sewage facilities	90%			90%	90%	>90%	60%
Houses using honey buckets		10%	100%	32%	10%				
Housing with holding tanks						10%	<10%	40%	8%
Houses with septic tanks				68%					
Heating	Main heating source	Diesel fuel	Baseboard or boiler system	Baseboard or boiler system	Diesel fuel	Diesel fuel	Diesel fuel	Diesel fuel and electricity	Fuel oil

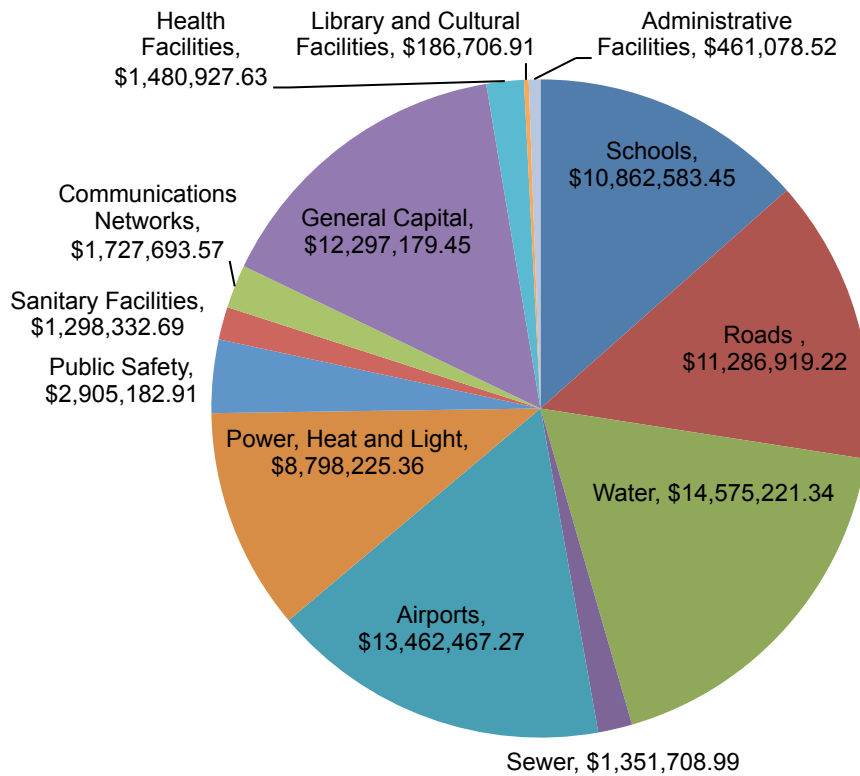
Source: North Slope Borough (2005)

Notes: * Indicates that fire hydrants are spaced further than 500m apart, which exceeds the maximum allowable distance in the International Fire Code

** Data from 2005

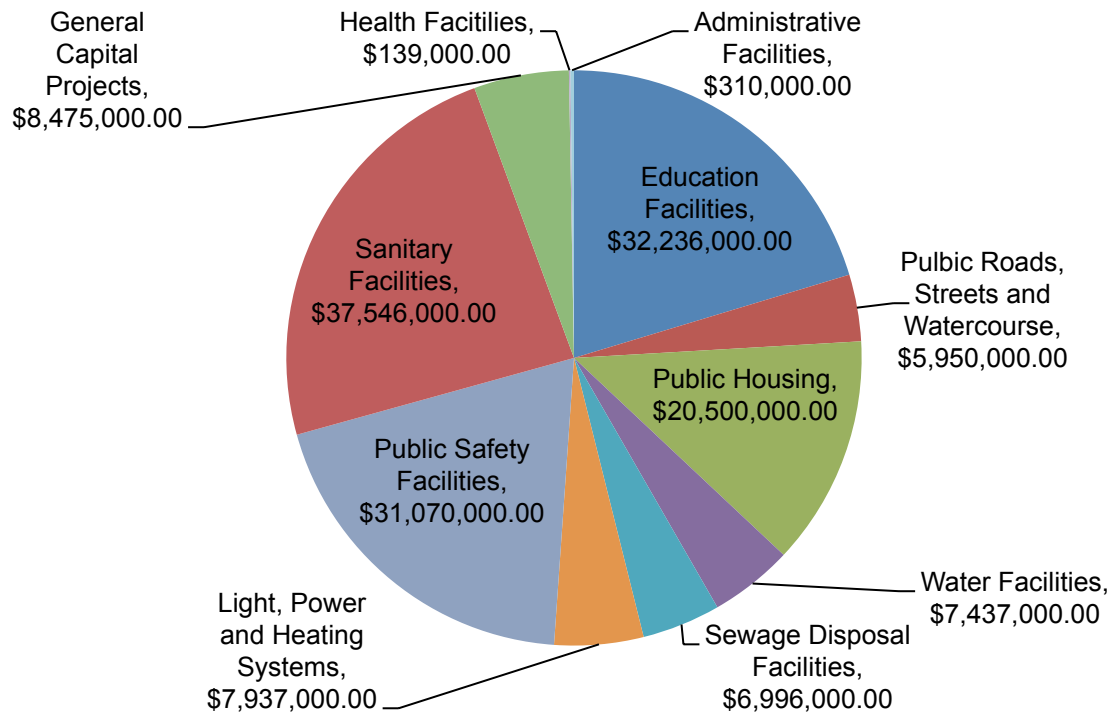
Capital spending indicates where the NSB government is spending money to maintain, upgrade or develop important community assets. The need for improvements, as well as the availability of funds for making improvements is closely linked to community size and demographics and also to the needs of and revenue generated for the NSB by industry. Figure 24 shows capital spending that was completed on major infrastructure projects in 2013. Roads and water comprised the largest costs, followed by airports and schools. Figure 25 shows bond ordinances (in other words, money raised) for capital improvement projects in 2014. Education facilities, public safety facilities and sanitary facilities were a major focus.

Figure 24: Capital spending in 2013 on major infrastructure projects



Source: North Slope Borough, Department of Administration and Finance (2013)

Figure 25: Upcoming projects, as indicated by 2014 bond ordinances



Source: North Slope Borough, Department of Administration and Finance (2014)

Health Care Services

Health care services in NSB villages comprise of health clinics staffed by Community Health Aides as well as the Samuel Simmonds Memorial Hospital in Barrow, which was newly built in 2010. Resource development projects have the potential to increase demand on local health care services, both due to in-migration of workers or by increasing burden of disease. Resource development can also improve availability of health care services by providing indirect funding through tax revenue. Table 25 notes the number of patient visits to health clinics and the Samuel Simmonds Memorial Hospital for the year 2013. Since Barrow is home to the only hospital in the NSB it has the highest number of patient visits of all the villages. Data for Point Hope and Anaktuvuk Pass are held by other Native associations and were unavailable for this report (see Appendix A for further explanation).

Table 25: Total patient visits in 2013

	Anaktuvuk Pass ¹	Atqasuk ²	Barrow ²	Kaktovik ²	Nuiqsut ²	Point Hope	Point Lay ²	Wainwright ²	
Total Visits	1774	4483	81468	5130	7862	--	3716	9610	
Gender	Male	--	2022	35125	2180	2961	--	1505	3858
	Female	--	2461	46343	2950	4901	--	2211	5752

Source: 1. North Slope Borough, Community Health Aide Program (2013)
2. North Slope Borough, Regional Patient Management System Database (2013b)

Note: Please see Appendix A for notes about data in this table.

Table 26 reports on the number of medivacs over the five-year period of 2009-2013. Medivacs are an important part of the health care service system in the NSB due to the remote location of the villages and the lack of advanced health care services in most of the villages. Throughout the NSB the rates of medivacs have remained relatively consistent over the five-year period and varied substantially between villages.

Table 26: Total number of medivacs in select NSB villages, over 5 years

	Anaktuvuk Pass	Atqasuk City	Kaktovik	Nuiqsut	Point Lay	Wainwright	Total North Slope Borough
2009	94	65	50	89	75	145	490
2010	252	65	62	104	18	188	689
2011	230	75	38	123	48	134	648
2012	144	24	49	120	31	96	464
2013	207	49	71	71	21	141	560

Source: North Slope Borough, Community Health Aide Program (2013)

Environmental Supports

Clean air, sufficient quantities of clean water, and other environmental supports are critical necessities for sustaining human health. Environmental supports are one of the areas most directly affected by resource development activities through the intentional or unintentional release of contaminants such as chemicals or dust. Environmental contamination is also consistently expressed by communities as being a major concern for resource development projects, making this an important area for future monitoring.

Data Sources and Representative Indicators

Environmental monitoring is a discipline that generates a large amount of data that is difficult to summarize in a small number of representative indicators. To begin with, there are a large number of potential contaminants to be tracked: particulate matter, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), heavy metals, sulphur and nitrous oxides, etc. In addition, monitoring needs to take place in a large number of locations in order to capture the effect of both point and mobile sources, and the exposure of groups of people in different locations.

Table 27 presents a summary of emissions in the NSB for several key contaminants, broken down by source for the years 2008 and 2011. Only those sources that could potentially be related to industrial development were included in the table (for example, emissions from dry cleaning establishments were not included). The table shows that in general, the levels of emissions for most sources and most substances is comparable between 2008 and 2011; while some sources have shown an increase in emissions, other sources have shown a decrease. The most notable increase was for industrial processes related to oil and gas production which showed an increase for all emission categories between 2008 and 2011, and most notably VOCs which rose from 431 tons in 2008 to over 125,000 tons in 2011.

Table 27: Emission summary for the NSB, 2011

	CO (tons)		NO _x (tons)		PM 10 (tons)		PM 2.5 (tons)		SO ₂ (tons)		VOCs (tons)	
	2011	2008	2011	2008	2011	2008	2011	2008	2011	2008	2011	2008
POINT SOURCES												
Fuel Comb - Electric Generation - Natural Gas	664	830	3350	3477	87	94	83	94	107	109	46	50
Fuel Comb - Electric Generation - Oil	204	126	408	569	9	9	9	9	35	95	13	11
Fuel Comb - Industrial Boilers, ICEs - Natural Gas	5579	6379	31346	31511	631	642	630	642	688	706	220	261
Fuel Comb - Industrial Boilers, ICEs - Oil	271	137	667	428	34	21	33	20	20	35	31	50
Fuel Comb - Industrial Boilers, ICEs - Other	8	0.7	30	0.1	3.1	0.6	3	0.4	0.1	0.1	2.2	0.1
Industrial Processes - Mining					0	0	0	0				
Industrial Processes - Oil & Gas Production	3793	2242	2260	1140	203	162	195	154	324	130	125,271	431
Industrial Processes - Petroleum Refineries	59	39	11	17	4	8	4.1	7	0.8	1.1	10	16
Industrial Processes - Storage and Transfer	12		55		3	0	3	0	<0.1		10	2.5
Area Sources												
Fuel Comb - Comm/Institutional - Natural Gas	19.77	22.22	23.59	26.46	1.79	2.02	1.79	2.02	1.14	1.12	1.3	1.44
Fuel Comb - Comm/Institutional - Oil	0.3	<0.1	1.1	0.1	0.2	0	0.1	0	0.2	<0.1	0.1	0
Miscellaneous Non-Industrial NEC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5	5.5
Waste Disposal	43	32	6	8	22	17	17	13	5	3.8	6	4.5
Mobile - Aircraft	336	341	43	35	5	3.8	4	0.9	6	5	43	28
Mobile - Commercial Marine Vessels	1897	1947	9338	10111	309	360	299	349	117	604	214	219
Mobile - Non-Road Equipment - Diesel	67	85	53	61	4	4.3	3	4.2	1	8	6	7
Mobile - Non-Road Equipment - Gasoline	1058	1133	26	25	6	7	5	6	0.1	0.3	263	312
Mobile - Non-Road Equipment - Other	6	9	1.2	1.7	0.2	0.2	0.2	0.2	0.1	0.1	0.3	0.4
Mobile - On-Road Diesel Heavy Duty Vehicles	37	20	146	80	6	7	5	7	0.2	2.2	4.8	4.7
Mobile - On-Road Diesel Light Duty Vehicles	3.3	0.8	6	1.3	0.3	0.2	0.3	0.2	<0.1	0.2	0.85	91
Mobile - On-Road Gasoline Heavy Duty Vehicles	54	91	2.7	6	0.2	0.7	0.2	0.6	<0.1	0.1	2.5	4.4
Mobile - On-Road Gasoline Light Duty Vehicles	597	1418	28	85	2.5	12	2.0	10	0.2	2.8	32	89
Solvent - Industrial Surface Coating & Solvent Use											3.2	0
Dust - Construction Dust					17		1.7					

Source: United States Environmental Protection Agency (2011)

Although environmental monitoring in the NSB has been described as “limited” (Alaska Department of Environmental Conservation, Division of Air Quality, 2011), there are several ongoing environmental monitoring programs that are generating relevant data. These data sources may be used in the future to generate longitudinal information about specific emission types, sources or locations. These data sources are listed in Table 28.

Table 28: Sources for environmental monitoring data

Earth System Research Laboratory

Located 8km northeast of Barrow Village, the observatory provides environmental monitoring data for all of Alaska. Both research publication and up-to-date data sets area available. Air quality is a particular focus at this monitoring station.

Available at: <http://www.esrl.noaa.gov/gmd/obop/brw/>

Emissions, Meteorological Data, and Air Pollutant Monitoring for Alaska’s North Slope

Made available by the Department of Environmental Conservation, Air Quality Division, this report from 2011 combines various sources monitoring air quality in the NSB. This report is intended to be the first in a series, and so future similar reports may be available in the coming years. Additional reports and information can also be accessed through the Department of Environmental Conservation.

Available at: http://dec.alaska.gov/air/ap/docs/North_Slope_Energy_Assessment_FINAL.pdf

Bureau of Ocean Energy Management

The Environmental Studies Program has been ongoing since 1973, and combines environmental, economic and social research to inform oil and gas decisions. The Environmental Studies Program Information System provides completed reports and research, and includes Alaska specific information.

Available at: http://www.data.boem.gov/homepg/data_center/other/espis/espisfront.asp

U.S. Environmental Protection Agency

Available is a database for the National Emissions Inventory, which is specific enough to include the NSB. A range of data can be selected depending on what air quality indicators are needed, and the database is currently updated to 2011, and may be further updated in the future.

Available at: <http://www.epa.gov/ttnchie1/net/2011inventory.html>

Exposure to Environmental Contaminants

It is important to remember that there is a difference between the release or presence of environmental contaminants, exposure to environmental contaminants, and the development of health consequences as a result of that exposure. While emissions may be released to the environment from resource development activities, the presence of a contaminant does not immediately mean there will be health effects. If there is no human exposure, the contaminant will have no effect at all (Canadian Center for Occupational Health and Safety, 2009). Exposure can occur through a number of different routes: through inhalation of contaminants via outdoor or indoor air, through ingestion of contaminants through water or food, or through dermal contact. Table 29 shows various pathways or media through which people could be exposed to contaminants released to the environment.

Table 29: Potential pathways of exposure for chemical emissions

Exposure media	Examples of exposure pathways	Examples of chemical hazards delivered via this medium
Outdoor air	Inhalation of toxic gases and particles from vehicle and industrial emissions	SO ₂ , NO _x , ozone, suspended particulate matter, lead, benzene, dioxins and furans, and dioxin-like compounds
Indoor air	Inhalation of pollutants released during indoor combustion of solid fuels, tobacco smoking, or from construction materials and furnishings, contaminants in indoor air and dust	SO _x , NO, CO, suspended particulate matter, PAHs, Hg, lead from lead-based paints, benzene, formaldehyde, asbestos, phthalates, PBDEs, radon, solvents
Drinking water	Ingestion of drinking water contaminated with toxic chemicals from industrial effluents, oil and mining wastes or from natural sources.	Pesticides, fertilizers, trace metals, fluoride, nitrate, cyanide, industrial solvents, petroleum products, disinfection byproducts
Food	Consumption of food contaminated with chemicals and toxic levels through industrial processes and environmental contamination	Pesticides, methylmercury, lead, arsenic, cadmium, dioxins, bisphenol A
Soil	Ingestion (particularly for children) or inhalation of soil contaminated through industrial processes, and industrial waste management	Heavy metals, pesticides, and POPs
Occupational exposure	Chronic or acute exposure through inhalation, dermal absorption, or secondary ingestion of toxic chemicals or by-products of industrial processes such as agriculture, mining or manufacturing	Pesticides, benzene, heavy metals, solvents

Source: Adapted from Prüss-Ustün et al. (2011)

Whether exposure to environmental contaminants results in the development of illness or other health outcomes depends not only on conditions of exposure (type of chemical, amount of exposure, frequency of exposure, etc.) but on a number of other factors that influence individual susceptibility, including biological and social factors. For these reasons, an identical exposure will not affect every person in the same way. Table 30 presents a number of factors that modulate exposure and influence the differential development of illness.

Table 30: Selected factors that influence vulnerability to environmental contamination exposure

Factors that may affect exposure	Factors that may affect individual susceptibility	Factors that affect an individual's preparedness and response to exposure
<p>Chemical Release Factors (at the source):</p> <ul style="list-style-type: none"> Type of chemical (e.g., physicochemical properties, association with other chemicals in mixtures) Release media (e.g., air, water, soil) Site of release (e.g., proximity to populated areas) Multiple routes of exposure (to one or multiple pollutants) <p>Environmental Factors (both natural and built):</p> <ul style="list-style-type: none"> Housing quality and density Land use patterns Sanitation infrastructure Traffic density Noise Geographic/climatic region Proximity to chemical releases (e.g., industrial and recycling sites) Climate variability Natural disasters <p>Psychosocial Factors:</p> <ul style="list-style-type: none"> Gender roles Race/ethnicity Socioeconomic status Segregation Stress <p>Behavioral Factors:</p> <ul style="list-style-type: none"> Occupational exposures Past exposures Time-activity patterns Product use (and manner of use) Diet Subsistence practices 	<p>Biological Factors:</p> <ul style="list-style-type: none"> Age Sex Genetic susceptibility Biological stressors (e.g., acute and chronic disease status) Compromised immune system Preexisting health conditions Repeated exposures (to one or multiple stressors) <p>Psychosocial Factors:</p> <ul style="list-style-type: none"> Race/ethnicity Socioeconomic status (including educational attainment) Emotional state (e.g., depression, anxiety) Social capital Self-efficacy and empowerment (e.g., ability to participate in decision-making process) Chronic and acute social stressors (e.g., conflict, crime) <p>Behavioral Factors:</p> <ul style="list-style-type: none"> Hygiene Diet Smoking and substance abuse 	<p>Structural Factors:</p> <ul style="list-style-type: none"> Health and education infrastructure (e.g., access to affordable health care and schooling) Local economy Housing Neighborhood physical conditions Land use patterns Employment (unemployment or underemployment) Access to information and resources Income Health status (e.g. compromised health) Self-efficacy and empowerment (e.g., ability to participate in decision-making process) Language barriers Access to communication channels <p>Psychosocial Factors:</p> <ul style="list-style-type: none"> Socioeconomic status (including educational attainment) Emotional state (e.g., depression, anxiety, stress) Social capital Self-efficacy and empowerment (e.g., ability to participate in decision-making process) Chronic and acute social stressors (e.g., conflict, crime, violence) Discrimination <p>Behavioral Factors:</p> <ul style="list-style-type: none"> Nutrition Hygiene Diet Product use Smoking and substance abuse Subsistence practices Religious, spiritual and cultural practices

Source: Commission for Environmental Cooperation (2014)

5. Data Limitations

Although this report presents useful information to understand health of NSB residents as it relates to resource development, there are some gaps in data worth noting. The following comments are intended to improve future versions of this report and are not meant to be a critique of data in the NSB or Alaska; which in general was easily accessible and abundantly available.

- Inconsistencies in the reporting of Census level data between villages made it challenging to compare data between villages. It is recommended that a standardized process be implemented for data collection, analysis and presentation to ensure comparisons can be made between villages.
- Data on sexually transmitted infections was not accessible at the state level so comparisons could not be made to data trends outside the NSB. Data is likely available but may take further coordination between DHSS and the state epidemiology department.
- Environmental monitoring data was readily available for many air quality pollutants; however, indicators of water quality were not readily available. As the NSB considers more off-shore oil and gas production and increased on-shore oil and gas production, surface and ground water testing may become more important.
- Much of the data on village level infrastructure was slightly outdated (most data was from 2005). These data may be important to update as resource development activity changes to better understand how industry supports or overwhelms village infrastructure.

6. Conclusions

Health in the North Slope Borough is defined through both health outcomes and the environmental, social and institutional determinants that influence health outcomes. In the NSB both health outcomes and determinants of health are changing, for the better (e.g. decreasing infant mortality rate) and for the worse (e.g. higher rates of obesity and diabetes and increased VOC air emissions from oil and gas production), while some health trends remain relatively constant (e.g. the number of medivacs per year and unintentional injury mortality rates).

As resource development in the NSB changes over the years to come it will be important to reexamine these health outcomes and determinants to decipher the ways in which health in the NSB is being supported and to identify the health vulnerabilities that need more attention. Resource development projects have the potential to bring about both adverse and beneficial health outcomes and reports such as this one will help health agencies plan for this type of growth to ensure development takes place in a sustainable and healthy manner for NSB residents.

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Appendix A: Data Sources and Methodology

Overall Health

Table 2. Self-reported health

Data source: North Slope Borough, Department of Health and Social Services (2012). *NSB Baseline Community Health Analysis Report (BCHAR)*.

Data origin: NSB 2010 Census

Notes: Data came from Appendix A: 2010 NSB Census: Community Health Profiles in BCHAR.

Figure 2. Life expectancy at birth

Data source: North Slope Borough, Department of Health and Social Services (2012). *BCHAR*.

Data origin: Alaska Bureau of Vital Statistics

Figure 3. Infant mortality rate

Data source: Alaska Department of Health and Social Services, Bureau of Vital Statistics (2012).

Data origin: Alaska Bureau of Vital Statistics, from the census area data.

Notes: Data was available since 1990, but it was not seen as necessary to report that long of a time period particularly considering the limitations of this data due to too few infant deaths to reliably calculate a precise rate in some years.

Table 3. Leading cases of death, 2007-2009

Data source: Alaska Department of Health and Social Services, Bureau of Vital Statistics (2012).

Data origin: Alaska Bureau of Vital Statistics, from leading cause of death data at the census level.

Notes: Age-adjusted rate for the most recent year available for the NSB is presented. Crude rate was excluded.

Table 4. Chronic health problems

Data source: North Slope Borough, Department of Health and Social Services (2012). *BCHAR*.

Data origin: NSB 2010 Census.

Notes: In the BCHAR, cell counts of less than five were excluded.

Figure 4. Lower respiratory disease mortality rates

Data source: North Slope Borough, Department of Health and Social Services (2012). *BCHAR*.

Data origin: Alaska Bureau of Vital Statistics.

Notes: Data was extracted for 10 years, with 2005-2009 data being the most current available.

Figure 5. Heart disease mortality rate

Data source: North Slope Borough, Department of Health and Social Services (2012). *BCHAR*.

Data origin: Alaska Bureau of Vital Statistics.

Notes: Data was extracted for 10 years, with 2005-2009 data being the most current available.

Table 5. Overweight and obesity among NSB household heads

Data source: North Slope Borough, Department of Health and Social Services (2012). *BCHAR*.

Data origin: NSB 2010 Census; Alaska Behavioral Risk Factor Surveillance System (BRFSS); NSB Public Health Nursing Regional Patient Management System (RPMS) database; *Obesity in Alaska* Report.

Notes: All adult data for NSB and individual villages was obtained from the NSB 2010 Census. The Alaska adult data was from the 2008 BRFSS. Sample size in the NSB for BRFSS tends to be low so estimates should be interpreted with caution. Childhood overweight and obesity data was originally from two sources. NSB children data was from the NSB Public Health Nursing RPMS database, and the obesity or overweight criteria were based on height and weight measurements taken between August 2008-August 2009. Alaska childhood estimates were from the Alaska Department of Health and Social Services from a report entitled, *Obesity in Alaska*. The estimates in this report were from the statewide Resource Patient Management System (RPMS) database for the years 2000-2005, and were also based off height and weight measurements. Data should be compared between sources with caution.

Figure 6. Type 2 diabetes prevalence in the NSB

Data source: North Slope Borough, Department of Health and Social Services (2012). *BCHAR*.

Data origin: Alaska Native Diabetes Program Registry (not publically available).

Notes: This data includes Alaska Native patients who live in Anaktuvuk Pass, Atkasuk, Barrow, Kaktovik, Nuisqut, Point Hope, Point Lay and Wainwright and visited the diabetes program in the last three years. These data have not been age-adjusted, therefore trend data should be interpreted with caution.

Figure 7. Age-adjusted incidence of cancers in the NSB, 1996-2009

Data source: North Slope Borough, Department of Health and Social Services (2012). *BCHAR*.

Data origin: Alaska Cancer Registry Data and Statistics, specifically Cancer Incidence Data and Statistics.

Notes: This data was age-adjusted to the 2000 U.S. standard population.

Table 6. Chronic conditions reported by NSB run clinics and the SSMH, 2013

Data source: North Slope Borough, Resource Patient Management System Database (2013).

Data origin: NSB Public Health Nursing RPSM Database.

Notes: This data was requested through the DHSS and is not publically available.

Figure 8. Chlamydia rates in the NSB

Data source: Alaska Department of Health and Social Services, Epidemiology (2010).

Data origin: Interactive Display of Alaska Chlamydia and Gonorrhea Data, by Region, created by Epidemiology within the Alaska Department of Health and Social Services.

Notes: The data for the NSB, presented under 'Arctic Slope' within this database, was extracted since 2001. The intent was to present Alaska-level data and NSB-level data; however, Alaska level data were not available.

Figure 9. Gonorrhea rates in the NSB

Data source: Alaska Department of Health and Social Services, Epidemiology (2010).

Data origin: Interactive Display of Alaska Chlamydia and Gonorrhea Data, by Region, created by Epidemiology within the Alaska Department of Health and Social Services.

Notes: The data for the NSB, presented under 'Arctic Slope' within this database, was extracted since 2001. The intent was to present Alaska-level data and NSB-level data; however, Alaska level data were not available.

Table 7. Number of reported cases of select infectious disease in the NSB from 1986-2009

Data source: North Slope Borough, Department of Health and Social Services (2012). BCHAR.

Data origin: Alaska Department of Health and Social Services, Division of Public Health, Epidemiology.

Table 8. Communicable diseases reported by NSB run clinics and the SSMH, 2013

Data source: North Slope Borough, Resource Patient Management System Database (2013a).

Data origin: NSB Public Health Nursing RPSM Database.

Notes: This data was requested through the DHSS and is not publically available.

Figure 10. Emergency service symptoms related to request, for the NSB's Department of Health and Social Services by number of calls in 2013

Data source: North Slope Borough, Department of Health and Social Services (2013).

Data origin: Integrated Behavioral Health Program, from the AKAIMS database.

Notes: This data was requested through the DHSS. It includes all patients requesting services, between January 1st and December 31st 2013.

Figure 11. Age-adjusted suicide mortality rates

Data source: North Slope Borough, Department of Health and Social Service (2012). BCHAR.

Data origin: Alaska Bureau of Vital Statistics.

Notes: Rates were age-adjusted to the 2000 U.S standard population.

Table 9. Self-reported alcohol and drug use

Data source: North Slope Borough, Department of Health and Social Service (2012). BCHAR.

Data origin: Center for Disease Control and Prevention, BRFSS; Alaska Department of Health and Social Services, Chronic Disease Prevention and Health Promotion; Alaska's Youth Risk Behavioral Survey (YRBS), 2005 & 2007; Survey of Living Conditions in the Arctic (SLiCA)

Notes: The first row, "Adults who report binge drinking in the past 30 days", for Alaska overall, is from BRFSS, which defines binge drinking for men as five or more drinks in one occasion, and four or more drinks in one occasion for women. For the NSB, the Alaska Department of Health and Social Services, Chronic Disease Prevention and Health Promotion, Division of Public Health provided a sub-regional analysis of the Alaska BRFSS data. The second row, "High school students who report having 5 or more drinks in the past 30 days" was originally from Alaska's Youth Risk Behavior Survey (YRBS), which defined binge drinking as 5 or more drinks in a row. Alaska data was from the 2007 YRBS, with the NSB data from the 2005 YRBS. The third row, "Self reported marijuana use among indigenous populations" was from SLiCA. This data point included Iñupiat or active indigenous residents 16 years of age, and older. The Alaska region includes the indigenous populations in the NSB, Northwest Arctic Borough and the Bering Straits regions. The final row, "Self reported marijuana use among high school, students, in the past 30 days", was originally from Alaska's YRBS. Alaska data was from the 2007 YRBS, with the NSB data from the 2005 YRBS.

Table 10. Impact of drugs and alcohol, household heads

Data source: North Slope Borough, Department of Health and Social Service (2012). BCHAR.

Data origin: NSB 2010 Census.

Figure 12. Child mortality rate, ages 0-19 years old.

Data source: North Slope Borough, Department of Health and Social Services (2012). BCHAR.

Data origin: Alaska Bureau of Vital Statistics.

Notes: Nine years of data have been presented. Rates for the NSB should be interpreted with caution as NSB rates are based on fewer than 20 occurrences.

Figure 13. Low birth weight

Data source: North Slope Borough, Department of Health and Social Services (2012). BCHAR.

Data origin: Alaska Bureau of Vital Statistics, under Birth Profiles.

Notes: Ten years of data have been presented.

Figure 14. Fetal Alcohol Spectrum Disorder (FASD)

Data source: North Slope Borough, Department of Health and Social Services (2012). BCHAR.

Data origin: Alaska Birth Defects Registry; "High Prevalence of Major Congenital Anomalies in Alaska, 1996–2002" State Epidemiology Bulletin 2008; *Alaska Maternal and Child Health Data Book 2005: Birth Defects Surveillance Edition*.

Notes: For the NSB, the original data came from the Alaska Birth Defects Registry, from the Alaska Department of Health and Social Services Maternal and Child Health Epidemiology Unit. The Alaska level data

came from “High Prevalence of Major Congenital Anomalies in Alaska, 1996–2002” State Epidemiology Bulletin 2008 and *Alaska Maternal and Child Health Data Book 2005: Birth Defects Surveillance Edition*. This data source may be difficult to reproduce in the future as it is primary research, and other sources may have to be investigated.

Figure 15. Unintentional injury mortality rates

Data source: North Slope Borough, Department of Health and Social Services (2012). BCHAR.

Data origin: Alaska Bureau of Vital Statistics.

Notes: Rates were age-adjusted to the 2000 U.S. standard population. Ten years of data are presented.

Figure 16. Motor vehicle injury deaths, 1999-2008

Data source: North Slope Borough, Department of Health and Social Services (2012). BCHAR.

Data origin: Alaska Bureau of Vital Statistics.

Notes: Rates were age-adjusted to the 2000 U.S. standard population.

Figure 17. Unintentional injury deaths by cause, 1994-2008

Data source: North Slope Borough, Department of Health and Social Services (2012). BCHAR.

Data origin: Alaska Bureau of Vital Statistics.

Notes: NSB rates are based on fewer than 20 deaths, and so should be used with caution.

Social and Well-Being

Table 11. Employment between people ages 16-64

Data source: North Slope Borough (2010). NSB 2010 Census.

Data origin: NSB 2010 Census.

Notes: For the first column (NSB total), percentages were calculated from total numbers of Iñupiat respondents, whereas the remaining columns included data for all ethnicities. The percentage of retired individuals was excluded, as it wasn't seen to add to knowledge of the relationship between resource development and employment. Finally, the row “Percent of labor force that perceive themselves to be underemployed” was taken from the first snapshot table in all of the NSB village profiles, as well as the NSB overall profile from the census.

Table 12. Percentage of people employed by select industries in the NSB.

Data source: North Slope Borough (2010). NSB 2010 Census.

Data origin: NSB 2010 Census.

Notes: This data was taken from the tables in the NSB census and the village profiles. *Government* was calculated by adding federal, state, city and NSB government. All other job categories were taken directly

from the census. Employment sectors were excluded if they were not included in each village profile and had no major link to resource development. For villages where employment was reported by gender, as well as ethnicity, male and female categories were added together. For all villages, percentages were calculated based off reported frequencies.

Table 13. Total average household income, 2010

Data source: North Slope Borough (2010). NSB 2010 Census.

Data origin: NSB 2010 Census.

Notes: Data for this table was taken from the NSB Census village profiles. In all cases, calculated household incomes were used as opposed to estimated incomes. The majority of villages provided the average calculated total household income per ethnicity, which was chosen over other ways of presenting household income. Barrow did not have household income data per ethnicity, and so household income for all ethnicities is presented. Village profiles for Nuiqsut, Point Hope and Wainwright did not include average household income so median values are presented instead. These data are difficult to compare with the first row. It should be noted that all values came from either the text or tables provided in the census village profiles but each profile presented the data differently. The average per capita income was available for most villages, and so was chosen over the median. The Atqasuk village profile did not include per capita income and therefore it is not included. Point Hope included median per capita income so this value is presented instead of the average.

Figure 18. Calculated total household income among NSB residents, by ethnicity

Data source: North Slope Borough (2010). NSB 2010 Census.

Data origin: NSB 2010 Census.

Notes: Data for each income bracket, for Iñupiat and Caucasian respondents, was included and plotted on the graph. Other ethnicities that were included in the census data, specifically “Other” or “Pilipino” (only in Barrow), were excluded, as they were not represented in each village profile.

Table 14. Percent of population living below the poverty line.

Data source: North Slope Borough (2010). NSB 2010 Census.

Data origin: NSB 2010 Census.

Notes: Poverty percentages were either taken from the text, or calculated from the charts provided in the village census profiles (by adding all households living under the poverty line and calculating the percentage of total houses that responded to the question). Where possible, Iñupiat and non-Iñupiat households were separated, but this was not always possible due to the data provided.

Figure 19. Child poverty, from 2003-2012

Data source: United States Census Bureau (2013).

Data origin: Small Income and Poverty Estimates, United States Census Bureau.

Notes: Data was found using the interactive database provided by the US Census Bureau. 10 years of data was requested from the Small Income and Poverty Estimates database and the percentage of people under the age of 18 living in poverty was selected.

Table 16. Housing quality indicators

Data source: United States Census Bureau (n.d.), & North Slope Borough (2010). NSB Census.

Data origin: 2008-2012 American Community Survey, 5 Year Estimates, United States Census Bureau; NSB 2010 Census.

Notes: Data on overcrowding, severe overcrowding and kitchen facilities (first three rows) was taken from the 2008-2012 American Community Survey, 5 Year Estimates, as provided by the US Census Bureau. This dataset provides village-level data. Data for the percent of houses without running water was taken from the NSB Census village profiles, where the question, "Does your house have running water?", was posed. Included are the percent of respondents for 1998, 2003 and 2010 that answered no. Data for earlier years was included in the 2010 Census reports but not included in this report.

Table 16. Monthly rental, mortgage and utility costs.

Data source: North Slope Borough (2010). NSB 2010 Census & Alaska Housing Finance Corporation (2014). 2014 Housing Assessment.

Data origin: NSB 2010 Census; 2014 Housing Assessment for the North Slope Borough.

Notes: Data for rental, mortgage and total average utility costs were taken from the NSB census, where provided. The percent change, and 2003 constant dollars (as seen in census data) were not included in this report, as this data was not provided for all villages. In Wainwright and Nuiqsut, it was indicated that the 2010 data for mortgage and rental costs were from 2009, not 2010. Point Hope did not have data for rental or mortgages. The average percent of income spent on energy costs was taken from the American Housing Finance Corporation, who published a 2014 Housing Assessment for the North Slope Borough. For this specific statistic, the median incomes were derived from the 2007-2011 American Community Survey, while the energy costs were taken from The Alaska Housing and Finance Corporation's Alaska Retrofit Information System.

Table 17. Subsistence Foods

Data source: North Slope Borough, Department of Health and Social Services (2012). BCHAR.

Data origin: NSB 2010 Census

Table 18. Percent of household's diet that is comprised of subsistence foods

Data source: North Slope Borough (2010). NSB 2010 Census.

Data origin: NSB 2010 Census

Notes: Data taken directly from each village profile and not modified in any way. The only village that did not provide all ranges of use of subsistence foods for 1998, 2003 and 2010 was Barrow, which did not have 1998 data. For Barrow, 2003 data included Iñupiat respondents only, while all other villages included all responding households.

Table 19. Food insecurity in households with Iñupiat household heads, 2010

Data source: North Slope Borough, Department of Health and Social Services (2012). BCHAR.

Data origin: NSB 2010 Census.

Figure 20. Market basket comparisons among four Alaska cities

Data source: North Slope Borough (2010). NSB 2010 Census.

Data origin: 2010 NSB Census

Notes: Data came from the census report for the NSB overall. A list of all items (and quantities) are included below. Bolded items indicate that the item and costs are available in Anchorage, Barrow and Point Hope, but not Nuiqsut. The original data also included different amounts of some items per villages (e.g. 5 quarts of ice cream in all villages, except for one where the value was given for 1 pint). When this was the case, costs for equal amounts of quantities were calculated.

Table 31: Items and quantities included in the market basket calculations

Item	Amount	Item	Amount	Item	Amount	Item	Amount
Frozen French Fries	32 oz.	Oranges/ fresh	1 lb.	Pie/ frozen/ready to bake	37 oz.	Tuna/ canned	6 oz.
Instant Mashed Potatoes	28 oz.	Strawberries/ frozen	16 oz.	Pastry/ frozen	11.5 oz.	Chili w/beans/ canned	15 oz.
Cabbage/Fresh	1 lb.	Applesauce/ canned	45 oz.	Soup/ chicken noodle	26 oz.	Eggs large	1 Dozen
Carrots/fresh	1 lb.	Fruit cocktail/ canned	15 oz.	Macaroni and Cheese	7.3 oz.	Peanut Butter	18 oz.
Celery/fresh	1 lb.	Peaches/ canned	15.25 oz.	Whole milk/ fresh	Gallon	Butter	1 lb.
Lettuce/fresh	1 lb.	Pears/ canned	15 oz.	Yogurt/ plain	6 oz.	Margarine	1 lb.
Onions/fresh	1 lb.	Apple/100% juice/ canned	46 oz.	Natural cheddar cheese	8 oz.	Shortening	3 lbs.
Tomatoes/fresh	1 lb.	Grape juice/ frozen	12 oz.	American cheese/sliced	12 oz.	Vegetable oil	48 oz.
Corn/canned whole kernel	15.25 oz.	Grape/ 100% juice/ canned*	46 oz. (64 oz.)	Ice cream/ bulk	5 quarts	Mayonnaise	16 oz.
Green Beans/ canned	14.5 oz.	Grapefruit juice/ canned	46 oz. (64 oz.)	Chuck steak bone-in	1 lb.	Sugar/granulated	5 lbs.
Spinach/ canned	14 oz.	Orange juice/ frozen	12 oz.	Round steak. Bone-in	1 lb.	Sugar/brown	2 lbs.
Peas/ canned	15 oz.	Orange juice/ canned	46 oz. (64 oz.)	Rump roast/ boneless	1 lb.	Syrup/ pancake	24 oz.
Tomatoes/ canned	28 oz.	Oatmeal/ old fashioned	42 oz.	Pork chops/ bone-in	1 lb.	Coke/ 7-up/ Pepsi	6-Pack
Catsup	36 oz.	All purpose flour/ enriched	5 lbs.	Pork Spareribs	1 lb.	Drink mix/ Tang/	21.1 oz.
Pickles/ dill whole	20 oz.	Rice	2 lbs.	Bacon	1 lb.	Gasoline/ unleaded	1 gallon

Apples/ fresh	1 lb.	Biscuit mix	40 oz.	Frankfurters	1 lb.	Diesel	1 gallon
Bananas/ fresh	1 lb.	Cake mix/ yellow	1 lb.	Bologna	1 lb.	Laundry detergent	50 (oz.)
Cantaloupe/ fresh	1 lb.	White bread/ enriched	24 oz.	Chicken/ or uncut	1 lb.	Denim Jeans	1 pair men's
Grapefruit/ fresh	1 lb.	Whole grain bread	24 oz.	Turkey/ Whole/Frozen	1 lb.	Boys briefs	3 pack

Table 20. High school graduation rates

Data source: North Slope Borough, Department of Health and Social Services (2012). BCHAR.

Data origin: State of Alaska Department of Education and Early Development.

Figure 21. Highest level of education achieved among Inupiat respondents

Data source: North Slope Borough (2010). NSB 2010 Census.

Data origin: NSB 2010 Census.

Notes: While the village profiles reported many different types of education, this report only included “high school diploma”, “GED”, “vocational/technical graduate” or “one or more university level degrees” as they indicated a completed level of education with certification. While the census separated university level degrees (bachelor degree, masters degree or professional/PhD), there were few degrees per category therefore these groups were combined.

Table 21. Reported police crimes in the NSB, from June 16 2013 to June 16 2014

Data source: NSB Police Department (2014).

Data origin: NSB Police Department.

Notes: These data were requested specifically for this report. In the raw data, types of sexual offenses were separated into the three different types, as well as the four different types of sexual abuses of a minor. All categories were added together in this report as that level of detail was not seen as necessary.

Table 22. Perception of household head to changes of drinking and violence in the community

Data source: North Slope Borough (2010). NSB 2010 Census.

Data origin: NSB 2010 Census

Notes: Data was taken from census data tables examining household head’s perceptions of change in the community. While many other perceptions were included in the census, this report only includes drinking and violence to illustrate changes in crime. To simplify the data, only the categories for “Decrease a lot”, “Stayed the same” and “Increased a lot” were included. It should be noted that the census data did not indicate the length of time these perceptions pertain to (e.g. over the past year, 5 years, etc.), so this data gives insight into a general perceived trend.

Table 23. Iñupiat household members' competency in Iñupiaq

Data source: North Slope Borough (2010). NSB 2010 Census.

Data origin: NSB 2010 Census.

Notes: The original tables included the following categories; 1) speaks fluently and prefers Iñupiaq, 2) speaks fluently and prefers English, 3) speaks fluently but doesn't prefer either, 4) speaks with difficulty, 5) understands well and speaks enough, 6) understands well but hardly speaks, 7) understands well some and speaks a little, 8) understands simple questions and speaks a little, and 9) understands simple questions but hardly speaks. The first three categories, where an individual is fluent, were combined into "Fluent". Categories 4, 5 and 6 were combined to become "Medium proficiency" and the last three categories (7, 8 and 9) were combined as "Limited proficiency". In some villages, category 2 was phrased, "speaks fluently but prefers another language", however either phrasing still uncovers whether or not the person is fluent in Iñupiaq, which was most important. Finally, while all villages had category 1, in some cases the only other fluent category was "speaks Iñupiaq but prefers other language", and when this was the case, this was used instead of category 2 and 3.

Figure 22: Household head's opinion of respect for elders within the community

Data Sources: North Slope Borough (2010). NSB 2010 Census.

Data origin: NSB 2010 Census.

Notes: Data shows the household head's perception of Elders. Principals were included in the original data as well, but were not included as an indicator of cultural maintenance. In rare cases, villages such as Wainwright phrased respect for elders as 'authority of elders'; however, this was seen as providing similar information. Categories other than "highly respected" were not presented to maintain simplicity.

Figure 23: Individual community members' participation in subsistence activities

Data source: North Slope Borough (2010). NSB 2010 Census.

Data origin: NSB 2010 Census.

Notes: This data indicated the percentage of respondent households where a member participated in subsistence activities. The type of subsistence activities that were presented in the Census village profiles ranged per village, but included: 1) hunting land mammals, 2) fishing, 3) picking berries and plants, 4) sewing skins and clothes, 5) making sleds and boats, 6) sharing, cooking and processing wild foods, 7) hunting birds, 8) participating in spring whaling, 9) participating in fall whaling, 10) hunting marine animals, 11) trading furbearers and 12) gathering bird eggs. These activities were posed as "yes" or "no" questions (i.e. Does an individual household member hunt land mammals?). All responses for "Yes" and "No" were added. The numbers of males, females, and various age ranges were tracked separately in the census data, however these data were collapsed within this report to understand how many respondents were participating in subsistence activities (total "Yes" responses), and how many were not participating (total "No" responses). Finally, "Yes" and "No" responses for each type of subsistence activity (also separated in the census) were added, so that the final numbers show the percent of respondents who participate in subsistence activities, and percent of respondents who were not participating in subsistence activities.

Municipal Infrastructure

Table 24. Water, sewage and heating indicators for all villages in the NSB, as of 2005

Data source: North Slope Borough (2005). *NSB Comprehensive Plan*.

Data origin: NSB Comprehensive Plan.

Notes: Specific village reports were used. Data was selected if it was available for the majority of NSB villages and there was the ability to indicate benchmarks or changes in municipal infrastructure over the long term. These reports were published in 2005, and so data are accurate as of 2005, unless indicated otherwise in the table.

Figure 24. Capital spending in 2013 on major infrastructure projects.

Data source: North Slope Borough, Department of Administration and Finance (2013).

Data origin: CIP Revenue-Expense Summary, NSB Administration and Finance Department.

Notes: These data were requested by the DHSS. Data includes all municipal expenditures in 2013. Individual expenditures were grouped by the NSB in the original data, into different types of infrastructure. These same groupings, or infrastructure categories, were used when creating this figure.

Figure 25. Upcoming projects, as indicated by 2014 bond ordinances.

Data source: North Slope Borough, Department of Administration and Finance (2014).

Data origin: 2014 Bond Ordinances Report, NSB Administration and Finance Department.

Notes: Each category consists of numerous different infrastructure projects. The costs of these projects have been added together to simply show the amount of municipal spending per different types of infrastructure in the NSB.

Table 25. Total patient visits in 2013

Data source: North Slope Borough, Community Health Aide Program (2013), & North Slope Borough, Regional Patient Management System Database (2013b).

Data origins: NSB Public Health Nursing RPMS Database; NSB Community Health Aide Program (CHAP).

Notes: Data for Atkasuk, Barrow, Kaktovik, Nuiqsut, Point Hope, Point Lay and Wainwright were supplied through the RPMS database, which is provided by hospital records for NSB facilities. RPMS data comes from the only hospital in the NSB (Samuel Simmonds Memorial Hospital), and the hospital does not input data for Anaktuvuk Pass or Point Hope, as these clinics are run out of Fairbanks and Kotzebue, respectively. Data for Anaktuvuk Pass in this report comes from the Community Health Aide Program (CHAP), which is more accurate for Anaktuvuk Pass than the RPMS database, but may not include every patient visit in the village as all paper records may not be transferred electronically. Point Hope does not have CHAP records and data from the RPMS database for this village is unreliable and so these data are not reported.

Table 26. Total number of medivacs in select NSB villages, over 5 year

Data source: North Slope Borough, Community Health Aide Program (2013).

Data origin: NSB CHAP.

Notes: Similar to Table 25, this table includes most, but not all villages. CHAP records do not include Barrow, or Point Hope, but all other villages are included.

Environmental Supports

Table 27. Emission Summary for the NSB, 2011

Data Sources: United States Environmental Protection Agency (2011). *National Emissions Inventory.*

Data origin: National Emissions Inventory, 2011 and 2010

Notes: The same indicators can be selected for future reports by selecting the same point sources and mobile sources, and specifying county level data for Alaska. In this database, PM 10 and PM 2.5 are provided as both primary and filterable. Primary was used within this report and can be used in future reports to include all particulate matter.