

# Chapter 1: Overall Health

*“Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.”*

—World Health Organization, 1948

Individuals and cultures define health in different ways, and there is no universally agreed-upon way of measuring overall health in a community. By examining a number of overall health indicators, however, this section attempts to provide a picture of the evolving health status of the people of the NSB. This section also explores many of the factors, or determinants, that may be influencing overall health in the NSB.

# 1.1. Measures of Overall Health

## 1.1.1. Self-Reported General Health Status

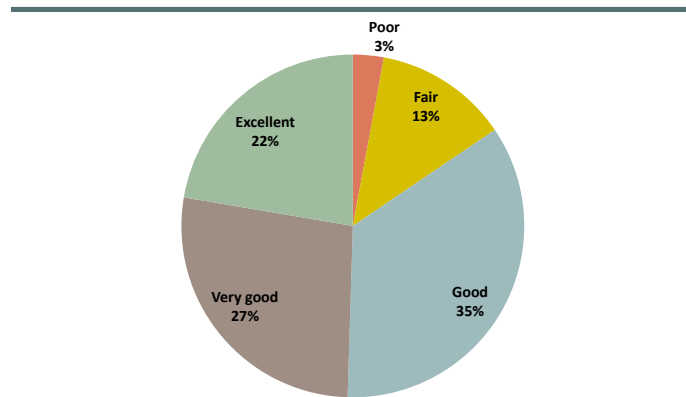
Self-reported general health status is a useful indicator of overall health and health-related quality of life in a community. It has been shown to be one of the strongest predictors of illness, premature death, health care utilization, and hospitalization.<sup>1</sup> Although perceptions and definitions of health can vary among individuals and across cultures, self-reported health is a useful way to compare overall health status across different populations and time periods.

In this section, we examine several data sources. The 2010 NSB Census collected data on self-reported general health status from a large majority of NSB household heads as well as proxy-reported general health status of other household members, based on responses from household heads. We also present general health data from the Alaska Behavioral Risk Factor Surveillance System (BRFSS) annual telephone survey.<sup>2</sup> Although BRFSS sample sizes in the NSB are quite small—between 50 and 250 respondents for each 3-year period—the BRFSS data do allow some examination of trends going back to the early 1990s as well as statewide and nationwide reference points. We also have included self-reported general health data from the 2007 Survey of Living Conditions in the Arctic (SLiCA) study.<sup>3</sup> This study surveyed NSB Iñupiat residents over age 16 and was also limited by small sample sizes in the NSB—about 200 respondents—but provides an important context of health and living conditions in other circumpolar arctic indigenous communities. General health status of children is discussed separately in Chapter 6: Maternal and Child Health.

### 1.1.1.1. General Health Status in the NSB: Data from the 2010 NSB Census<sup>4</sup>

In the 2010 NSB Census, household heads were asked to rate their own general health as well as that of other household members. Overall, a large majority of NSB adults (including household heads) reported being or were reported to be in good, very good, or excellent health. Reported general health status among household heads was similar to that of adult household members, except in the 44- to 54-year-old age group, where household heads were more likely to have “fair” to “poor” reported health than were other adult household members (25% vs. 16%, respectively). Household heads and other adult household members were roughly equally likely to have “very good” to “excellent” reported health in all age groups.

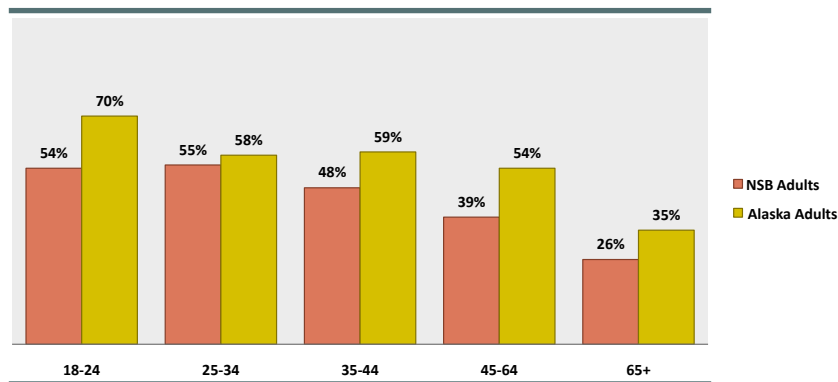
Figure 1.1: Reported General Health Status: NSB Adults



2010 NSB Census.

Reported general health among adults did not vary significantly by gender but was highly associated with age throughout the North Slope. In all age groups, NSB adults were less likely to have reported very good to excellent health than were Alaskan adults in the BRFSS survey as seen in Figure 1.2.

**Figure 1.2: General Health Status Among Adults, by Age Group:**  
*Percent with reported very good to excellent general health*

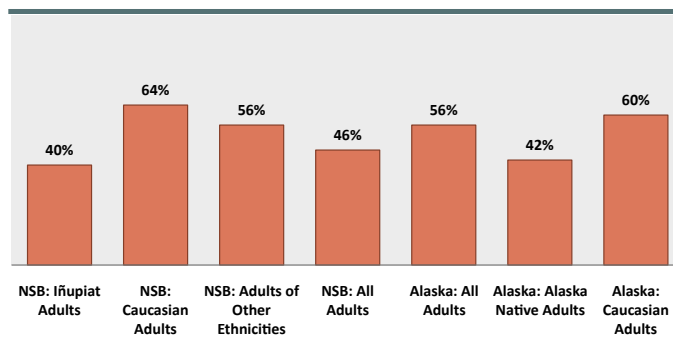


NSB data source: 2010 NSB Census.  
Alaska data source: 2008 Alaska BRFSS.

Reported general health among NSB adults varied significantly by ethnic group. NSB Iñupiat adults in all age groups were less likely than Caucasians and those in other ethnic groups to report very good or excellent health and more likely to report fair or poor general health.

Reported general health status among adults in the NSB was worse than for Alaskan adults overall, despite the fact the NSB adults are, as a group, younger than Alaskan adults. Reported general health status among NSB Iñupiat adults was similar to that of Alaska Native adults statewide,<sup>2</sup> however, and health status among NSB Caucasian adults was similar to that of Caucasian adults statewide. The disparity between general health status among Alaska Natives and Caucasians statewide was similar to that seen among Iñupiat and Caucasians in the NSB.

**Figure 1.3: General Health Status Among Adults:**  
*Percent with reported very good to excellent general health*



NSB data source: 2010 NSB Census.  
Alaska data source: 2008 Alaska BRFSS.

In the NSB, the relationship between reported general health status and community of residence was also statistically significant. Reported very good to excellent health status among NSB adults ranged from 21% in Atqasuk to 53% in Barrow. Atqasuk adults were also significantly more likely than those living in other North Slope villages to have fair to poor reported health. The reasons for this wide range of reported health status among the North Slope villages, and in particular for the poor reported health status among Atqasuk residents, are not entirely clear and warrant further inquiry.

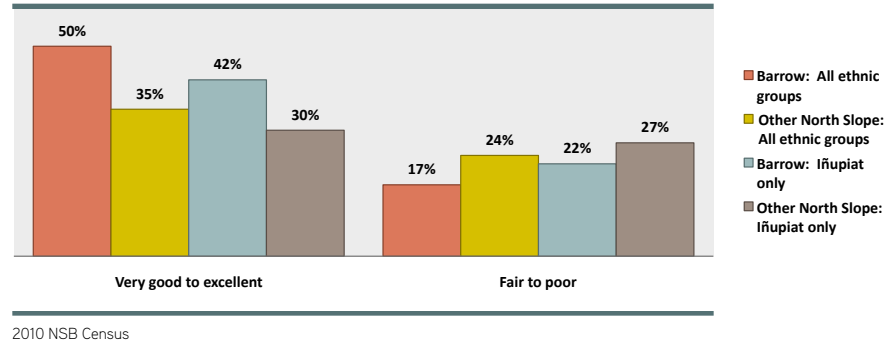
**Table 1.1: Reported General Health Status of Adults in NSB Villages**

	AKP	Atqasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	All NSB
Very good to Excellent	32%	21%	53%	38%	39%	36%	52%	35%	46%
Fair to Poor	*	34%	13%	19%	22%	21%	10%	21%	16%

2010 NSB Census.  
\*Based on cell count <5.

Reported general health status was significantly better among Barrow adults than among adults in the other North Slope villages as a whole, both in all ethnic groups combined and among Iñupiat only.

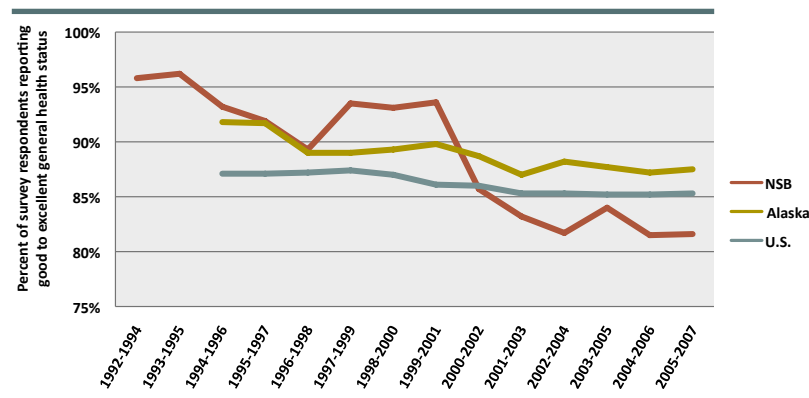
**Figure 1.4: Reported General Health Status of Adults: Barrow vs. other North Slope villages**



### 1.1.1.2. Trends in Self-Reported General Health Status: Data from the Alaska BRFSS Survey<sup>2</sup>

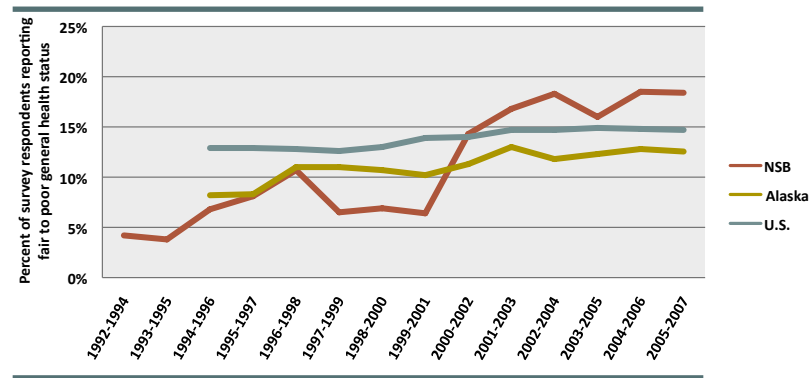
In a state-wide telephone survey, the Behavioral Risk Factor Surveillance System, a large majority of U.S., Alaskan, and NSB adult residents rate their own health as good to excellent. Despite improvements in health indicators such as life expectancy and infant mortality, however, self-reported health status has been gradually declining in the NSB since the mid-1990s. This trend is also apparent in Alaska and the U.S. Between 1993 and 2007, the number of adult NSB residents reporting fair to poor health has quadrupled, and this increase was statistically significant.

**Figure 1.5: Trends in Good to Excellent Self-Reported Health Among Adults: Data from the Alaska BRFSS survey**



U.S. and Alaska data source: Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System (BRFSS).  
NSB data source: Sub-regional analysis of Alaska BRFSS data provided by Alaska Department of Health and Social Services, Chronic Disease Prevention and Health Promotion, Division of Public Health.  
NSB results are weighted according to the Alaska BRFSS "rural" region and not post-stratified to the NSB. Results are not age-adjusted.  
Alaska and U.S. data are for midpoint year of time period shown.

**Figure 1.6: Trends in Fair to Poor Self-Reported Health Among Adults: Data from the Alaska BRFSS survey**



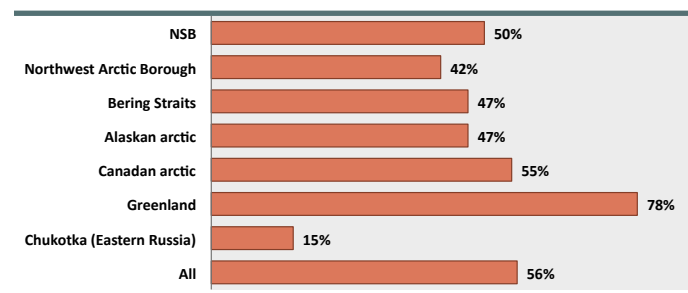
U.S. and Alaska data source: Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System (BRFSS).  
 NSB data source: Sub-regional analysis of Alaska BRFSS data provided by Alaska Department of Health and Social Services, Chronic Disease Prevention and Health Promotion, Division of Public Health.  
 NSB results are weighted according to the Alaska BRFSS “rural” region and not post-stratified to the NSB. Results are not age-adjusted.  
 Alaska and U.S. data are for midpoint year of time period shown.

In Alaska, a significantly higher proportion of non-Natives than Alaska Natives report very good or excellent health. Respondents living in rural areas were significantly less likely than those in non-rural areas to rate their health as very good or excellent.<sup>2</sup> Self-reported excellent or very good health is also associated with higher educational and income level, as well as younger age.

### 1.1.1.3. Self-Perception of Personal Health Among Circumpolar Indigenous Regions: Data from the SLiCA Study<sup>3</sup>

In this survey of arctic indigenous communities, self-reported health was similar in the three regions of northern Alaska that were surveyed but varied substantially throughout the circumpolar regions surveyed, with Greenland respondents reporting the best health and residents of Chukotka in eastern Russia reporting the worst. Perceived health of Alaskan Iñupiat—including the NSB—and Canadian Inuit fell in between.

**Figure 1.7: Self Perception of Personal Health Among Circumpolar Indigenous People: Percent of respondents reporting very good or excellent personal health**



Data source: Poppel, 2007, SLiCA results (includes Iñupiat/arctic indigenous residents aged 16 and older).  
 The Alaskan arctic includes NSB, Northwest Arctic Borough, and Bering Straits regions.  
 According to study authors, differences of 10 percentage points or more between groups are likely to be significant.

### 1.1.2. Life Expectancy and Mortality

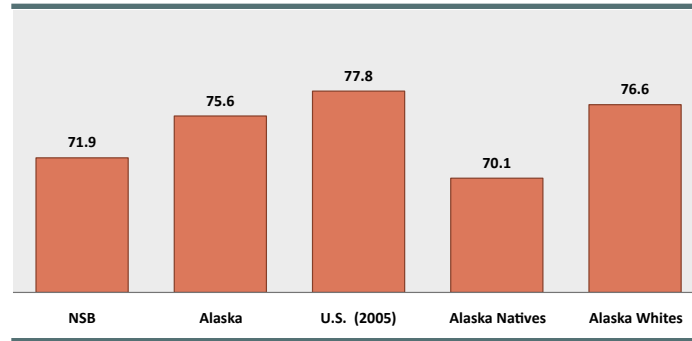
Life expectancy and mortality statistics give us useful information about the relative burden of different health problems and causes of death in a population, and examining trends over time can help us understand the evolving health status of a population. Because death certificates are legally required and filed with the state, mortality statistics are some of the more reliable sources of information about the health status of

large populations. When looking at relatively small populations, however, death rates become quite variable from year to year, given the relative infrequency of events in small populations. In general, rates based on fewer than 20 occurrences during the time period examined are considered unreliable and must be interpreted with caution, and will be noted. Rates based on fewer than 6 occurrences are not reported.

### 1.1.2.1. Life Expectancy

During the decade 1999–2008, the life expectancy at birth for a resident of the NSB was roughly four years shorter than that of Alaskans overall, falling between that of Alaska Natives and Alaska whites, and six years shorter than in the U.S. in 2005.<sup>5,6</sup>

**Figure 1.8: Life Expectancy at Birth, 1999–2008**



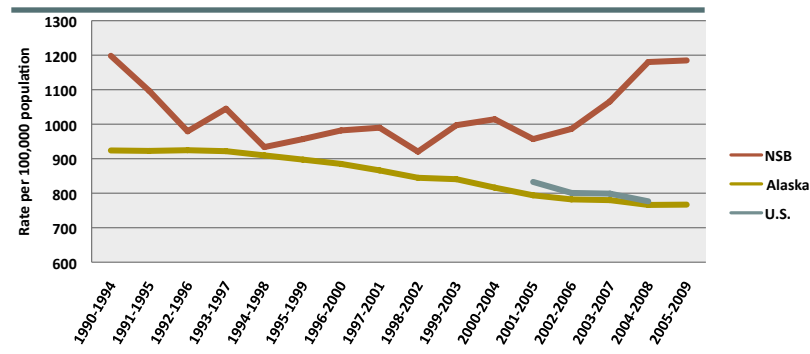
Alaska and NSB data source: Alaska Bureau of Vital Statistics.

U.S. data source: *Health, United States, 2007, with Chartbook on Trends in the Health of Americans*. National Center for Health Statistics.

### 1.1.2.2. All-Cause Mortality

A high level of year-to-year variability makes it difficult to detect trends in mortality rates in small populations such as the NSB. The downward trend seen in Alaska since the mid-1990s is not apparent in the NSB during this time period, however. Since 1990, all-cause mortality rates in the NSB have generally remained higher than Alaska and U.S. rates.<sup>5-7</sup> All-cause mortality is an area of racial health disparity. In 2003–2007, the all-cause mortality rate for Alaska Natives was 1.4 times that of U.S. whites and 1.5 times that of Alaska whites.<sup>8</sup>

**Figure 1.9: All-Cause Mortality Rates, 1990–2009**



NSB and Alaska data source: Alaska Bureau of Vital Statistics.

U.S. data source: *Health, United States, 2007 with Chartbook on Trends in the Health of Americans and Health, United States, 2009 with Special Feature on Medical Technology*, U.S. Dept of Health and Social Services.

Rates are age-adjusted to the U.S. 2000 standard population.

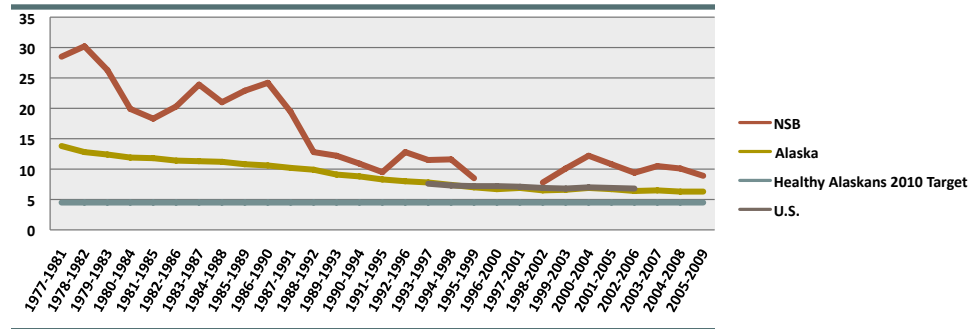
### 1.1.2.3. Infant Mortality

The infant mortality rate (IMR), defined as the number of deaths in infants below one year of age per 1000 live births, is an important marker of overall health and well-being of a community. The IMR reflects such

factors as living conditions, education and income level of parents, as well as access to primary care and other medical interventions.

The IMR has decreased dramatically in the NSB and around the state in the past half-century. The IMR in the NSB remained approximately twice the state average, however, until around 1990, when the Borough experienced a dramatic decrease in the IMR.<sup>5</sup> The NSB's IMR has not continued this decline, however, and remains higher than the state average and has not reached the Healthy Alaskans 2010 target of 4.5 per 1000 live births.<sup>9</sup>

**Figure 1.10: Infant Mortality Rates: Average annual number of infant deaths per 1000 live births, 1977–2009**



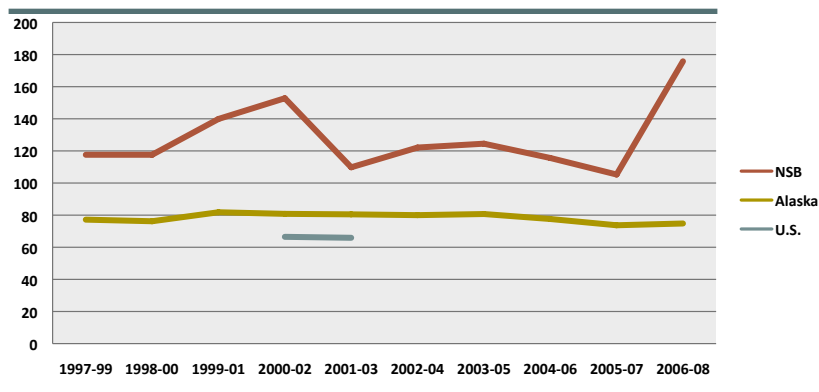
NSB and Alaska data source: Alaska Bureau of Vital Statistics.  
 U.S. data source: Health, *United States, 2007 with Chartbook on Trends in the Health of Americans*.  
 Rates for NSB include rates based on fewer than 20 events and must be interpreted with caution.  
 Missing data points represent time periods with fewer than 6 infant deaths.

### 1.1.2.4. Child Mortality

Due to the small number of events from a statistical standpoint, NSB rates fluctuate from year to year, but over the past decade, the 0- to19-year-old child mortality rate in the NSB has remained higher than the statewide average.<sup>5</sup>

Child mortality is a major public health concern in Alaska, and reducing deaths among children is a public health goal statewide. Alaskan children have 1.5 times the risk of death as other American children, and Alaska Native children have death rates several times higher than that of whites.<sup>9</sup>

**Figure 1.11: Child Mortality: Average annual number of deaths per 100,000 persons aged 0–19 years, 1997–2008**



\*NSB rates are based on fewer than 20 occurrences per time period and must be interpreted with caution.  
 NSB and Alaska data source: Alaska Bureau of Vital Statistics.  
 U.S. statistics were available for 2002, 2003, 2005 for ages 0–19. Data source: National Center for Health Statistics.<sup>10</sup> Mortality statistics for the U.S. are typically calculated for age groups excluding infants under one year old, and are therefore not directly comparable to Alaska census area data, where population estimates for children under age one are not readily available.

### 1.1.2.5. Leading Causes of Death

Cancer has been the leading cause of death in the NSB for almost two decades. Heart disease, unintentional injuries (accidents), and intentional self-harm (suicide), and chronic lower respiratory disease are other major causes of death in the Borough. Leading causes of death in the NSB have been fairly similar to statewide rankings.<sup>5</sup>

**Table 1.2: Leading Causes of Death, 2006–2008**

Cause of Death	NSB Rank	Number of Deaths	NSB Rate (Number of deaths per 100,000 population)	Alaska Rank	Alaska Rate (Number of deaths per 100,000 population)
Cancer	1	29	272.9	1	181.3
Heart Disease	2	26	274.8	2	154.8
Unintentional Injury	3	17	125.2*	3	54.8
Chronic Lower Respiratory Diseases	4	10	144.3*	5	42.5
Suicide	4	10	53.3*	6	22.7
Total Deaths		136	1267.0		772.5

\*Rates are based on fewer than 20 occurrences and should be interpreted with caution.

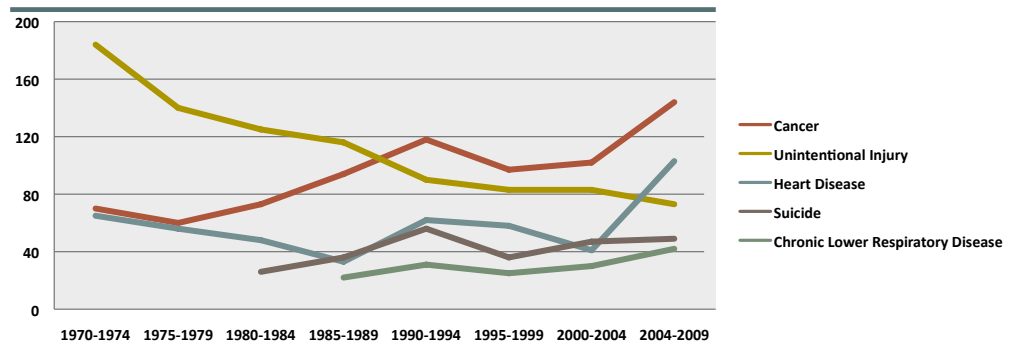
Data source: Alaska Bureau of Vital Statistics.

All rates are age-adjusted to U.S. 2000 standard population.

### 1.1.2.6. Leading Causes of Death in the NSB—Historical Perspective

Looking back to the 1970s, some trends become apparent. In the early 1990s, cancer overtook unintentional injury as the leading cause of death in the NSB. The crude death rate from heart disease has also increased over the past decade, overtaking unintentional injury as the second leading cause of death in the NSB. In the 1980s, suicide, and chronic lower respiratory infections emerged as leading causes of death.<sup>5</sup>

**Figure 1.12: Trends in Leading Causes of Death in the NSB:**  
*Average annual number of deaths per 100,000 population*



Represent "crude" rates, not adjusted for the effect of age. Thus, changes in the age structure of the population over time may affect the death rates from different causes.

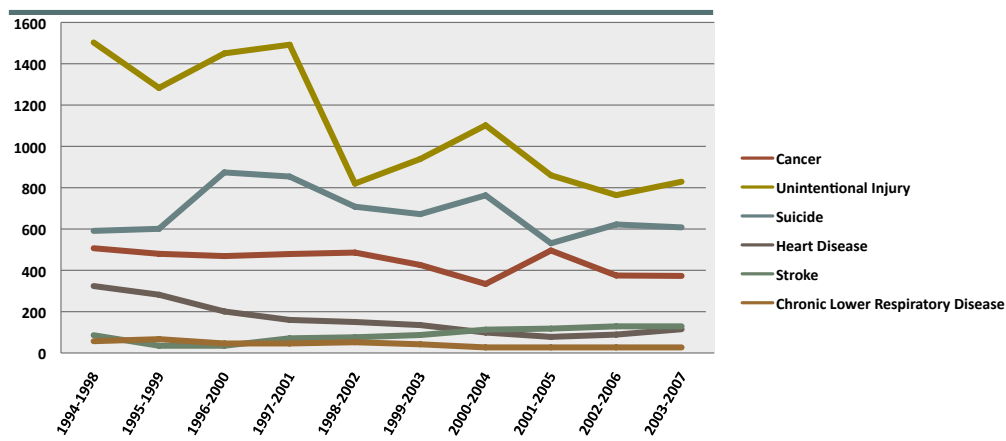
Rates based on fewer than six occurrences are not reported.

Data source: Alaska Bureau of Vital Statistics. Historical rates were provided by ABVS for 1970–2004 in 5-year intervals. The 2004–2009 rate was calculated from the 3-year moving average rates provided on the ABVS Data and Statistics website.

### 1.1.2.7. Leading Causes of Premature Death

Although cancer is the leading cause of death overall in the NSB, unintentional injury and suicide disproportionately affect a younger segment of the population and take the most years of potential life from the community, emerging as the leading causes of premature death in the NSB.<sup>5</sup> Although most deaths in a community occur at advanced ages, some of the most tragic and often most preventable deaths occur to younger members of the community. Using a set endpoint (age 75 is used here), the potential years of life lost for each death in a community can be combined for a given time period to determine the leading causes of premature death in the NSB for each time period.

**Figure 1.13: Leading Causes of Premature Death in the NSB:**  
*Average annual years of potential life lost\**



\*Years of potential life lost are calculated by subtracting age at death from 75.  
Rates based on fewer than six occurrences are not reported.  
Data source: Alaska Bureau of Vital Statistics.

### 1.1.3. County Health Rankings—Alaska

Now in its second year, the County Health Rankings, a national public health project, has recently ranked almost every U.S. county on their overall health status and a variety of individual health measures to facilitate community-level health promotion efforts.<sup>11</sup> The overall rankings are based on a weighted composite of health indicators for which comparable data are available. In 2011, the NSB ranked 15th in health outcomes of 23 Alaskan counties or census tracts, placing it above most of the other remote rural Alaskan regions. The NSB was ranked 17th in health factors, which include various health behaviors and socioeconomic and environmental variables that influence health. Some data were unavailable for the NSB and other small rural Alaskan communities.

**Table 1.3: 2011 County Health Rankings—Alaska**

Rank	Health Outcomes	Rank	Health Factors
1	Southeast Fairbanks	1	Juneau
2	Juneau	2	Kodiak Island
3	Sitka	3	Anchorage
4	Fairbanks North Star	4	Sitka
5	Kodiak Island	5	Fairbanks North Star
6	Kenai Peninsula	6	Wrangell-Petersburg
7	Wrangell-Petersburg	7	Kenai Peninsula
8	Anchorage	8	Matanuska-Susitna
9	Aleutians West	9	Ketchikan Gateway
10	Ketchikan Gateway	10	Valdez-Cordova
11	Dillingham	11	Aleutians West
12	Prince of Wales-Outer Ketchikan	12	Aleutians East
13	Matanuska-Susitna	13	Skagway-Hoonah-Angoon
14	Skagway-Hoonah-Angoon	14	Southeast Fairbanks
15	North Slope	15	Dillingham
16	Valdez-Cordova	16	Prince of Wales-Outer Ketchikan
17	Bethel	17	North Slope
18	Aleutians East	18	Lake and Peninsula
19	Northwest Arctic	19	Bethel
20	Yukon-Koyukuk	20	Northwest Arctic

Table 1.3, continued

Rank	Health Outcomes	Rank	Health Factors
21	Nome	21	Nome
22	Lake and Peninsula	22	Yukon-Koyukuk
23	Wade Hampton	23	Wade Hampton

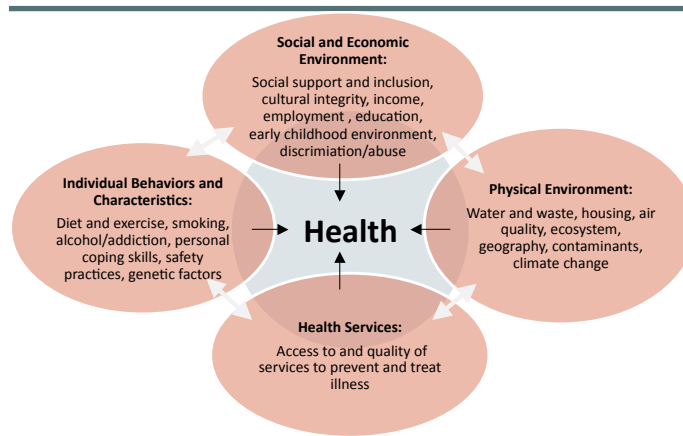
County Health Rankings: Mobilizing Action Toward Community Health <http://www.countyhealthrankings.org/alaska/overall-rankings>

## 1.2. Determinants of Overall Health

In this section, we will examine many of the factors that may be influencing general health status in the NSB.

An individual’s health is influenced by a complex interaction of social, economic, and environmental factors, genetics, and personal behaviors, such as diet, exercise, smoking and alcohol use. Access to good quality health prevention and treatment services also has important effects on health. The figure below identifies a number of factors that research has suggested or shown to be linked with health.<sup>12</sup> These factors are sometimes called “health determinants.”

Figure 1.14: Determinants of Overall Health



Modified from World Health Organization: Determinants of Health<sup>12</sup>

Relatively little research has looked specifically at the factors influencing health in arctic communities like the NSB. The Institute for Circumpolar Health Studies in Anchorage examined the available literature on the determinants of circumpolar health as they relate to the leading causes of death in Alaska.<sup>13</sup> Table 1.4 summarizes their findings.

Table 1.4: Determinants of Circumpolar Health

Determinant	Definition
Addiction	Confluence of psychological, social, and biological forces that combine to promote and support compulsive substance use
Social isolation	Social situations characterized by anxiety, depression, shame, conflict, and a lack of gainful employment
Environmental exposures	Presence of environmental hazards that adversely affect health or the ecological balances essential to human health
Diet/nutrition	Procurement and consumption of nutrients necessary to maintain life and health
Global climate change	Adverse environmental factors induced by rapid changes in the earth’s climate
Access to clean water	Processes, quantity and quality of water obtained for hygiene and consumption
Access to quality health care	Effective health care service utilization

Driscoll DL. Social and Physical Determinants of Alaskan Health: a Meta-Analysis

## 1.2.1. Social and Economic Environment

### 1.2.1.1. Demographic Factors

The health of a population is determined, in part, by its demographic composition—the size of the community, age and sex of the residents, the racial and ethnic mixture, movement of populations, and other demographic factors.

#### Total Population Size

Like other rural Alaskan regions, the NSB is comprised of a larger “hub” village and a number of smaller communities distributed across a large geographic area. The size of a community determines, in part, the availability of jobs and services, the social structure of the community, and many other factors that influence health. The population estimates below are from the 2010 NSB Census.<sup>4</sup>

**Table 1.5: 2010 NSB Estimated Population**

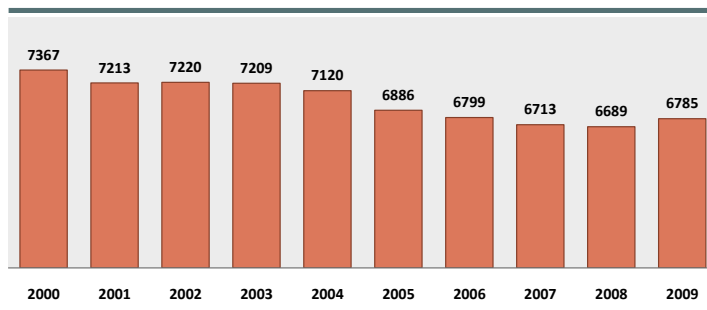
Community	2010 NSB Census Population Estimate
Anaktuvuk Pass	369
Atkasuk	258
Barrow	4789
Kaktovik	286
Nuiqsut	455
Point Hope	803
Point Lay	269
Wainwright	574
NORTH SLOPE BOROUGH	7839

Data source: 2010 NSB Census

#### Population Trends

Like most regions in Alaska, the NSB experienced steady and dramatic growth between 1960 and 2000, almost tripling in population size during those four decades. Annual Alaska Department of Labor and Workforce Development population estimates from 2000 to 2009, however, suggest that the population of the borough is leveling off, even experiencing a small net decrease in population. Like many other rural regions in Alaska, net outmigration from the NSB exceeded natural increases, resulting in net population loss during this period, according to these population estimates.<sup>14</sup>

**Figure 1.15: Trends in NSB Estimated Population, 2000–2009**

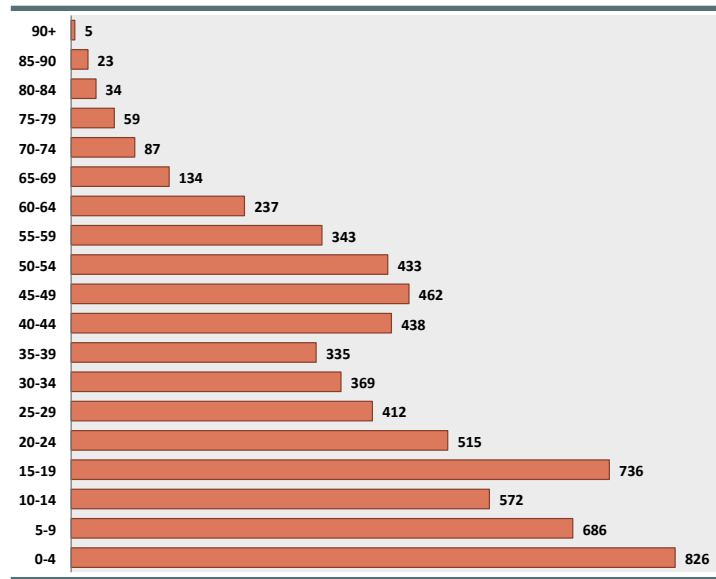


Data source: Alaska Department of Labor and Workforce Development

## Age Distribution

The NSB is one of the youngest regions in the state, with children making up the largest portion of the population. The age distribution of a community, in part, determines the relative burdens of different health problems as well as how health resources must be utilized. For instance, a younger population will likely experience higher rates of childhood illnesses, pregnancy-related problems, some mental illnesses, and sexually-transmitted infections. An older population will likely experience more chronic disease such as heart disease, diabetes, arthritis, and cancer.

**Figure 1.16: Age Distribution in the NSB:**  
Estimated number of persons, by age group, in 2008



Data source: Alaska Department of Labor and Workforce Development.

Based on ages of household members reported by the household head in the 2010 NSB Census, the median, or middle, age for the NSB in 2010 was 26 years.<sup>4</sup> This means that half of the people living in the NSB are younger than 26 years old and half are older. The 2000 U.S. census estimated the median age for the NSB at 27 years, lower than Alaska and the U.S. overall.<sup>15</sup> The 2010 NSB Census median age for Iñupiat residents of the NSB was 23 years, similar to the 2000 U.S. census estimate for Alaska Natives statewide.<sup>4, 15</sup>

**Figure 1.17: Year 2000 U.S. Census Median Age Estimates**



Data source: United States Census Bureau

## Dependency Ratio

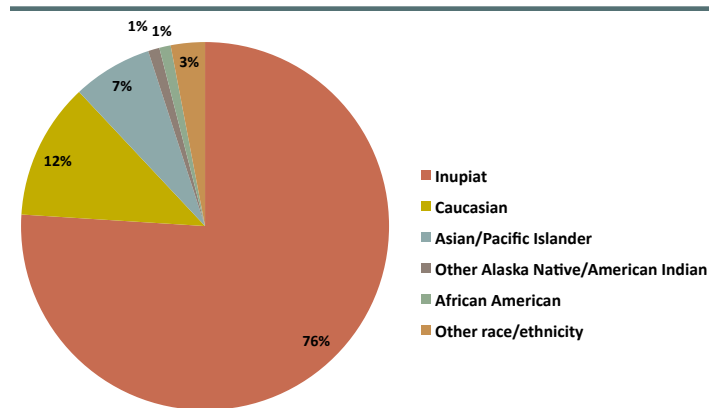
Another useful measure of age composition of a community is the dependency ratio. The dependency ratio is a measure of the portion of a population that is composed of dependents (people who are too young or too old to work and needing support or care) to those of working age. This ratio, in part, determines the amount of services needed in a community and the economic workforce available to fund them. It is also a factor in

economic growth and stability. According to the 2010 NSB Census, the ratio of residents aged 0–15 years or 65+ years to those aged 16–64 is 0.56, although it is higher in some North Slope communities.<sup>4</sup> This number indicates that there are slightly less than two persons of working age for every person in “dependent” age groups in the NSB.

### Racial/Ethnic Composition

The homeland of the Iñupiat people for millennia, the North Slope of today is a racially and ethnically diverse community. In the 2010 NSB Census, 76% of residents were identified by the household heads as Iñupiat. Caucasians represented the largest minority, followed by Asian/Pacific Islander groups, of which Filipinos comprised the largest single ethnic group.<sup>4</sup>

Figure 1.18: Racial/Ethnic Composition of the NSB in 2010



Data source: 2010 NSB Census.

#### 1.2.1.2. Economic Factors

The economic environment in which a person lives has been shown to be a major driver of health. In virtually every population studied, higher income level is associated with better health, and poverty and unemployment are associated with ill health.<sup>16</sup> While “the disparity in health status between the Inuit and the larger national populations to which they belong (Canada, Denmark, Russia and the United States) has often been attributed to their poor socioeconomic status,”<sup>17</sup> research is relatively limited regarding direct causal links between economic conditions and health in the Alaskan arctic. Peter Bjerregaard, in his 1998 book, *The Circumpolar Inuit—Health of a Population in Transition*, examines the determinants of health in circumpolar Inuit communities, primarily in Greenland and Canada and identifies evidence of associations between socioeconomic status and measures of overall health in these populations.

The economy of remote rural Alaska and other circumpolar indigenous regions is complex, incorporating income from wages, tax revenues from resource development, Native corporation dividends, and government sources. Many remote rural areas also engage in a difficult-to-measure informal economy of goods and services exchanged among residents. Subsistence activities and sharing networks also have both economic value as well as social and health benefits that go beyond their direct economic contribution. Moreover, among rural Alaskan and circumpolar regions, the economic situation in the NSB is unique.

The economy of the North Slope of Alaska was forever changed by the discovery of massive oil reserves in the 1960s. In 1971, the Alaska Native Claims Settlement Act (ANCSA) was ratified, allotting 11% of Alaska’s land and \$962 million to regional and village for-profit and non-profit Native corporations, and enabling oil extraction at Prudhoe Bay and the construction of the Trans-Alaska Pipeline.

After the passage of ANCSA, state legislation made it possible to form regional governments, or boroughs. Following an extensive period of litigation, the North Slope Borough was formed and granted the authority to tax properties, including the oil-rich region of Prudhoe Bay.<sup>18</sup> In the decades since oil development began, the NSB has collected substantial tax revenues from oil production, funding many community services and infrastructure projects and creating local employment opportunities, primarily in Barrow. In addition, residents receive dividends from the for-profit corporations created with ANCSA.

A comprehensive analysis of the effects of ANCSA and the current status of the NSB economy is beyond the scope of this report, but some major economic indicators are reviewed to provide a general picture of the economic environment as a potential determinant of health in NSB communities.

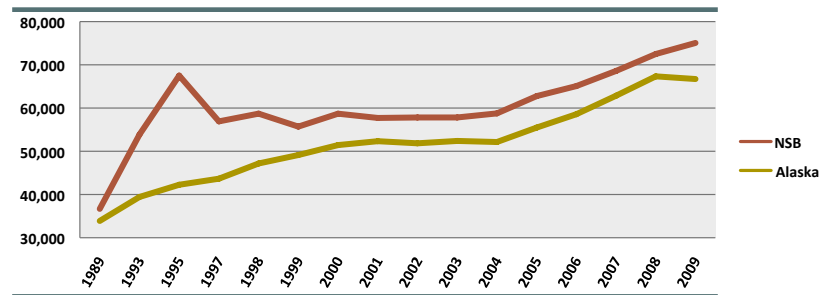
## Income

Socioeconomic status is generally accepted to be an important driver of overall health.<sup>12</sup> Income is only one of a number of measures of socioeconomic status. In Alaska, income level is strongly associated with self-reported health status.<sup>2</sup> It is not entirely clear to what extent this association represents a direct causal relationship, however. Driscoll's meta-analysis of determinants of health in Alaska and circumpolar regions did not find evidence of income level as a causal factor in any of the leading causes of death.<sup>13</sup>

### Median Household Income

The estimated median household income in the NSB has remained above the Alaska state average for several decades.<sup>19</sup>

**Figure 1.19: Median Annual Household Income Estimates, 1989–2009 (U.S. Dollars)**



Data source: U.S. Census Bureau Small Area Income and Poverty Estimates (SAIPE).

### Income Distribution

Income is never distributed equally to all residents, and medians and averages can sometimes be misleading. Research suggests a relationship between income inequality and health. More equitable distribution of income within a community or country is associated with better self-reported health and lower mortality.<sup>20</sup> This relationship likely reflects a variety of mechanisms and pathways through which the distribution of social and economic goods within a society affects health. Researchers have calculated estimates of income distribution within Alaskan census areas, and identified the NSB as having among the highest levels of household income equality in the state.<sup>11</sup> There seems to be a threshold of inequality beyond which negative health effects begin to occur, however, and the NSB, Alaska, and the U.S. fall above this level in measures of income inequality.<sup>20</sup> Therefore, whereas income in the NSB may be more equitably distributed than in other parts of Alaska, overall levels of income inequality are quite high in Alaska and the rest of the U.S., as compared to other developed countries, and this income inequality may be affecting health in negative ways.

## Employment

Across widely varying socioeconomic and geographic populations, unemployment has been found to be associated with ill health, both mental and physical. According to Mathers and Schofield,<sup>21</sup> two prominent researchers in the field:

People who are unemployed have poorer physical and mental health than people who are employed. Health problems that are associated with unemployment include depression and other mental health problems, chronic illnesses such as cardiovascular disease, and high levels of risk behaviours such as smoking. These health differentials are the result of several mechanisms. Job loss can be a consequence of ill health. Unemployment also causes ill health, by reducing people's ability to purchase goods and services—such as adequate nutrition and housing—and through its psychosocial effects, including lowered self-esteem and loss of social networks.

The relationship between employment and health has not been well studied in a mixed wage and subsistence economy such as exists in large parts of rural Alaska; however, NSB Iñupiat residents have identified the lack of good jobs as a priority issue of community concern.<sup>22</sup> A majority (65%) of North Slope Iñupiat aged 16 years and older surveyed stated that they would prefer to participate in a combination of wage-based and traditional subsistence activities.<sup>22</sup> In the 2010 NSB Census, 40% of Iñupiat household heads thought that the number of good jobs for Iñupiat people has decreased in the last 5 years, compared to 16% who believed it had increased.<sup>4</sup>

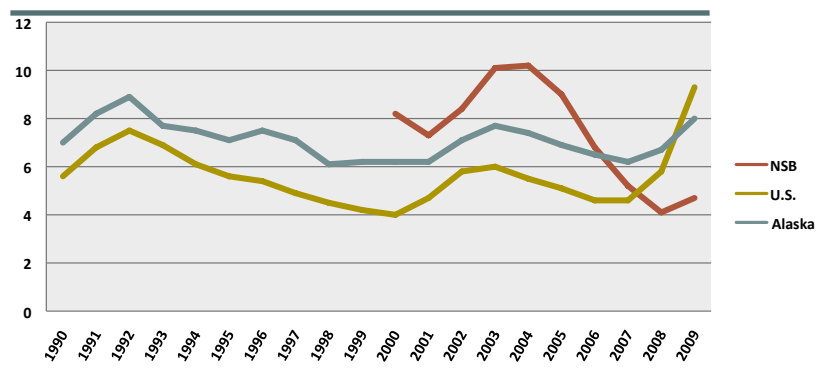
### Unemployment

According to the 2010 NSB Census:

- 28% of NSB household members aged 16–64 years identified themselves or were identified by the household head as “unemployed.”
- Of those identified as unemployed, 32% stated reason for unemployment as “could not find a job,” for an overall 9% of household members identified as unemployed because they could not find a job.
- Unemployed status was significantly related to ethnic group, with 36% of Iñupiat residents aged 16–64 years identified as unemployed, compared with 6% of Caucasians, 13% of Filipino, and 12% of other ethnic groups.

The Alaska Department of Labor and Workforce Development also reports monthly and annual average unemployment rates. The unemployed are defined as persons aged 16 years and older who had no employment during the reference week, were available for work, except for temporary illness, and had made specific efforts to find employment sometime during the four-week period ending with the reference week. Unemployment rates in the NSB have fluctuated over the last decade, often not following the state and national trends.<sup>14</sup>

**Figure 1.20: Average Annual Official Unemployment Rate, 1990–2009: Number unemployed as a percent of the labor force\***



Data source: Alaska Dept of Labor and Workforce Development.

\*A change in the way the labor force statistics are calculated for boroughs and census areas makes data prior to 2000 not comparable with data from 2000 forward. Rates are not seasonally adjusted.

The standard definition of unemployment typically underestimates the true number of unemployed, as those who have exhausted their unemployment benefits or have given up trying to find employment are not included in estimates. This phenomenon is common in areas, such as many parts of rural Alaska, where employment opportunities are limited. Prolonged, or chronic, unemployment may also be a result of drug or alcohol problems, particularly where the available local jobs require drug testing. Chronic unemployment can have even more profound negative effects on health than temporary unemployment. The chronically unemployed are not reflected in standard unemployment statistics. Although in recent years, the formal unemployment rate in the NSB has been among the lowest in the state, the number of non-working adults in the villages of the NSB likely represents a higher percentage of residents.

## Underemployment

According to the 2010 NSB Census:

- Of those aged 16–64 years, 26% with temporary or seasonal employment, 34% working part-time, and 8% with full-time permanent work believe that they are underemployed (working at a job that does not utilize their experience and education).
- Perceived underemployment varied by ethnic group, with 24% of Iñupiat residents aged 16–64 years feeling underemployed, compared with 8% of Caucasians, 16% of Filipinos, and 12% of those in other ethnic groups.

Underemployment estimates help capture more subtle indicators associated with poorer health outcomes, including unstable employment and job insecurity, as well as suboptimal psychosocial environment at work, with regard to “enabling (a worker) to practice his or her skills and experience control in terms of successful agency (and)...feelings of mastery.”<sup>16</sup>

## Resident and Non-resident Employment in the NSB

Whereas this report focuses on permanent residents of the NSB, it is notable that non-residents of the NSB working in the North Slope, primarily in privately-owned oil and gas drilling and related operations, outnumber NSB permanent resident workers by more than 4 to 1.<sup>23</sup>

**Table 1.6: Resident and Nonresident Workers and Earnings in the North Slope (2008)**

Ownership	Alaska Resident Workers		Nonresident Workers		Wages (in Millions)		
	Local resident	Other Alaska resident	Number	Percent	Local resident	Other Alaska resident	Non-resident
State Government	16	26	12	22.2%	\$1.0	\$1.5	\$0.2
Local Government	1,971	238	244	9.9%	\$65.9	\$10.1	\$6.2
Private Sector	1,445	10,424	5,379	31.2%	\$48.2	\$775.1	\$400.9

Data source: *Nonresidents Working in Alaska 2008* report, Alaska Department of Labor and Workforce Development.

## Household Economics

Many factors contribute to a household’s economic situation, including such variables as household income, the local cost of living and specific household needs, family size, money-management skills, and the presence of drug or alcohol problems.

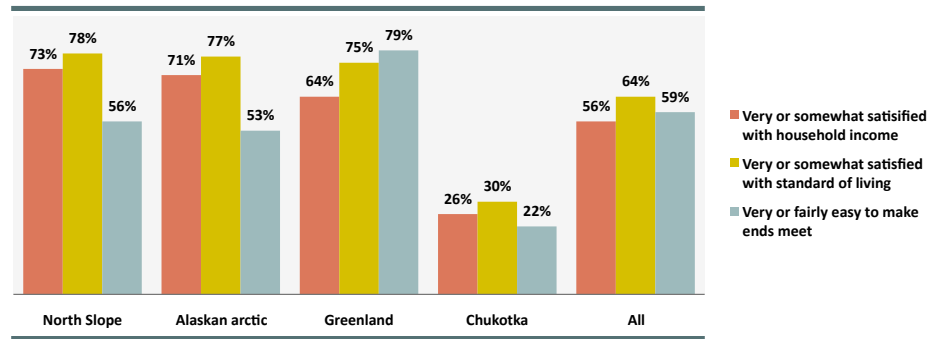
### Cost of Living

Some of the relatively high median household income in the NSB is offset by the high cost of certain essentials such as food. In recent surveys of food costs, Barrow had the highest food costs of all of the Alaskan cities surveyed. The cost of a weekly “market basket” for a family of four in Barrow was more than twice the cost in Anchorage and slightly higher than other remote rural hubs, such as Bethel and Kotzebue.<sup>24</sup> An increasing cost for many Americans, health-care is provided to Alaska Natives at no cost, although travel and expenses associated with health-care outside the village can be significant. Overall, Barrow ranked fourth highest in cost of living of 13 Alaska communities surveyed in 2008.<sup>25</sup> One North Slope resident comments that, with the increasing cost of living, many rural Alaska Natives seem to be relying more heavily on subsistence.

### Satisfaction with Standard of Living and Household Economics

Among Iñupiat adults surveyed in the SLiCA study, reported satisfaction with household income and standard of living in the NSB was quite similar to that in the Northwest Arctic and Bering Straits regions and to indigenous communities of Greenland. In all of these regions, indigenous residents expressed higher levels of satisfaction than did their counterparts in Chukotka, Russia.<sup>3</sup>

**Figure 1.21: Satisfaction with Household Economics in Circumpolar Indigenous Regions**



The Alaskan arctic includes NSB, Northwest Arctic Borough, and Bering Straits regions  
 Data for Canada were not available for these questions.  
 Data source: Poppel, 2007, SLICA results (includes Inupiat/arctic indigenous residents aged 16 and older)  
 According to study authors, differences of 10 percentage points or more between groups are likely to be significant.

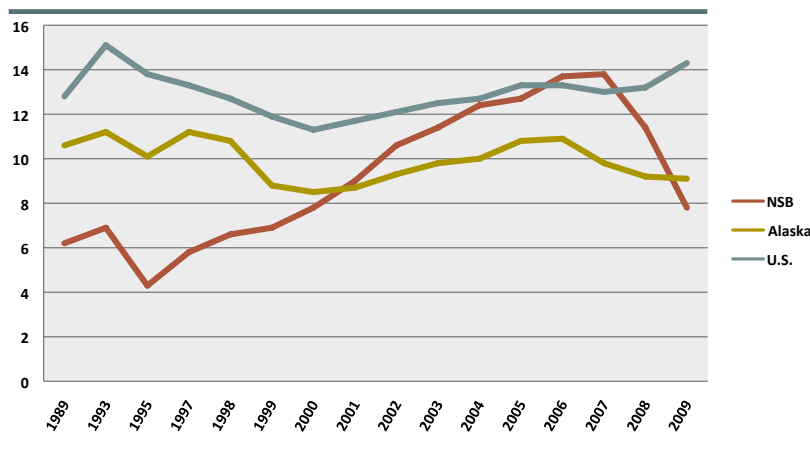
## Poverty

The federal poverty threshold takes into account household income and household size and age composition. It is based on a set of economic measures and updated each year using the consumer price index, but it does not take into account regional variations in cost of living and many other variables affecting household economics and standard of living. Poverty has a devastating impact on health. The chronic stress, poor nutrition, increased exposure to crime and victimization, and problems with access to health care associated with poverty all play a role in influencing health outcomes. The high cost of living, a complex economic structure, and small population numbers compound the difficulty of defining and measuring poverty in remote rural Alaska. The poverty estimates for the NSB below are based on nationally-developed models utilizing tax return data combined with other U.S. survey and census data. Defining and measuring poverty has been controversial for many decades, and newly developed models for setting poverty levels are expected to change the way poverty is measured in the future.

### *Percentage of Population Living Below the Poverty Threshold*

Estimated poverty rates in the NSB have fluctuated considerably over the past two decades. Estimated poverty levels in the NSB rose through the 1990s and early 2000s to peak in 2007 before dropping back down below national and then statewide estimates.<sup>19</sup>

**Figure 1.22: Poverty Estimates: Percent of population living below the federal poverty threshold, 1989–2009**



Data source: U.S. Census Small Area Income and Poverty Estimates (SAIPE).

### Free or Reduced Lunch Program Eligibility

A number of programs use federal poverty guidelines to determine eligibility for services. The National School Lunch program is one such program for which annual data are readily available at the community level. The percent of children eligible for free and reduced lunch gives a reasonable estimate of the number of children living in families with household incomes less than 185% of the poverty level.

In 2011, 44% of students enrolled in the NSB School District were eligible for the Free or Reduced Lunch program. Roughly 1/3 of Alaska school districts had lower percentages and 2/3 had higher percentages of students eligible for the program than the NSB School District.<sup>26</sup>

**Table 1.7: Percent of Enrolled Students Eligible For Free or Reduced Lunch: Alaska, by School District**

	2010	2011
St. Mary's School District	88%	92%
Bering Strait School District	87%	88%
Yup'it School District	91%	88%
Hydaburg City School District	94%	85%
Southwest Region Schools	91%	85%
Yukon Koyukuk School District	82%	85%
Alaska Gateway Schools	90%	84%
Yakutat School District	76%	81%
Annette Island School District	73%	79%
Kashunamuit School District	75%	77%
Kuspuk School District	76%	77%
Lower Kuskokwim Schools	72%	77%
Lower Yukon School District	67%	76%
Craig City Schools	77%	75%
Iditarod Area Schools	64%	75%
Klawock City Schools	72%	74%
Northwest Arctic Borough School	72%	74%
Kake City Schools	68%	73%
Yukon Flats School District	74%	72%
Chatham School District	70%	71%
Lake Peninsula School District	66%	68%
Dillingham City Schools	71%	64%
Nome Public Schools	68%	64%
Southeast Island School District	72%	62%
Wrangell Public Schools	59%	61%
Haines Borough Schools	60%	59%
Aleutians East Borough Schools	56%	58%
Hoonah City Schools	68%	58%
Mt. Edgecumbe High School	40%	51%
Galena City Schools	46%	48%
Petersburg Public Schools	50%	47%
Kodiak Island Borough Schools	43%	45%
Cordova Public Schools	45%	44%
North Slope Borough School District	45%	44%
Bristol Bay Borough Schools	43%	43%
Copper River School District	43%	43%
Nenana City Public Schools	26%	43%

Table 1.7, continued

	2010	2011
Kenai Peninsula School District	37%	42%
Delta Greely School District	38%	40%
Anchorage School District	37%	39%
Matanuska-Susitna Borough School District	36%	37%
Ketchikan Gateway Schools	33%	36%
Sitka Borough School District	27%	33%
Fairbanks North Star Borough Schools	28%	30%
Juneau School District	22%	27%
Unalaska City School District	17%	25%
Valdez City Schools	25%	25%
Skagway City Schools	14%	8%

State of Alaska Department of Education and Early Development: Child Nutrition Services: National School Lunch Program

Within the NSB School District, the percent of students eligible for the Free or Reduced Lunch program varied quite widely among the village schools.<sup>26</sup>

**Table 1.8: Percent of Enrolled Students Eligible For Free or Reduced Lunch: NSB, by School**

	2010	2011
Alak School (Wainwright)	77%	81%
Harold Kaveolook School (Kaktovik)	82%	79%
Nunamiut School (Anaktuvuk Pass)	63%	67%
Tikigaq School (Point Hope)	75%	63%
Meade River School (Atkasuk)	58%	49%
Kiita Learning Center (Barrow)	35%	40%
Ipalook Elementary School (Barrow)	30%	35%
Kali School (Point Lay)	39%	33%
Barrow High School (Barrow)	29%	32%
Eben Hopson Sr. Memorial Middle School (Barrow)	32%	32%
Nuiqsut Trapper School (Nuiqsut)	34%	25%

State of Alaska Department of Education and Early Development: Child Nutrition Services: National School Lunch Program

### 1.2.1.3. Education

The North Slope Borough has invested heavily in educational opportunity in the region. The NSB School District spends more than twice the state average in average per-student expenditures.<sup>27</sup> The NSB School District and other leaders within the NSB community have also recognized the importance of incorporating Iñupiaq values, culture, and language into the school curriculum, establishing the Iñupiaq Education Department. Ilisagvik College was also founded to offer North Slope residents further educational opportunities that incorporate and affirm the Iñupiaq cultural heritage.

Education is widely recognized as an important determinant of overall health. Research has demonstrated that educational attainment is a strong predictor of health outcomes over the lifespan.<sup>16</sup> Education may mitigate some of the negative influences of other factors, such as poverty and discrimination. Moreover, “education is a strong predictor of many of the important intervening variables that are more directly associated with good health outcomes, including self-efficacy, knowledge, social participation, control over work, cognitive complexity, and coping.”<sup>28</sup> Additionally, improved education of women, particularly in developing countries, has been associated with better birth outcomes and lower infant mortality,<sup>28, 29</sup> and “educated girls and women...seek medical care sooner for themselves and their children and provide better care and nutrition for their children.”<sup>30</sup>

Research has shown, however, that “education which is characterized by cultural and linguistic alienation has long-term negative impacts on individuals and disempowering consequences for communities.”<sup>31</sup> Unfortunately, the history of education in rural Alaskan communities has been far from positive or affirming of Native cultures. The forced placement of rural Alaska Native children into boarding schools during the 20th century, as well as the devaluing and persecution of traditional language and customs within the school system, traumatized many Native children, families, and communities and lead to multi-generational social ills. The incorporation of Alaska Native culture, history, and language into public school education has improved over the past several decades, but tensions and controversy remain about balancing the need to meet statewide education requirements and efforts to integrate Native language and culturally relevant curriculum. The NSB School District has been a leader in this area, developing a comprehensive Iñupiaq education curriculum that will attempt to incorporate Iñupiaq language, culture, traditional skills, and knowledge into virtually every aspect of the school curriculum.

Below are presented a number of educational indicators for the NSB. The educational measures below do not consider components of traditional education such as hunting skills, ecological knowledge, or storytelling. One NSB Iñupiat resident describes the importance of traditional Iñupiaq education:<sup>32</sup>

Learning from our Elders is very crucial in our way of Iñupiaq life. Our Iñupiaq Elders were doctors, scientists, weather forecasters, astronomers (they knew directions using the stars and looking at the sky and horizon knew what kind of weather it was going to be), teachers of survival. They knew how to make the most energy efficient home (sod house) for this type of harsh climate, knew which plants were edible, medicinal and what was not edible. They taught young people how to cut up a whale, seals, and certain seasons of what kind of caribou skin would be good for attire (caribou skin is thicker for winter wear) walrus (how to prepare it, ferment it).

### Community Education Levels

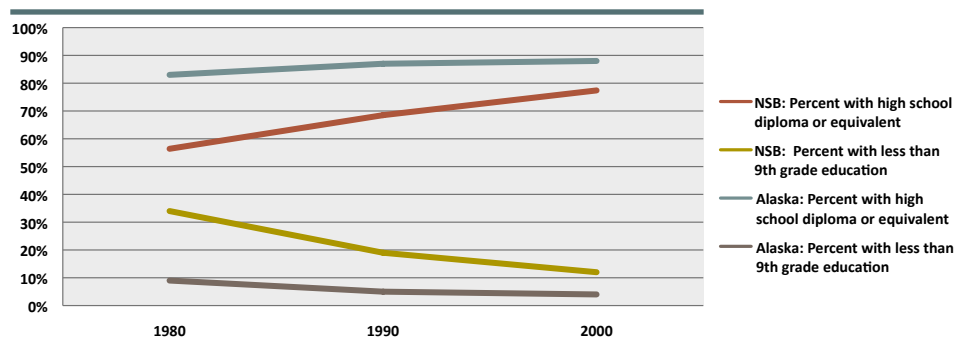
According to 2010 NSB Census data, four of five NSB adults over age 25 years had attained at least a high school diploma or equivalent. The largest differences between ethnic groups were in the proportions with high school diplomas and with college degrees.<sup>4</sup>

**Table 1.9: NSB Adults Over Age 25 Years: Highest Level of Education Attained**

	Iñupiat	Caucasian	Other ethnic groups	All NSB adults over age 25
None	1%	0%	0%	1%
Elementary school	3%	0%	1%	2%
Middle school	4%	0%	0%	3%
High school	3%	0%	1%	3%
Did not finish high school	15%	2%	3%	11%
High school diploma	40%	12%	27%	33%
GED	7%	2%	4%	6%
Voc/tech graduate	3%	5%	3%	3%
Some college	20%	25%	31%	22%
B.A. degree	2%	35%	22%	9%
M.A. degree	1%	22%	7%	6%
Professional degree	1%	4%	1%	2%
Other	0%	3%	0%	1%

U.S. census data show that, since 1980, educational levels among adults in the NSB have increased steadily but still remained below statewide levels in 2000. The 2010 U.S. 2010 Census questionnaire did not include questions on educational level of residents, but the 2010 NSB Census estimates that 80% of NSB adults over age 25 years have at least a high school diploma or equivalent, a slight increase from the 2000 U.S. Census estimate.<sup>15</sup>

**Figure 1.23: Education Levels Among Residents Over Age 25, 1980–2000**

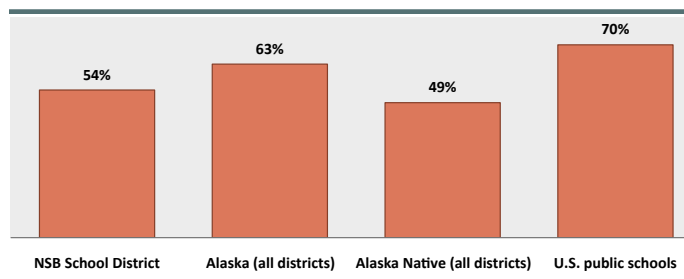


Data source: U.S. Census Bureau.

### High School Graduation Rates

Because of the small size of the NSB School District, graduation rates fluctuate substantially from year to year. Between 2005 and 2009, however, the average graduation rate in the NSB School District was lower than that for Alaska overall and the U.S. but slightly higher than that of Alaska Natives statewide.<sup>27</sup> A student in Alaska does not count as a graduate if the students has not passed the HSGQE, regardless of earning the required credits for graduation. Also, the graduation rate does not always correctly reflect students who leave school and come back to graduate at a later time.

**Figure 1.24: Average Annual High School Graduation Rates, 2005–2009\***



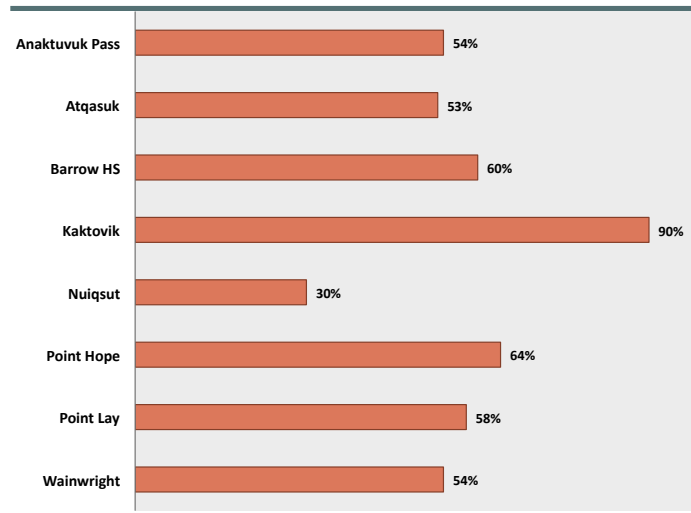
\*U.S. rates are for 2005–2007.

NSB and Alaska data source: State of Alaska Department of Education and Early Development

U.S. data source: Graduation Rate Trends 1997–2007. *Education Week* June 14, 2010. Vol 29; Issue 34

Within the NSB, Kaktovik had the highest average high school graduation rate (90%), and Nuiqsut had the lowest (30%) during the most recent seven-year period. Caution must be used when interpreting these numbers, due to the small numbers of graduates per year.<sup>27</sup>

**Figure 1.25: 2003–2009 Average NSB High School Graduation Rates, by Village**

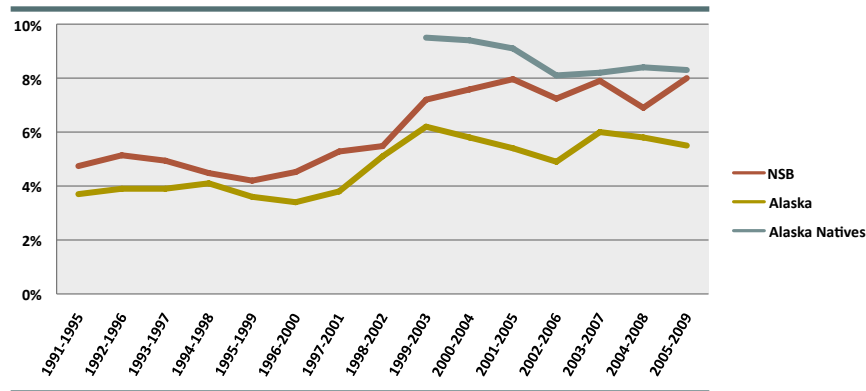


Data source: State of Alaska Department of Education and Early Development.

### Grade 7–12 School Drop-Out Rates

School drop-out rates are an imperfect measure of school engagement and achievement, especially in small districts, but they do allow some examination of trends over time. The five-year average school drop-out rates in the NSB increased from approximately 5% through most of the 1990s to almost 8% between 2000 and 2009.<sup>27</sup> The most common reasons NSB household heads cited for students they knew leaving school before graduating were boredom with school, having a baby, being behind in credits, and “other reasons.”<sup>4</sup>

**Figure 1.26: Grade 7–12 School Drop-Out Rates**



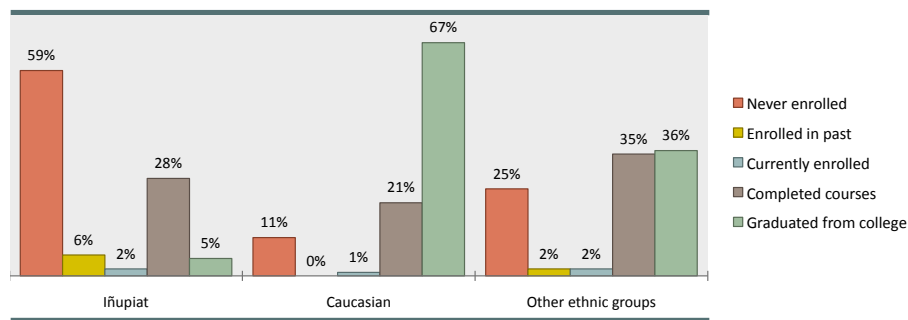
Data source: State of Alaska Department of Education and Early Development.

Rates for Alaska and Alaska Natives reflect single-year statewide rates, midpoint of the referenced period.

### Post-Secondary Education

Local post-secondary educational opportunities have increased dramatically for NSB residents over the last generation with the founding and ongoing expansion of Ilisagvik College in Barrow as well as the growth of distance-learning programs and other online educational opportunities. Non-Iñupiat community members are more likely than Iñupiat to have finished high school and completed a college degree,<sup>4</sup> however, often coming to the community for employment opportunities such as teaching or health care that require a higher level of education. Roughly two of three household heads in all ethnic groups believed that additional training would help them achieve career goals.<sup>4</sup> Only a modest proportion of household heads see a college curriculum as the best route for them, however, while a majority of household heads cite on-the-job training, either short or long-term, as the preferred route to improving their skills.<sup>4</sup>

**Figure 1.27: College Experience Among NSB Household Heads, by Ethnic Group**



Data source: 2010 NSB Census.

### Early Childhood Education

There is growing evidence that quality day care and preschool settings support healthy development and improve health outcomes later in life.<sup>33</sup> The NSB School District recognizes the importance of early educational opportunity and offers a half-day early childhood education program available to all 3- and 4- year-old children. In Barrow, an Iñupiaq language immersion pre-school class for 3- and 4- year-olds was started several years ago and is available to interested families. Previously, there were also immersion programs for grades K–4 in Barrow, but they are not currently available due to lack of qualified teaching staff.<sup>34</sup>

#### 1.2.1.4. Sociocultural Environment

One of the most important drivers of overall health is the social environment in which one lives and works.<sup>16</sup> Social environment includes such factors as cultural integrity, personal safety and exposure to violence, job satisfaction, and level of civic participation and control. It also includes the degree of trust, mutual support, and connectedness among community members. High levels of social trust, a sense of belonging, and community participation are associated with better health.<sup>35</sup> The inverse is also true: social isolation or exclusion has been associated with measures of poor health as well as with some of the leading causes of death in Alaska.<sup>13</sup>

### Social Support and Connectedness

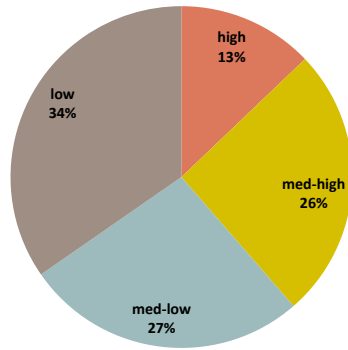
Research suggests that the connections among people in a community can affect the overall health of community members.<sup>35</sup> Residents of NSB communities place a high value on community and family ties and engage with other community members through subsistence activities and food-sharing networks, as well as other community and cultural events. Yearly celebrations such as Nalukataq (the whaling festival) and the bi-annual Kivgiq celebration in Barrow bring people together from all over the region. Many aspects of social connectedness are included in the Traditional Iñupiaq Values—Sharing, Family and Kinship Roles, Compassion, Cooperation, Avoidance of Conflict, and Love and Respect for Elders and Others.

#### *Social Support Among Adults*

Despite the emphasis placed on social connectedness in the Iñupiaq value system, many North Slope residents today do not feel that they are getting the social and emotional support they need. In the 2005–2009 BRFSS surveys, almost half (47%) of NSB adults stated that they “never,” “rarely,” or only “sometimes” get the social and emotional support they need, compared with only 20% of adults statewide. Northern, southwest, and interior rural regions of Alaska reported similarly low levels of social and emotional support.<sup>11</sup>

Survey data collected in 2003–2004 for the SLiCA study also assessed the degree of social support and connectedness that North Slope Iñupiat residents experience. When asked whether they had someone to get together with for relaxation, someone to confide in or talk with about themselves or their problems, or someone they can count on when they need advice, a minority (39%) of NSB Iñupiat residents aged 16 years and over reported experiencing high or medium-high levels of social support.<sup>3</sup>

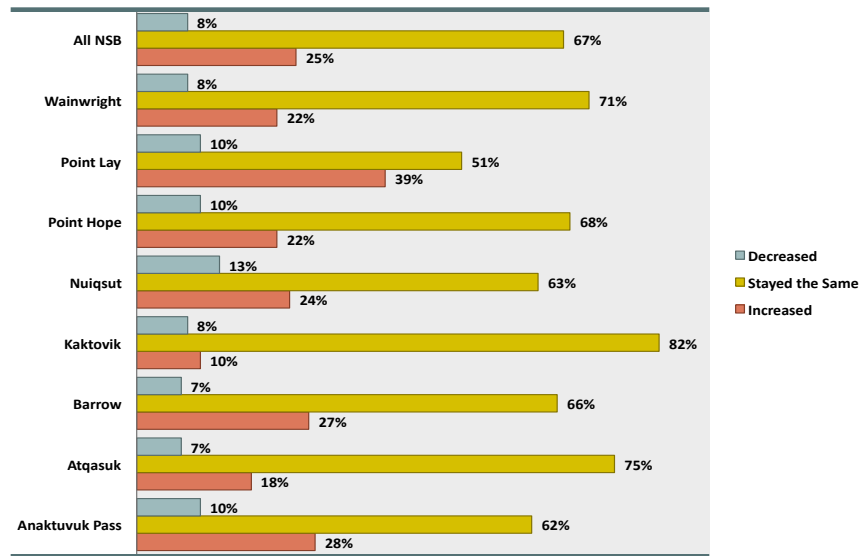
**Figure 1.28: NSB Inupiat Residents' Reported Levels of Social Support Available to Them**



Data source: Poppel, 2007, SLICA results (includes Inupiat residents and arctic indigenous residents aged 16 years and older).

In the 2010 NSB Census, household heads were asked whether they perceived that the support they received from others had increased, decreased or stayed the same over the past five years. Two-thirds of respondents thought that the level of support had stayed the same, 26% thought it had increased, and only 8% thought it had decreased.<sup>4</sup>

**Figure 1.29: 2010 NSB Census: Household Heads' Attitudes About Changes Over the Past Five Years in the Support They Have Received from Others**



2010 NSB Census

### *Social Support and Connectedness Among Youth*

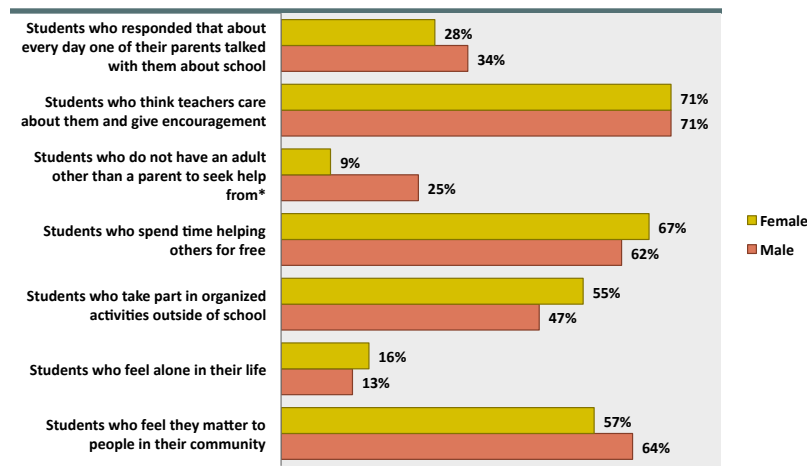
A sense of connectedness is important during the adolescent years, and social isolation may be particularly harmful at this developmental stage. The NSB community has recognized youth connectedness and community involvement as important determinant of community well-being, organizing such programs as the Developmental Youth Assets program, the Mayor's Youth Advisory Council, Elders and Youth conferences, the 2010 Tumitchiat Leadership Summit, and activities sponsored by the Mayor's Office Healthy Communities Initiative, ranging from sports camps to dumpster painting to subsistence classes.

In the 2010 NSB Census, a large majority of parents with school aged children thought that their children were either somewhat or very connected or involved in their school. This was true for all ethnic groups.<sup>4</sup>

In 2005, a number of questions were asked of NSB high school students regarding their feelings of connectedness and support within their communities. The results are summarized in the Figure 1.30 and

demonstrate, overall, a fairly high level of connectedness and social support for most students. A minority of students clearly experience isolation, however, and may not be receiving the support they need from their school, family, and community.<sup>36</sup>

**Figure 1.30: Community Support and Connectedness Among NSB High School Students (2005)**



Data source: YRBS 2005.

Compared with statewide estimates from the 2007 Alaska YRBS survey, North Slope high school students were either more likely or as likely to report high levels of social support and connectedness. The single exception was that NSB students were less likely to report that their parents talked with them about school on a daily basis, compared with their statewide counterparts.<sup>36</sup>

**Table 1.10: Community Support and Connectedness Among High School Students in the NSB and Alaska**

	NSBSD HIGHER than 2007 Alaska sample*	NSBSD LOWER than 2007 Alaska sample*	NSBSD SIMILAR to 2007 Alaska sample
Percent of students who feel they matter to people in their community	■		
Percent of students who spend time helping others for free	■		
Percent of students who think teachers care about them and give encouragement	■		
Percent of students who feel alone in their life			■
Percent of students who take part in organized activities outside of school			■
Percent of students who do not have an adult other than a parent to seek help from			■
Percent of students who responded that about every day one of their parents talked with them about school		■	

Data source: YRBS 2005 and 2007.

\*Statistically significant (p<0.05)

### Cultural Integrity

In recent years, the leadership and active community members of the NSB have supported cultural strengthening and affirmation as a path to community well-being through the *Healthy Communities Initiative*, celebrations such as the Kivgiq (Messenger Feast), the Iñupiaq Heritage Center, the development of the NSB School District Iñupiaq Education Department, the Borough’s subsistence leave policy, and many other programs. The health of a predominantly indigenous community today depends on that community’s ability to adapt successfully to the rapid changes brought on by development and modernization. This

success depends on many factors, one of which is maintaining cultural values and identity in a modern world.<sup>37</sup> In predominantly indigenous communities around the world, cultural integrity and the strength of one's cultural identity are associated with positive health outcomes.<sup>37</sup>

### Language Ability and Use

Indigenous language use is an integral part of most indigenous cultures and one marker of cultural continuity. Increasing the ability of North Slope residents to speak and read the Iñupiaq language has been a major goal of the North Slope Borough, and the NSB School District has devoted substantial resources toward that effort. The theme of the most recent Elders and Youth Conference was “Let’s Speak Iñupiaq!” More than 600 people participated in a variety of workshops focused on increasing the use of the Iñupiaq language. The NSB Planning Department is also leading a project involving the use of the Rosetta Stone language technology.

Measuring language ability at the population level can be challenging, and different available data sources provide different measures that are not readily comparable but can each contribute to the overall picture of Iñupiat language proficiency, utilization, and exposure in North Slope communities.

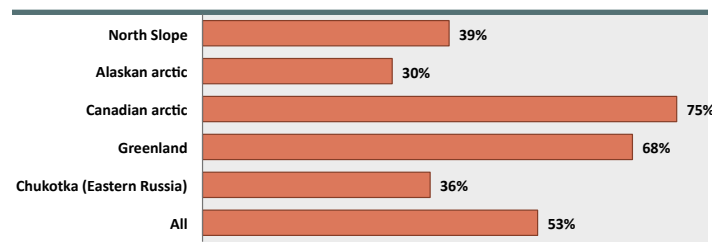
#### 2010 NSB CENSUS LANGUAGE DATA

Data collected in the 2010 NSB Census confirm that the Iñupiaq language is actively being used in a large proportion of Iñupiat households. Two-thirds of Iñupiat households have at least one member who speaks fluent Iñupiaq and two-thirds have at least one household member who reads Iñupiaq. More than half (55%) of Iñupiat household heads report that either “mostly Iñupiaq” or “both Iñupiaq and English” are spoken at home. Iñupiaq language proficiency remains concentrated in older age groups, however, with 79% of Iñupiat household members aged 61 years and over speaking Iñupiaq fluently and preferring this language. Younger adults and children were more likely to understand some Iñupiaq but speak only a little or hardly at all. Slightly more than half report that English is the language mostly spoken to children, although 43% of household heads report that both Iñupiaq and English are spoken to children in the home.<sup>4</sup>

#### LANGUAGE DATA FROM THE SLICA STUDY

In 2003–4, compared with other Iñupiat regions in Alaska, language proficiency among Iñupiat residents in the NSB appeared to be relatively high. Compared with the circumpolar regions of Canada and Greenland, however, indigenous language proficiency in the North Slope and neighboring Iñupiat regions of Alaska was somewhat lower.<sup>3</sup>

**Figure 1.31: Indigenous Residents’ Ability to Understand and Speak Indigenous Language “Very Well” in Circumpolar Arctic Regions**



Alaskan Arctic includes North Slope, Northwest Arctic Borough, and Bering Straits regions.

According to study authors, differences of 10 percentage points or more between groups are likely to be significant.

Data source: Poppel, 2007, SLICA results (includes Iñupiat residents/arctic indigenous residents aged 16 years and older).

### The Subsistence Way of Life

In addition to providing nutritious food, exercise, and social interaction, participation in traditional subsistence activities is a vital part of maintaining cultural integrity on the North Slope. The Native Village of Barrow and the NSB both organize subsistence classes and community events such as traditional whaling feasts that celebrate subsistence as a source of cultural pride. A major part of the NSB Department of Wildlife Management’s mission is to document the continued importance of subsistence hunting, fishing, and trapping through the collection of harvest data. This department also works with community representatives to develop and implement management programs for subsistence-use animals.<sup>38</sup> Information on nutrient value of subsistence foods is presented in the diet and nutrition section, later in this chapter.

The 2010 NSB Census confirms that participation in subsistence activities is high in North Slope households, particularly hunting land and sea mammals (including whales), fishing, sharing/cooking/processing wild foods, and picking berries and wild plants.<sup>4</sup> Participation was high across all age groups. Iñupiat household heads were more likely to believe that hunting and whaling opportunities had increased than decreased in the last five years.

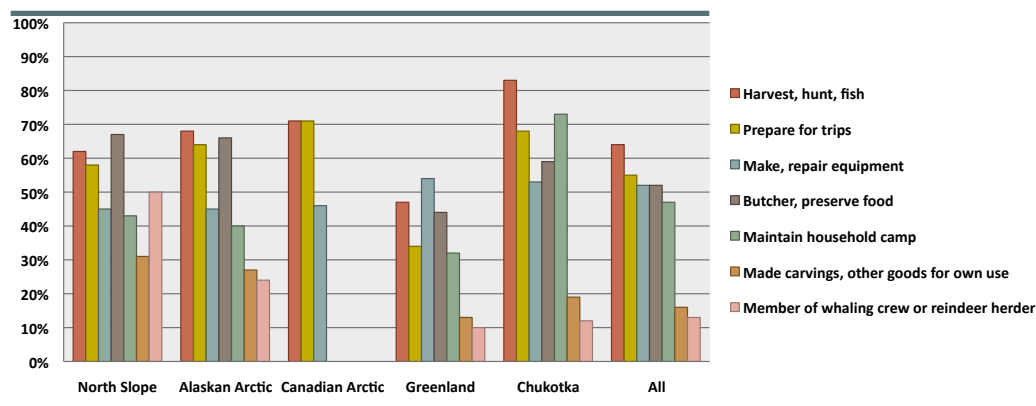
**Table 1.11: NSB Iñupiat Household Heads' Participation in Subsistence Activities**

	Men	Women
Participate in spring whaling	44%	27%
Participate in fall whaling	31%	23%
Hunt sea mammals	55%	17%
Hunt land mammals	69%	30%
Fish	70%	49%
Hunt birds	61%	22%
Gather bird eggs	14%	7%
Pick berries and plants	44%	45%
Share, cook, and process wild foods	79%	82%
Sew skins and clothes	10%	42%
Make sleds and boats	38%	6%
Trap fur bearers	9%	1%

Data source: 2010 NSB Census.

The SLiCA study data collected in 2003–4 also confirmed substantial levels of participation in subsistence-related food harvesting and preparation among Iñupiat and Inuit adults throughout the circumpolar arctic. Overall participation in the NSB was fairly similar to other arctic indigenous regions. Participation in whaling was considerably higher in the NSB, however.<sup>3</sup>

**Figure 1.32: Household Adults Participating in Subsistence Activities in Circumpolar Arctic Regions**



The Alaskan arctic includes NSB, Northwest Arctic Borough, and Bering Straits regions.

According to study authors, differences of 10 percentage points or more between groups are likely to be significant.

Data source: Poppel, 2007, SLiCA results (includes Iñupiat/arctic indigenous residents aged 16 years and older).

Subsistence food sharing is an important cultural component of the subsistence way of life. The NSB Census also collected data on subsistence food sharing, and these are discussed in a later section under food security.

## Authority of Elders

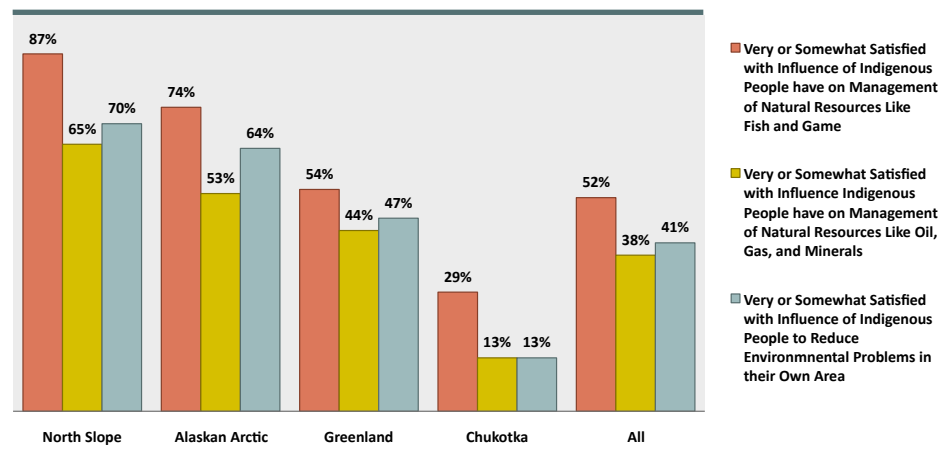
Respect for elders is a core Iñupiat value. In the 2010 NSB Census, 67% of Iñupiat household heads thought that elders in the community were highly respected by students and community members, while 23% thought that they were somewhat respected. High levels of respect for elders were reported across the NSB and did not vary significantly among different North Slope communities.<sup>4</sup>

## Control of Destiny and Civic Engagement

Research suggests that personal empowerment, or “the ability of people to deal with the forces that affect their lives,” is positively associated with health.<sup>16,39</sup> This finding is of particular importance in historically oppressed or exploited groups and in racial and ethnic minorities.

The NSB governmental and tribal organizations have made substantial efforts to maintain a strong voice in decisions affecting the local people and environment, and levels of satisfaction with the influence of local indigenous people on these decisions do appear to be somewhat higher overall in the NSB than in other arctic communities, at least with regard to management of natural resources.<sup>3</sup> In the 2010 NSB Census, roughly two of three household heads reported voting in the last borough and state elections, and 70% of household heads reported voting in the last national election.<sup>4</sup>

**Figure 1.33: Indigenous Residents’ Control of Destiny in Circumpolar Arctic Regions**



Alaskan Arctic includes North Slope, Northwest Arctic Borough, and Bering Straits regions.

Data from the Canadian arctic were not available for these questions.

According to study authors, differences of 10 percentage points or more between groups are likely to be significant.

Data source: Poppel, 2007, SLICA results (includes Iñupiat/arctic indigenous residents aged 16 years and older).

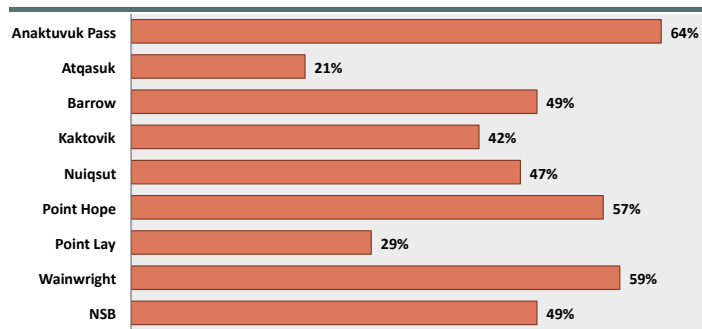
## Crime and Victimization

Living in high crime or unsafe areas affects the health of community members through violent injuries, acute and chronic stress, the inability to be outdoors safely, and other pathways.

### Community Perception of Crime

In the 2010 NSB Census, household heads were asked whether they believed the amount of drinking, drugs, fighting, and stealing in their village had increased, stayed the same, or decreased. Overall, 12% of respondents thought it had decreased, 39% thought it had stayed the same, and 49% felt it had increased, either somewhat or a lot in over the past 5 years. The responses varied considerably across the region.<sup>4</sup>

**Figure 1.34: Percent of NSB Household Heads Who Think That the Amount of Drinking, Drugs, Fighting, and Stealing in the Village Has Increased in the Last Five Years**

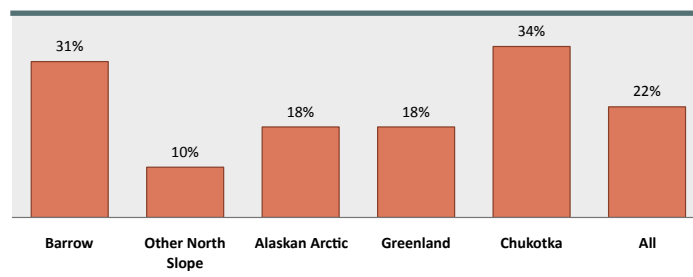


Data source: 2010 NSB Census.

### Self-Reported Victimization

In the SLiCA survey, conducted in 2003–4 in the NSB, Iñupiat survey respondents were asked whether they had been a victim of a crime in the last 12 months. Of the Barrow residents participating in the survey, 31% acknowledged being the victim of a crime, whereas 10% of respondents in other villages reported being victimized in the past year. Small sample sizes in the NSB make it difficult to draw firm conclusions about these differences. Theft was by far the most common type of crime that the residents reported.<sup>4</sup>

**Figure 1.35: Victimization in Circumpolar Arctic Regions: Percent of respondents who reported being the victim of a crime in the last 12 months**



Alaskan Arctic includes North Slope, Northwest Arctic Borough, and Bering Straits regions.

Data from the Canadian arctic were not available for this question.

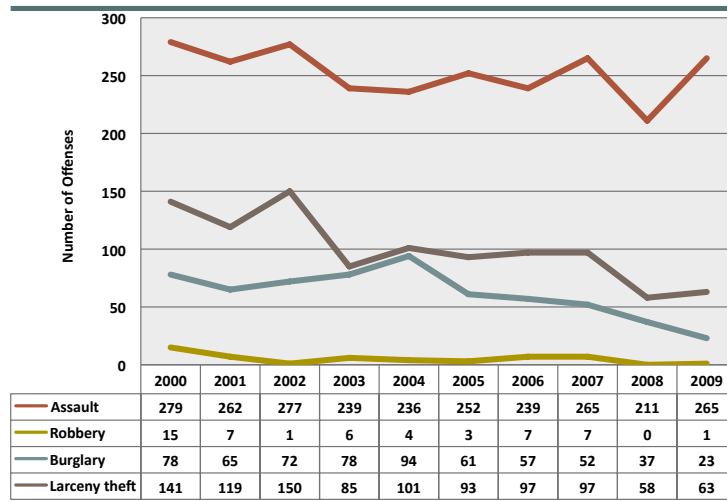
According to study authors, differences of 10 percentage points or more between groups are likely to be significant.

Data source: Poppel, 2007, SLiCA results (includes Iñupiat/arctic indigenous residents aged 16 years and older).

### Local Crime Statistics

According to Uniform Crime Reporting statistics, assault is the most common crime reported to local law enforcement in the NSB, and the number of assaults in the NSB did not change appreciably between 2000 and 2009. Rape and/or sexual assault and drug and/or alcohol related crimes are discussed separately in later sections of this report.

**Figure 1.36: Uniform Crime Reporting: Actual offenses reported or known in the NSB**



Data source: Public Safety Statewide Services, *Crime Reported in Alaska, Annual Reports* (based on FBI Uniform Crime Reporting program data).

Assault includes aggravated assault (attack for the purpose of inflicting severe or aggravated bodily injury, usually accompanied by use of a weapon or by other means likely to produce death or great bodily harm) and simple assault.

Robbery is defined as the taking or attempting to take anything of value through use of force or threat of force or violence.

Burglary is defined as the unlawful entry of a structure to commit a felony or theft.

Larceny includes motor vehicle theft and other theft of property that is not taken by force or unlawful entry of a structure.

### Sexual Assault and Domestic Violence

Being a victim of intimate partner violence or sexual abuse is associated with a number of health problems, including chronic disease, poor self-rated health, and mental health problems.<sup>40</sup> A number of different data sources provide evidence that the NSB has disproportionately high rates of sexual assault and intimate partner violence, compared with state and national estimates. Sexual assault and domestic violence are discussed in detail in the “Injury” chapter of this report.

### Child Maltreatment

Conditions during the early childhood period have lifelong physical, emotional, and cognitive effects, and the early childhood environment is a predictor of health outcomes later in life.<sup>16</sup> Child maltreatment has been linked to an increased risk of many physical and mental health problems, including alcoholism, depression, drug abuse, eating disorder, obesity, sexual promiscuity, smoking, suicide, and certain chronic diseases.<sup>41</sup> Often, alcohol or drug abuse and domestic violence are contributing factors to adverse home environments for children. Children were present in 43% of domestic violence incidents reported to Alaska State Troopers in 2004.<sup>42</sup>

The NSB experienced rates of child maltreatment in 2006–2008 that were high compared with the state average, but similar to other remote rural areas.<sup>43</sup> Child maltreatment is discussed further in Chapter 6: Maternal and Child Health.

## 1.2.2. Physical Environment

The physical environment in which one lives affects health in many ways. The NSB experiences a harsh arctic coastal climate, although one to which Iñupiat have successfully adapted over thousands of years. Connection to the natural world is a core value for many residents of the North Slope Borough, and residents depend on the natural environment for not only for food, but also for social and cultural identity. A healthy ecosystem, therefore, is important to both the physical and cultural survival of NSB communities, and both real and perceived environmental problems have the potential to affect the health and well-being of the population.

Safe water and adequate sanitation facilities have been public health priorities for decades in Alaska and have contributed significantly to the improvement of health in rural Alaska. Exposures to pollution and

other contaminants systems are a concern throughout the developed and developing world, but factors specific to arctic communities have warranted attention and investigation in this area. The effects of climate change are also of particular importance and urgency to northern communities. Recently, increased attention has also been paid to the health effects of housing, urban planning, and access to safe and healthy recreational opportunities. These “built environment” issues apply not only to urban centers but also to smaller rural regions such as the NSB.

### 1.2.2.1. Geography

The North Slope Borough encompasses the vast area of land across the north slope of Alaska. The eight villages are widely distributed, with the majority along the northern coast. Anaktuvuk Pass is unique in the NSB for its mountainous interior location. The remote locations of NSB communities affect many aspects of community life, including many of the determinants of health such as access to health and social services, job and educational opportunities, and market goods.

Figure 1.37: North Slope Borough Map



### 1.2.2.2. Community Infrastructure

#### Housing

Today, the majority of housing units in the North Slope are simple, modern houses with modern heating, water, and sewer systems. According to the 2010 NSB Census, 69% of North Slope households occupy single-family homes. The household size in the NSB is 3.44 persons, compared to an average of 2.59 persons per household nationwide.<sup>15</sup> The average square footage of the housing unit, according to household heads, is 1139 square feet. About half of household live in units that they own or on which they carry a mortgage, and about half rent their homes.<sup>4</sup>

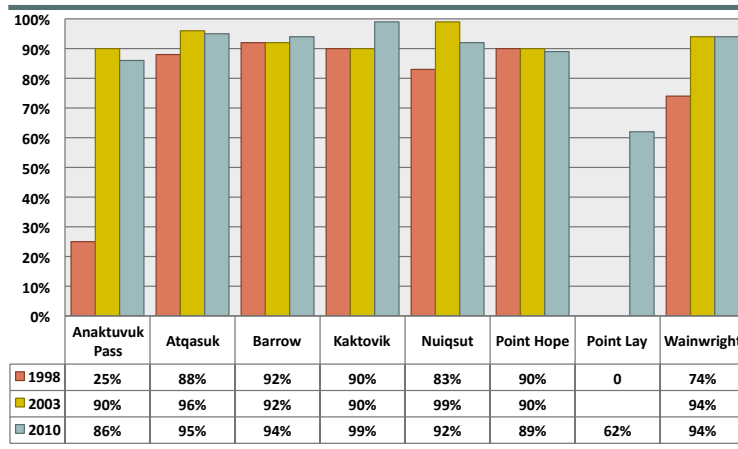
#### Transportation

The vast majority of motorized transportation within NSB villages occurs through private vehicles, including cars and trucks as well as snowmachines and four-wheelers. Barrow has a limited public city bus service, and there are several taxicab companies in town. The North Slope villages are fairly compact, allowing most parts of town to be reached by foot. Transportation between villages occurs through scheduled and chartered aircraft operated by commercial carriers. Transportation between the NSB and other parts of Alaska occur primarily via commercial aircraft that connect Barrow and Deadhorse/Prudhoe to the cities of Fairbanks and Anchorage. Since the development of the nearby Alpine oil production facility, a seasonal ice road has allowed surface transportation between the village of Nuiqsut and the Alyeska Pipeline gravel highway that leads south to Fairbanks.

#### Water, Sewage and Solid Waste

Access to adequate quantities of clean, safe water and proper disposal of waste are cornerstones of population health efforts worldwide, and this is an area in which the NSB has invested heavily. According to the 2010 NSB Census, 92% of NSB households have running water, 91% have flush toilets, and 8% currently rely on honeybuckets (buckets used as toilets inside the house). Of those households with running water, 90% have it piped to the house and 10% have it hauled by water truck. Point Lay had the lowest percentage of households with running water (62%) and Kaktovik the highest (99%).<sup>4</sup>

**Figure 1.38: Percent of NSB Households with Running Water, by Village**

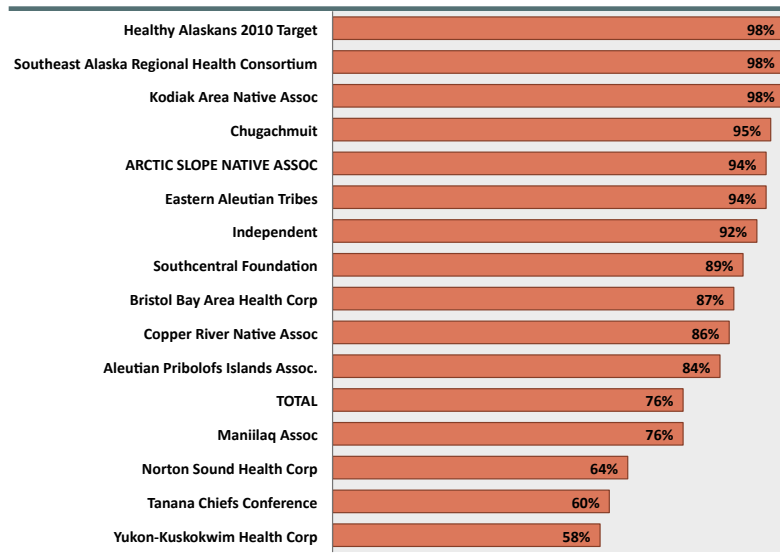


Data source: 1998, 2003 NSB Economic and Census Profiles<sup>59</sup> and 2010 NSB Census.<sup>4</sup>

Water and sewer access has improved dramatically in rural Alaska over the past two decades, but a minority of rural households continue to rely on honeybuckets and individually hauled water. Lack of modern water service has been found to be associated with increased rates of lower respiratory tract infection in children in Alaska.<sup>44,45</sup> Alaska Native Epidemiology Center included 2008 comparison data on water and sewer service in Alaska in their recent publication *Regional Health Profile Arctic Slope*.<sup>46</sup> The ASNA, or Arctic Slope, service area had one of the highest levels of water and sewer service in the state (94%) and was only slightly below the Healthy Alaskans 2010 target of 98%.

**Figure 1.39: Water and Sewer Service, by Region (2008):**

*Percent of housing units with piped water or closed haul*



Alaska Native Epidemiology Center; *Regional Health Profile Arctic Slope*, cited data source ANTHC Department of Environmental Health and Engineering

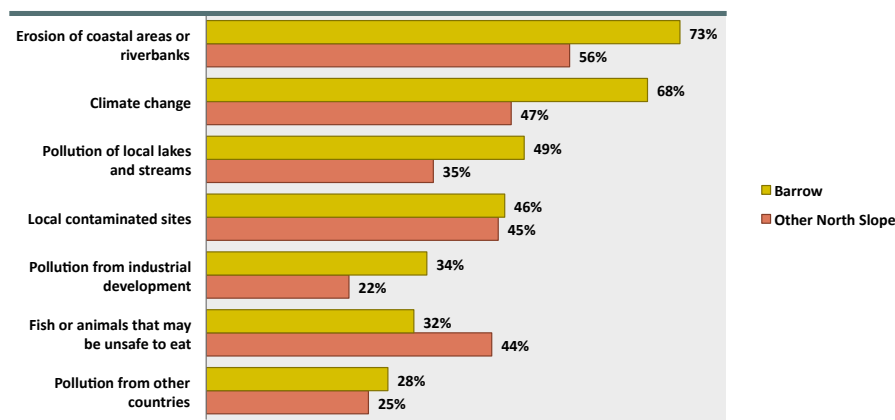
Note: Data include all NSB villages with the exception of Point Hope

Proper disposal of solid waste is important to human and animal health. Improper dumping and poorly designed landfills can contaminate water supplies, attract wildlife foraging, create unpleasant odors, and allow litter to be blown over surrounding land. Alaska DEC regulates and permits landfills in rural and urban areas. In 2000, only 33% of landfills in Alaska had a current permit or acceptable alternative.<sup>9</sup> As of 2010, all NSB villages had currently permitted landfills.<sup>47</sup> Barrow has a permitted Class II municipal landfill and other NSB villages have Class III (less than five tons of municipal waste per day).<sup>47</sup>

### 1.2.2.3. Environmental Concerns

A healthy natural environment is central to the physical and cultural survival of the residents of the North Slope. While often seen as pristine and untouched by the environmental problems plaguing more developed areas, the arctic environment faces many of the same issues seen in other regions. In some cases, for example in the area of climate change, the impact is even more severe in the arctic than in temperate regions. The climactic, geographic, and biological characteristics of the Alaskan arctic environment are unique and require tailored research and solutions. The top areas of environmental concern that NSB Iñupiat residents expressed in the 2003–4 SLiCA survey included erosion and climate change, pollution, and contamination of waterways and food sources.<sup>3</sup> The concerns noted in Figure 1.40 are not unrelated, however. For example, other countries and regions are the source of much of the pollution affecting local waterways and wildlife.

**Figure 1.40: Perceived Environmental Problems**



Data source: Poppel, 2007, SLiCA results (includes Iñupiat residents aged 16 years and older).

### Climate Change

Climate change and the related problem of coastal erosion were top concerns among the NSB Iñupiat residents who were surveyed, particularly in Barrow. The arctic region is warming twice as fast as the rest of the planet,<sup>48</sup> and the arctic is expected to experience the greatest rates of warming compared with other world regions, according to the International Panel on Climate Change. As permafrost temperatures rise and frozen ground thaws, there is potential for destabilization of infrastructure in many arctic communities. Barrow has been identified as “ground zero” for climate change.<sup>49</sup> Some concerns voiced by local North Slope residents and leaders include the impact of ocean temperatures and increased marine traffic on bowhead whale migration patterns, disappearing nesting grounds for migrating bird species,<sup>49</sup> and spoilage of subsistence meats that are stored in permafrost cellars.<sup>49,50</sup> A recent report on the health impacts of climate change in Point Hope identified a number of health concerns related to climate change, including temperature-related problems with the community drinking water source, thawing traditional permafrost food storage cellars resulting in food insecurity and food safety issues, unstable shore ice increasing risk to hunters and interfering with subsistence activities, and a number of other subsistence-related concerns.<sup>51</sup>

Research on arctic climate change is ongoing. Some observed and potential effects of climate change on human health include, but are not limited to:<sup>48</sup>

- Unpredictable and changing weather patterns, limiting subsistence activities or increasing risks associated with those activities.
- Changes in ice distribution and stability and land stability, limiting access to subsistence resources.
- Effects on subsistence food species abundance and/or availability.
- Emergence of new infectious diseases or re-emergence of old ones due to ecosystem changes.
- Impacts on water and sanitation infrastructure and possible contamination of water sources.
- Increased use of previously inaccessible arctic waterways resulting in potential disruption of marine migration patterns and potentially profound socioeconomic changes.
- Unpredictable effects on transport of contaminants to and within the arctic.

Rural arctic residents are particularly vulnerable to the effects of climate change for a number of reasons. These are summarized in the Climate Change and Human Health chapter of the Arctic Climate Impact Assessment synthesis report:<sup>48</sup>

- Many arctic residents live in very small, isolated communities, with a fragile system of economic support, dependence on subsistence hunting and fishing, and little or no economic infrastructure.
- Rural arctic public health and acute care systems are often marginal, sometimes poorly supported, and in some cases, non-existent.
- Culture is often critical to community and individual health, and may be affected by climate change via mechanisms such as the loss of a traditional subsistence food source, which can result in a grief response and severe stress. Climate changes can become a source of illness, injury, and mortality for arctic communities.

With a more developed local economic and government infrastructure, the NSB may be more able to respond to the impacts of climate change than some other small arctic communities.

## **Air Quality**

Air pollution has been shown to increase the risk of or exacerbate a number of respiratory and cardiac conditions, including such major health burdens as asthma, coronary artery disease, and lung cancer.<sup>52</sup> The elderly, children, and those with underlying health problems are particularly vulnerable to the effects of air pollution.

Major areas of air quality concern in rural Alaskan villages include diesel emissions, indoor air quality, road dust, solid waste burning, and wood smoke. In the NSB, residents are also concerned about air pollution generated by nearby oil and gas extraction activities. Arctic climate-related factors can contribute to decreased air quality and increased levels of exposure to air pollution through a variety of mechanisms. Low temperatures increase incomplete combustion products and create temperature inversions, trapping pollution near homes and people. Newer, energy efficient, or “tight,” construction often lacks adequate ventilation and traps pollutions inside homes and buildings, where people spend a great majority of time, especially during the long winter months.<sup>53</sup> Few data are publically available regarding local air quality in the NSB.

### *Outdoor Air Quality*

Outdoor air pollution includes components such as dust from roadways, both exhaust from both vehicular and stationary combustion of fuels, and fumes from landfills and sewage lagoons. Alaska’s air monitoring program focuses on three major pollutants: carbon monoxide, coarse particulate matter (PM10, primarily dust), and fine particulate matter (PM2.5, formed by combustion). More than 50 villages in Alaska have expressed concerns about dust. Limited dust monitoring in rural Alaskan villages has confirmed periodic high levels of PM10 (dust). Of the 12 Alaskan villages that have or are conducting monitoring, eight of them have recorded values in excess of the PM10 standard. Among the ADEC PM10 communities with dust complaints are Barrow, Point Hope, and Nuiqsut. To the best of the author’s knowledge, none of these NSB communities has PM10 monitoring through the air monitoring program at this time, however.<sup>54</sup>

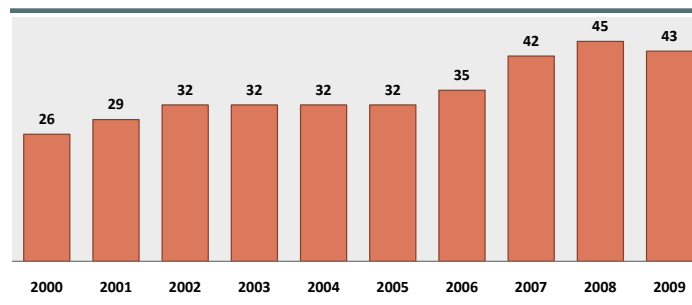
Diesel exhaust contains air pollutants such as carbon monoxide, air toxics, and fine particles and is associated with a number of negative health effects.<sup>55</sup> “Studies in urban areas, and on workers occupationally exposed to diesel, found a number of health impacts from exposure. Shorter term exposure leads to eye, throat, and lung irritation, exacerbation of an existing lung condition like asthma, cough and increased phlegm, headaches, lightheadedness, and nausea. Longer term exposures may increase [the] risk of lung cancer.”<sup>56</sup>

In rural Alaskan communities, diesel power generation creates the vast majority of diesel exhaust. Conversion to ultra-low sulfur diesel (ULSD) and related technologies can reduce harmful particulate matter and nitrogen oxides in exhaust substantially. In 2010, rural areas of Alaska were mandated to begin transitioning to ULSD. In 2007, the Alaska Department of Environment Conservation (ADEC) and the Western Regional Air Partnership released the “Alaska Rural Communities Emission Inventory,” which quantified air emissions for communities and non-aviation sources in rural Alaska. According to the report authors, however, recruitment efforts for community participation in the air quality analysis were unsuccessful in the North Slope region.

In the NSB, all but two villages—Barrow and Nuiqsut—use diesel oil as the primary fuel source for heating. Barrow and Nuiqsut use primarily natural gas, and a small number of NSB households use electricity, wood, kerosene or a combination of sources.<sup>4</sup> Motor vehicles are an additional contributor to diesel and

other emissions, as well as dust. The use of poorly maintained or inefficient engines and idling vehicles near homes and schools can increase exposure to harmful diesel exhaust. The number of vehicles registered with the Department of Motor Vehicles increased by more than 1000 vehicles in the NSB between 2000 and 2008.<sup>57</sup> It is not known how many additional vehicles are not registered.

**Figure 1.41: Number of Motor Vehicles Registered in the NSB, per 100 Persons**



Data source: Alaska Department of Motor Vehicles

Population estimates: Alaska Department of Labor and Workforce Development

A recent study was conducted by the Alaska Native Tribal Health Consortium and the University of Alaska Institute for Circumpolar Health Studies investigating air quality and respiratory complaints in Nuiqsut, the village closest to active oil and gas extraction activities. Investigators set up air-monitoring stations in the village to measure particulate matter, carbon monoxide, sulfur dioxide, and nitrogen oxides and interviewed residents regarding perceptions of air-quality risk. Results have not been published at the time of this writing, but according to one of the investigators, the study has found little evidence of significant air-quality problems associated with oil development near the village.<sup>58</sup>

### *Indoor Air Quality*

Indoor air pollution includes components such as tobacco smoke, off-gassing of volatile fumes from stored gasoline and solvents, combustion heaters, cooking smoke, and fumes from a variety of chemicals used in household products, carpets, and furniture. Again few data are available regarding the various types of indoor air pollution in NSB communities. The main types of heating systems used in the NSB are boiler/baseboard heat and forced-air furnaces.<sup>4</sup>

Awareness of the dangers of second-hand tobacco smoke is high in the NSB,<sup>59</sup> and a large majority of household heads do not permit smoking in the house.<sup>4</sup> Nonetheless, of the 49% of household heads who smoke, one-third smoked and/or permitted others to smoke inside the house. Barrow is one of a handful of localities in Alaska that has enacted more stringent smoking regulations, with a smoking ban in restaurants but not all enclosed workplaces. Alaska is one of only 11 states that have not enacted a general statewide ban on smoking in non-government-owned public spaces.<sup>60</sup>

## **Contaminants**

### *Overview*

All humans living in modern society are exposed to chemicals and other potentially harmful pollutants through food, water, air, household products, and other pathways. One analysis estimated the average individual living in the U.S. is exposed to six different contaminants from pesticides and industrial pollutants at levels that may increase the lifetime risk of cancer and other negative health effects.<sup>61</sup> Certain contaminants are known to travel to and accumulate in the arctic from lower latitudes via atmospheric and oceanic pathways, entering the arctic food chain. The North Slope is fortunate, however, that major pollution and contaminant transport pathways tend to lead to other regions and not to the Alaskan arctic.<sup>62</sup> Military sites, industrial development, and landfills are additional local sources of local contamination in the NSB and other arctic regions. Possible contamination of subsistence food sources is a major concern among NSB residents, with 44% of Iñupiat village residents stating a concern that fish and animals may be unsafe to eat.<sup>3</sup>

Two major categories of contaminants in the arctic food chain are persistent organic pollutants (POPs), which include polychlorinated biphenyls (PCBs) and other related compounds, and the elemental heavy

metals, of which mercury has been the primary concern. The health effects of these contaminants are not completely understood despite a great deal of research. In general, young children and developing fetuses are most vulnerable to the health effects of these contaminants, although some compounds are implicated in an increased risk of certain cancers and other chronic health problems.<sup>63-66</sup>

Studies of subsistence foods in the NSB have been quite reassuring with respect to the health risks of contaminants, and the NSB Department of Wildlife Management strongly supports the consumption of subsistence foods in the NSB.<sup>62</sup> A number of efforts have been undertaken to evaluate the health risks of contaminants in subsistence foods in Alaska<sup>67-70</sup> and in the NSB.<sup>71-76</sup> The most useful ones detail the actual analyses performed and provide information to balance the health risks of contaminants against the nutritional, social, cultural, and economic benefits of subsistence foods. Based on the growing body of evidence, the State of Alaska Department of Health and Social Services also encourages the use of traditional subsistence foods. The study and report authors continue to emphasize, however, that ongoing research and monitoring is warranted.

Note: The nutritional value of North Slope subsistence foods is discussed later in the Diet and Nutrition section of this chapter.

### *Persistent Organic Pollutants: PCBs, Organochlorines (OCs), and Related Compounds*

#### BACKGROUND

PCBs, OCs and other POPs are manmade chemicals that persist for long periods of time in the environment at low levels. They are transported to the arctic through the atmosphere, oceans, and marine food chain, where they become more concentrated in animals higher on the food chain. Many studies have examined the potential health effects of these chemicals, often with conflicting results. A 2004 report published by the State of Alaska Department of Health and Social Services summarizes the evidence regarding the overall health risks of PCB's and related compounds: "Overall, we conclude that there is some small, unproven but theoretical risk of subtle health effects related to low-level exposure to PCB-like chemicals."<sup>67</sup>

#### SUMMARY OF LOCAL POP CONTAMINANTS RESEARCH

Overall, analyses of subsistence-harvested foods from the North Slope have shown very low levels of OCs, levels that are below levels of public health concern.<sup>62</sup>

**Whale:** University-based research conducted in cooperation with NSB Department of Wildlife Management examined persistent OCs in tissues of subsistence marine species (bowhead and beluga whales) from the NSB. The investigators concluded that the nutrient and other benefits of consuming these species outweighed the minimal risk of health effects due to contaminants.<sup>71</sup> A separate study compared OCs in store-bought foods to subsistence foods in the NSB, concluded that "there was no clear indication that store-bought foods were significantly less contaminated than comparable traditional (wildlife) foods, except for blubber and blubber-containing products (there was no blubber analog in the store). We conclude that switching from non-blubber tissues to local store-bought alternatives will not eliminate OC exposure and may only provide a slight reduction, in any, that may be at the expense of much less nutrient-rich products and the elimination of important, healthy, socio-cultural practices."<sup>72</sup>

**Fish:** Overall, analyses of OC levels in North Slope fish species found them much lower than levels in marine mammals, and in many cases the subsistence fish had lower concentrations than the store-bought foods that were examined.<sup>62</sup> In response to concerns about PCB and DDT contamination found in fish in Umiat, a former military site about 90 miles upstream of Nuiqsut on the Coleville River, community members, scientists, and state and federal officials collaborated to provide information about the safety of fish in the Nuiqsut area. In 2000–2001, analyses of subsistence fish species were carried out in the North Slope, including the Nuiqsut area. Burbot and broad whitefish from Nuiqsut were found to be seven to eleven times lower for PCBs and 25–45 times lower for DDTs than the Umiat fish. A related large study sampling fish from a wide area of lakes between Atqasuk and Nuiqsut found that, again, contaminant levels were much lower than Umiat levels and were similar to commercial food levels. One investigator noted that whitefish, in particular, are low on the food chain and, thus, the exposure to POPs is also low.<sup>73</sup>

**Caribou:** Chemicals like PCBs are generally not part of the lichen-caribou-human food chain and, thus, are not thought to be a problem in caribou hunted as a subsistence food.<sup>77</sup>

**Human blood sampling:** Blood samples taken from a small number of pregnant women suggest that PCB levels in the NSB may be lower than in other regions of the state. For additional reference, a study of banked serum from the 1980s from Alaska Native women statewide found blood levels of PCBs to be similar to those reported in New York women from the same period.<sup>78</sup>

**Table 1.12: Serum PCB Levels**

Study Participants	Serum PCB Levels (ppb)
Barrow: pregnant women <sup>79</sup>	0.77
Bethel: pregnant women <sup>79</sup>	1.29
Aleutian/Pribilof: women of childbearing age <sup>67</sup>	2.90
Alaska Native women: mean age 57, banked serum (1980's) <sup>78</sup>	7.56

### STATE OF ALASKA RECOMMENDATIONS REGARDING POPs

Based on the limited sampling of human blood levels and fairly extensive sampling of animals used in subsistence diets, as well as the known health and social and cultural benefits of subsistence foods, the 2004 State of Alaska Department of Health and Social Services report concluded that while additional research and monitoring is greatly needed, “POP levels documented in Alaska to date are not expected to cause adverse health effects. We continue to recommend the unrestricted consumption of traditional foods.”<sup>67</sup>

### PDBEs

Polybrominated diphenyl ethers (PDBEs) are related chemicals widely used as flame retardants and in other industries. PDBEs are an emerging concern, as their levels are increasing worldwide and they have been found in animals in the Canadian and Greenlandic arctic.<sup>80,81</sup> Data are extremely limited in Alaska, however.

## Mercury and Other Toxic Elements

### MERCURY

#### Background

Mercury is one of several naturally occurring heavy metals that are released into the environment by industrial activities such as coal burning and mining. Mercury is converted into its organic, and most toxic, form by microorganisms in water and sediments and then ingested by fish. This methylmercury accumulates as it travels up the marine food chain and, therefore, is found in highest concentrations in large marine predators. Mercury can cause severe toxicity to the central nervous system of human at high levels and more subtle neurodevelopmental effects at lower levels. Based on a number of studies of children exposed to mercury prenatally, the World Health Organization has established blood and hair mercury concentrations below which no effects have been observed, called the “no observed effect level,” or NOEL, for women of childbearing age.

#### Summary of Local Information About Mercury

In a 2002 analysis by the Alaska Native Tribal Health Consortium, both hair and blood samples taken from Barrow area mothers had very low levels of mercury, although sample sizes were small. In general, samples taken from rural Alaskan women contain levels well below the World Health Organization NOEL.

**Table 1.13: Maternal Blood Mercury Levels**

	Maternal Blood Mercury Levels (ppb)	Range	Sample size
World Health Organization NOEL	56		
Health Canada level of concern	20		
Barrow (2002) <sup>82</sup>	1.5	(0–4.5)	29
Bethel (2002) <sup>82</sup>	6.5	(0.6–21)	52

NOEL=No Observable Effects Level

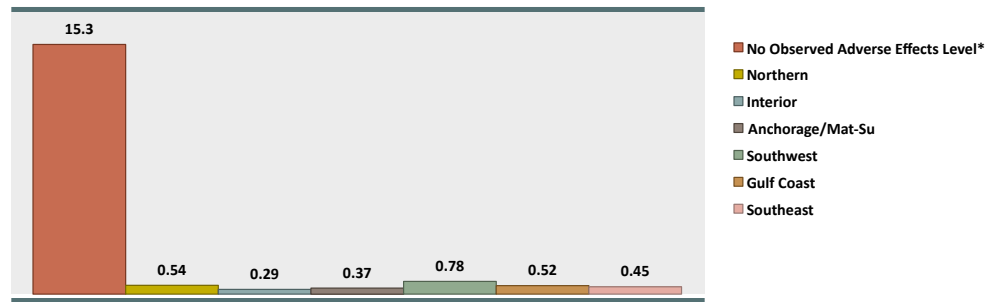
Ppb=parts per billion

Marine fish and mammals that feed higher on the food chain can be a source of mercury exposure for arctic residents. Bowhead whales, however, feed low of the food chain and have mercury concentrations that are “relatively miniscule compared to other marine mammals, ... below levels used by regulatory agencies for marketed animal products.”<sup>75</sup>

### State of Alaska Mercury Studies and Recommendations

In 2002, the Alaska Section of Epidemiology in the Division of Public Health began the Statewide Maternal Hair Mercury Biomonitoring Program. As of May, 2010, hair samples from 813 pregnant women and women of childbearing age had been analyzed. Mercury levels were found to be low in women from all over Alaska, including participants from the NSB, with no samples exceeding the NOELs established by any organization and the vast majority found to be far lower.

**Figure 1.42: Alaska Hair Mercury Biomonitoring Program (July 2002–May 2010): Median hair mercury concentration (ppm), by region**



\*As established by the Agency for Toxic Substances and Disease Registry (ATSDR). The World Health Organization has set the NOEL at 14 ppm and Health Canada at 10 ppm.

Northern region includes the North Slope Borough, Northwest Arctic Borough and Nome census area.

Participants included pregnant women and women of childbearing age.

Data source: *Alaska Hair Mercury Biomonitoring Program Update, July 2002-May 2010*.<sup>83</sup>

Based on the available evidence regarding mercury levels in Alaskan women as well as the proven health benefits of fish and marine mammals, in 2004, the State of Alaska recommended unrestricted consumption of fish and marine mammals from Alaskan waters for all residents.<sup>68</sup> In 2007, the state released updated guidelines recommending modest limitations on consumption of several species of large Alaskan fish for women who are pregnant or breastfeeding or who could become pregnant, and for children under 12 years of age. The guidelines did not make any specific recommendations in marine mammal consumption.<sup>84</sup>

### LEAD, CADMIUM, AND OTHER HEAVY METALS

Other heavy metals can produce a wide range of serious health problems, both in humans and animals. Industrial activities in the arctic region have raised concerns about potential heavy metal contamination in subsistence species, such as caribou. In response to local concerns about the health of local caribou herds, researchers measured concentrations of a number of heavy metals, including lead, cadmium, and arsenic in caribou carcasses from a large mortality event occurring near Point Hope and Cape Thompson in 1995 and compared them with levels in hunter-killed caribou from Barrow, Teshekpuk Lake, Point Hope, Anaktuvuk Pass, and Red Dog Mine areas. None of the levels found indicated concern for heavy metal toxicity.<sup>74</sup>

Lead is a heavy metal that produces a range of harmful human health effects, from subtle neurodevelopmental problems at low levels to seizures and death at high levels of exposure. With the transition to lead-free gasoline and paints in the latter half of the last century, the risk of lead exposure has decreased considerably nationwide. In Alaska, the primary route of non-occupational exposure has been found to be in indoor firing ranges (81% of cases). Alaska does not require universal lead screening for children. In 1993–1994, however, 967 Medicaid eligible children in 33 communities in Alaska, including Barrow and Nuiqsut, were offered blood lead screening. Blood lead levels in these children were found to be very low.<sup>85</sup> In a separate study, lead levels in salmonberries collected at Point Hope were found to be the lowest of all berries sampled in the region.<sup>86</sup> Analyses of bowhead whale liver and kidney found these tissues not to be a significant source of lead.<sup>75</sup> Although lead continues to be an important public health issue, it does not appear to represent a major health concern in the NSB at this time.

Cadmium is another element with a number of potential toxic effects. Sources of cadmium include natural sources, industrial pollution, certain paints and pigments, contaminated processed foods, and cigarettes. Cadmium can accumulate in the liver and kidney of adult animals, and it has been found to be present in bowhead whale liver and kidney at varying concentrations.<sup>75</sup> It is also present in the kidneys of North Slope caribou.<sup>74</sup> However, as North Slope residents usually do not consume kidney in large amounts, it is unlikely to pose a significant health risk.<sup>62</sup>

## *Environmental Radiation*

### BACKGROUND

Radioactive contamination in the arctic has been a recurring health concern among Alaska Natives and other arctic peoples. Prior to the Nuclear Test Ban Treaty in 1963, extensive surface nuclear weapons testing in the U.S. and Soviet Union resulted in worldwide radioactive fallout. Geographic and ecological factors in the arctic environment caused radionuclides from weapons testing to accumulate in the arctic food chain, particularly in arctic herbivores such as caribou that feed on lichen, which are known to collect radioactive fallout. Events such as the intentional release of radioactive materials near Point Hope in 1962, known as the Project Chariot dumping, contributed further to the fear and anger around radioactive contamination in the NSB. The known history of dumping and spillage of radioactive materials into the Arctic Ocean by the former Soviet Union has raised concerns about contamination of marine mammals.

Naturally-occurring radioactivity is an additional environmental source of radiation exposure for humans. Industrial activity can enhance exposure to naturally-occurring background radioactivity, and fossil fuel extraction is one potential source of these so-called TENORMs (technologically enhanced naturally-occurring radioactive materials).<sup>87</sup> Potential also exists for the effects of climate change to release existing radionuclides from the land, glaciers, and nuclear waste sites, although it is difficult to accurately predict or quantify these effects.<sup>87</sup> Radon is a naturally occurring radioactive gas found in nearly all soils. Radon can enter homes through cracks in foundations and walls and become trapped and inhaled by residents. Exposure to radon is one cause of lung cancer. The NSB is in a low potential zone for radon exposure, although homes with high levels of radon have been found even in low potential zones. Many houses in the arctic are built on pilings in the permafrost, thus decreasing the risk of radon exposure in homes.<sup>88</sup>

### HEALTH EFFECTS OF ENVIRONMENTAL RADIATION

All humans are exposed to small amounts of naturally-occurring radiation every day. At high dosages, radiation can cause serious acute health effects and even death. At lower dosages, radiation is known to increase the risk of certain cancers and birth defects.

Cancer risk calculations have determined that in a worst-case scenario (likely overestimating the true risk by a factor of 10–1000), a maximum of 3.6 cases of cancer would have developed in North Slope villages over a 20-year period because of radioactive fallout burdens.<sup>89</sup> No increase in radiation-related cancers has been detected in Alaska Natives, nor have residents of Iñupiat villages exposed to increased levels of radiation been found to have higher rates of the types of cancers that result from radioactive fallout.<sup>89</sup> Caution is warranted in drawing any conclusions from such epidemiologic data, however, due to very small numbers of cases in individual villages and to the relative rarity of cancers associated with radiation exposure. At the state level, there does not appear to be any excess in radiation-associated cancers in Alaska Native children, compared to U.S. White children.<sup>90</sup> Other contributions to cancer risk are discussed in detail in Chapter 2: Cancer.

A NSB-commissioned investigation also concluded that while the potential exists, the likelihood of effects to NSB residents from radioactive waste released by Russian nuclear power plants was low.<sup>89</sup> University-based researchers have conducted extensive sampling of marine mammals in the Arctic Ocean and determined that “the current human health risk from anthropogenic (man-made) radionuclides in marine mammal food resources is very likely to be negligible.”<sup>91</sup> In 1999, in response to resident’s concerns about the health and safety of local caribou herds, O’Hara et al.<sup>92</sup> conducted an analysis of radionuclides in caribou in the Point Hope region and reference sites, concluding that “no significant human health risk exists at present...these caribou are unaffected by radionuclides and safe for consumption.”<sup>92</sup> Health Canada has conducted research on caribou in northern Canada, which have been found to have higher levels than Alaskan caribou, and found that the amount of radiation produced in the body of someone eating a half pound of caribou every day is equivalent to about one chest x-ray per year. Based on the most current research, Health Canada concluded that caribou was a safe and nutritious food item.<sup>77</sup>

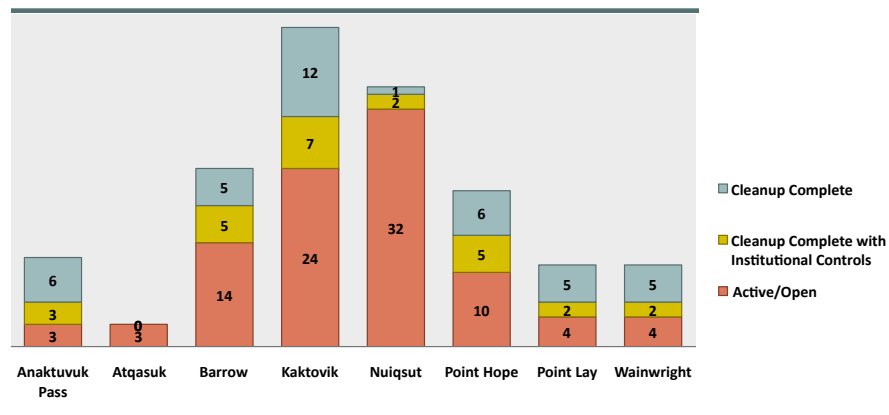
Although the available research suggests that the direct physical health effects of radioactivity in the NSB are very likely to be minimal, the impacts to psychological health may be substantial. An intimate relationship with the natural environment is fundamental to Iñupiat culture, and the perception that the land, water, and animals have been poisoned by radioactivity has possibly had a profound effect on overall well-being.

### Local Contaminated Sites and/or Spills

The arctic has an unfortunate history of contamination from military activity, mining, oil development and other human activity. The Alaska Department of Environmental Conservation operates the Contaminated Sites Program,<sup>93</sup> which provides regulatory oversight for the assessment, cleanup and management of contaminated sites to protect humans and the environment. The program maintains a publicly accessible database, the Contaminated Sites Database, which documents identified contaminated sites and tracks the cleanup process for each site. DEC gives 'Cleanup Complete' status when efforts to reduce hazardous substance contamination have achieved the most stringent levels established in state regulation, or the possibility of human exposure to any residual contamination is highly unlikely. The Department may allow hazardous substances to remain in the environment at a site if the contamination does not pose a risk to human health or the environment, but there may be conditions or restrictions associated with the site that require compliance by current or future owners/operators.

There are more than 3,300 known contaminated sites in Alaska including 166 in the NSB (if Deadhorse and Prudhoe Bay are excluded). The sites are not equally distributed among villages, however. As of December, 2009, Nuiqsut had the highest number of open (active) contaminated sites.<sup>93</sup>

Figure 1.43: Number of Contaminated Sites in the NSB, by Village



Alaska Department of Environmental Conservation Contaminated Sites Program Database of Contaminated Sites, accessed 12/8/09.

### 1.2.3. Health-Related Behaviors

Personal behaviors and choices affect many aspects of mental and physical health. Examples include tobacco, drug, and alcohol use, diet and exercise, sexual behavior, use of seatbelts and helmets, and utilization of preventive health services. Whereas these are individual behaviors, they are to a large extent determined by the social, cultural, economic, and physical environment in which people live.<sup>16</sup> For example, dietary choices are driven by many factors, including access to different foods, cultural norms and traditions, cost, personal preferences, marketing and advertising, education, and time and resources available for food preparation. Other health-related behaviors, such as smoking, alcohol, and drug use are also heavily influenced by a person's social, cultural, and economic environment. Across many cultures and populations, poverty and disadvantage are strongly associated with many unhealthy behaviors, while prosperity and social advantage are associated with healthy behaviors.<sup>16</sup>

The 2011 County Health Rankings places the NSB 23rd of 23 Alaskan boroughs and/or census areas in health behaviors and related health indicators, specifically adult smoking, adult obesity, excessive drinking, sexually-transmitted infections, and teen birth rate.<sup>11</sup> This section focuses on smoking, diet, and physical activity as major health-related behaviors. Although clearly affecting overall health in the NSB and elsewhere, a number of other important health-related behaviors are discussed in separate chapters: alcohol and drug use are discussed separately in the Behavioral Health chapter. Data on sexual behavior

are presented along with sexually-transmitted diseases in the Infectious Disease chapter. Data on safety practices such as helmet and seatbelt use are presented in the Injury chapter. Utilization of preventive health services such as cancer screening and prenatal care are presented in the Cancer and Maternal and Child Health chapters, respectively.

### 1.2.3.1. Tobacco

Tobacco smoking is associated with a multitude of health problems, including many cancers, diabetes, emphysema, heart disease and stroke, and even impotence. Thus, it is one of the most important modifiable behaviors influencing overall health and widely recognized as a top public health concern. Smoking rates vary widely by income, education, and employment status as well as race. In Alaska, BRFSS surveys have demonstrated that men and women with less than a high school education are four times more likely to smoke as are those who have graduated from college.<sup>2</sup> Low-income residents, both Native and non-Native, are more likely to smoke than higher income residents,<sup>94</sup> and those who are unemployed are nearly twice as likely to smoke as those who are employed.<sup>95</sup>

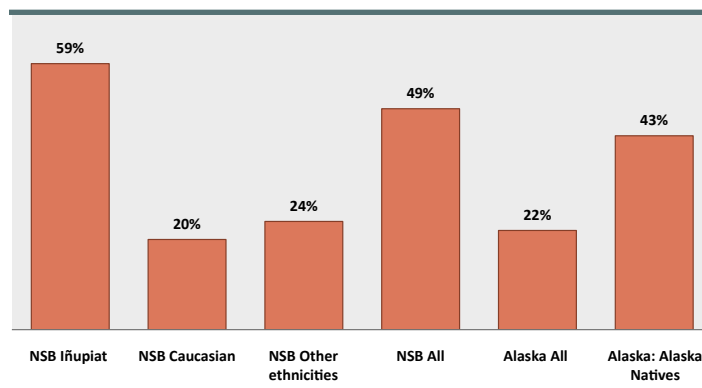
Tobacco was introduced to Alaska Natives in the 1700s, when it was used as an article of trade. Use of the highly addictive substance quickly became pervasive throughout rural Alaska. Today, rates of tobacco use among Alaska Natives are nearly twice as high as among non-Natives. Alaska Native youth also smoke at more than twice the rate of non-Native youth and have not experienced the decline in smoking rates seen in their non-Native counterparts.<sup>94</sup>

#### Tobacco Smoking Among Adults

##### *NSB Census Tobacco Smoking Data*

The 2010 NSB Census provided data on tobacco use in NSB villages. NSB adults (49%) were more than twice as likely to report smoking tobacco as did adults statewide (22%). Iñupiat adults in the NSB were almost three times as likely to report smoking as Caucasian adults in the NSB and also 37% more likely to smoke than were Alaska Natives statewide.<sup>4</sup>

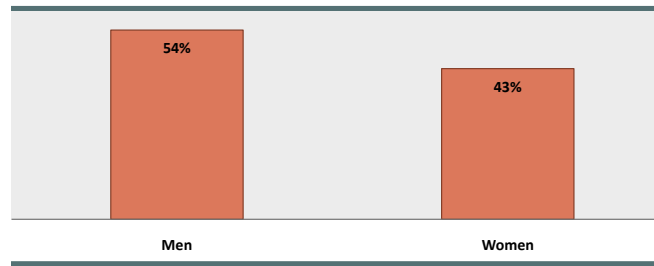
**Figure 1.44: Current Tobacco Use: Percent of Adults Who Report Smoking Tobacco (In Any Form), by Ethnic Group**



NSB data source: 2010 NSB Census.  
Alaska data source: 2008 Alaska BRFSS.

Adult males were significantly more likely to smoke than were adult females throughout the NSB.<sup>4</sup>

**Figure 1.45: Reported Current Tobacco Smoking Among NSB Adults, by Gender**



Data source: 2010 NSB Census.

Among household heads, reported tobacco smoking varied by age, with reported smoking dropping to 34% in the 65+ age group from roughly 50% in the other age groups.<sup>4</sup>

Among household heads, smoking rate was significantly associated with the village of residence, with Barrow household heads being the least likely to report smoking tobacco. Among Iñupiat household heads, the prevalence of tobacco smoking was also significantly related to village of residence, with slightly more than half (54%) of Point Hope household heads reporting smoking tobacco, and more than 70% of Iñupiat household heads reporting smoking in Kaktovik, Atqasuk, Point Lay, Nuiqsut, and Anaktuvuk Pass. Smoking rates were significantly lower in Barrow than in the other villages overall, looking at all ethnicities together and at Iñupiat residents only.<sup>4</sup>

**Table 1.14: Tobacco Smoking Among NSB Household Heads**

Smoke tobacco in any form:	AKP	Atqasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	All NSB
All household heads	65%	61%	44%	65%	62%	49%	58%	53%	50%
Iñupiat household heads	71%	73%	61%	75%	71%	54%	72%	59%	63%

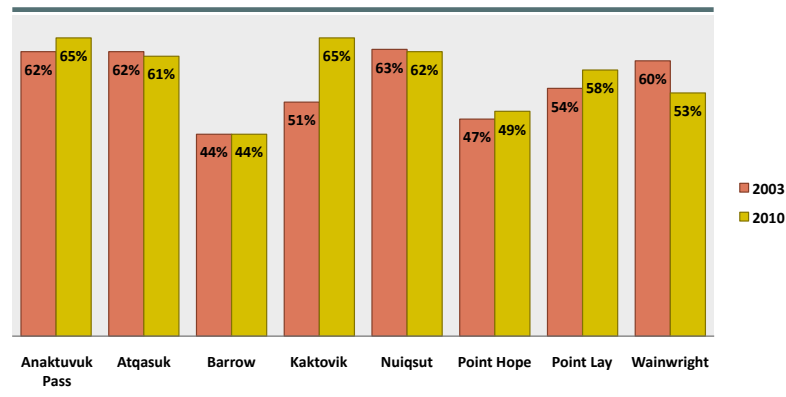
**Tobacco Smoking: Barrow vs. Other North Slope Villages**

	Barrow		Other North Slope Villages	
	All	Iñupiat Only	All	Iñupiat only
Adults: Smoke tobacco in any form	42%	56%	57%	62%

Data source: 2010 NSB Census  
AKP=Anaktuvuk Pass

Smoking rates among household heads did not decrease between 2003 and 2010.<sup>4,59</sup>

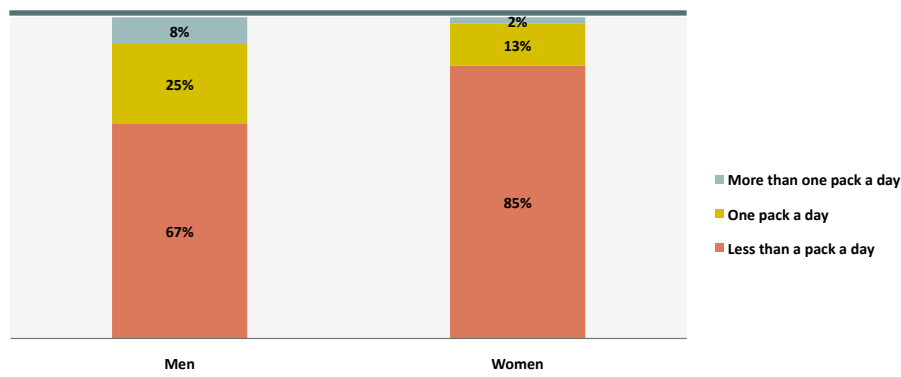
**Figure 1.46: Tobacco Smoking Among NSB Household Heads in 2003 and 2010, by Village**



Data sources: 2003 NSB Economic and Census Profile and 2010 NSB Census.

Among smokers, there was no statistically significant relationship between ethnicity and the amount smoked each day. Male household heads were significantly more likely to smoke at least one pack per day (20 cigarettes) than were female household heads.<sup>4</sup>

**Figure 1.47: Among NSB Household Heads Who Smoke Tobacco, Amount Smoked, by Gender**



Data source: 2010 NSB Census

Among Iñupiat household heads who smoked, the amount smoked was significantly related to village of residence, with Kaktovik household heads most likely to smoke at least one pack per day of cigarettes. Both in all ethnic groups combined and among Iñupiat only, household heads in Barrow were significantly less likely to smoke at least one pack per day than were their counterparts in the other North Slope villages overall.<sup>4</sup>

**Table 1.15: Amount Smoked: Among Iñupiat Household Heads Who Smoke**

	AKP	Atqasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	NSB
Percent who report smoking one or more packs per day	32%	27%	21%	43%	29%	24%	25%	22%	24%

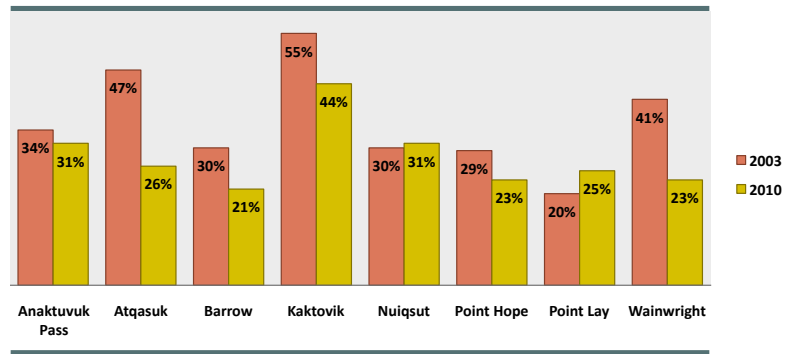
  

Barrow vs. Other North Slope Villages				
	Barrow		Other North Slope Villages	
	All	Iñupiat Only	All	Iñupiat only
Among household heads who smoke, percent who smoke one or more packs per day	22%	21%	29%	29%

Data source: 2010 NSB Census.  
AKP=Anaktuvuk Pass.

In the 2010 NSB Census, 71% of household heads who smoked reported a desire to quit, and a majority (62%) had tried to quit at least once in the past year. The *Healthy Alaskans 2010* target was for 90% of daily smokers in Alaska to quit for at least one day in the past 12 months.<sup>9</sup> Although smoking rates among household heads have not changed significantly between the 2003 and 2010 census, smokers in several communities appear to be smoking less in 2010 than in 2003.<sup>4,59</sup>

**Figure 1.48: Of NSB Household Heads Who Smoked, Percent that Smoked at Least One Pack of Cigarettes per Day in 2003 and 2010**



Data source: 2003 Economic and Census Profile and 2010 NSB Census.

### *Tobacco Smoking Data from BRFSS and Other Sources*

According to estimates from the Alaska BRFSS survey, the NSB has one of the highest smoking rates in Alaska, almost twice the statewide rate. Comparisons between individual communities must be made with caution, as sample sizes are small, and differences in the composition of the populations have not been completely controlled for. One can see, however, that smoking rates tend to be highest in the remote rural, predominantly Alaska Native regions of the state.<sup>11</sup>

**Table 1.16: Adult Smoking Rates in Alaska, by Borough and/or Census Area**

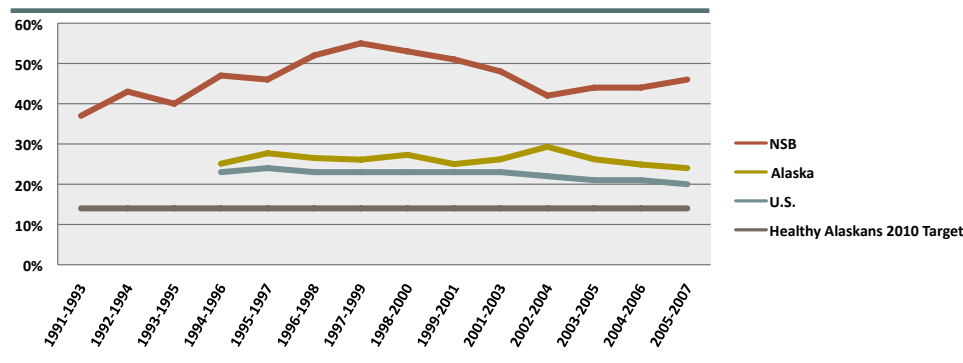
Place	Percent of Adults Who are Current Smokers (2003–2009)	Sample Size	Error Margin
Northwest Arctic	49%	330	43–56
Nome	46%	468	41–52
North Slope	44%	284	37–51
Yukon-Koyukuk	43%	378	37–49
Dillingham	40%	265	33–47
Wade Hampton	38%	286	31–45
Bethel	34%	758	30–38
Prince of Wales-Outer Ketchikan	34%	244	28–41
Aleutians West	33%	176	25–41
Matanuska-Susitna	28%	891	24–31
Ketchikan Gateway	25%	713	22–29
Skagway-Hoonah-Angoon	25%	157	18–34
Southeast Fairbanks	25%	239	19–32
Valdez-Cordova	25%	484	21–30
Kenai Peninsula	23%	2,541	21–25
Wrangell-Petersburg	23%	315	19–29
Fairbanks North Star	22%	3,354	20–24
Denali	21%	160	15–29
Kodiak Island	21%	614	17–25
Sitka	20%	393	16–25
Anchorage	19%	2,846	18–21
Haines	19%	130	13–28
Juneau	19%	1,409	17–22
Yakutat	16%	84	10–25

Data source: County Health Rankings, citing data from CDC BRFSS.

Among Alaska Natives, adult smoking rates in the Arctic Slope (NSB), Norton Sound, Aleutians and Pribilof regions are significantly higher than for Alaska Natives statewide ( $p < 0.05$ ).<sup>6</sup> Smokeless tobacco use is lower in the NSB than in some other parts of rural Alaska, with between 2% and 9% household heads in North Slope villages reporting using smokeless tobacco in 2003.<sup>59</sup>

BRFSS data also suggest that the high smoking rates among NSB adults are not trending downward.<sup>2</sup>

**Figure 1.49: Adult Tobacco Smoking Rates from BRFSS, 1991–2007**



U.S. Alaska data source: Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System (BRFSS).

NSB data source: Sub-regional analysis of Alaska BRFSS data provided by Alaska Department of Health and Social Services, Chronic Disease Prevention and Health Promotion, Division of Public Health.

NSB results are weighted according to the BRFSS rural region and not post-stratified to the NSB. Results are not age-adjusted.

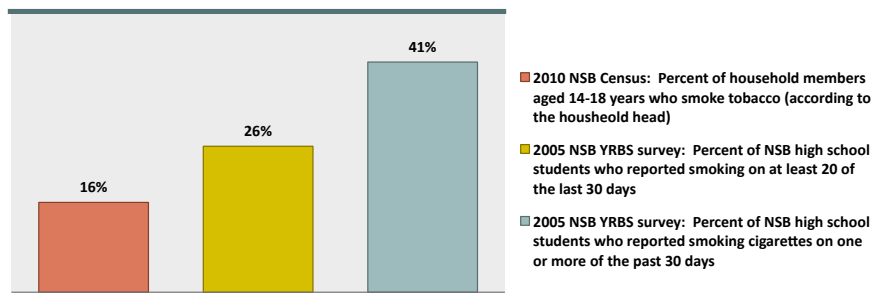
Alaska and U.S. data are for midpoint year of time period shown.

## Tobacco Smoking Among NSB Youth

### 2010 NSB Census and 2005 YRBS Youth Smoking Data

The 2010 NSB Census collected proxy data on child and/or teen tobacco smoking from household heads.<sup>4</sup> A 2005 anonymous survey of high school students, the Youth Risk Behavior Surveillance (YRBS) survey, yielded a far higher smoking rate among NSB teens than the results of the NSB census estimate, however, suggesting that proxy information from household heads likely considerably underestimates the number of adolescent and teen smokers in the NSB.<sup>36</sup> The Healthy Alaskans 2010 target was for no more than 17% of high school students to report smoking a cigarette during the last 30 days.<sup>9</sup>

**Figure 1.50: NSB Teen Smoking Rate Estimates**



Data sources: 2010 NSB Census, 2005 YRBS.

In the 2010 NSB Census, gender was not significantly associated with teen smoking rates. Ethnic group was, however. Iñupiat teens were significantly more likely to be reported to smoke than were Caucasian teens (18% vs. 12%, respectively). Reported teen smoking rates also varied widely across North Slope communities, with Nuiqsut having the highest reported tobacco smoking rate among teens and Barrow the lowest. Both among all ethnic groups combined and among Iñupiat teens only, reported smoking rates were significantly lower in Barrow than in the other North Slope villages overall.<sup>4</sup>

**Table 1.17: NSB Teen Tobacco Smoking, by Community of Residence**

	AKP	Atqasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	NSB
Percent of teens (aged 14–18 years) who smoke tobacco in any form*	32%	**	8%	26%	43%	12%	15%	31%	16%

Barrow vs. Other North Slope Villages				
	Barrow		Other North Slope Villages	
	All	Iñupiat Only	All	Iñupiat only
Percent of teens (aged 14–18 years) who smoke tobacco in any form*	8%	11%	25%	24%

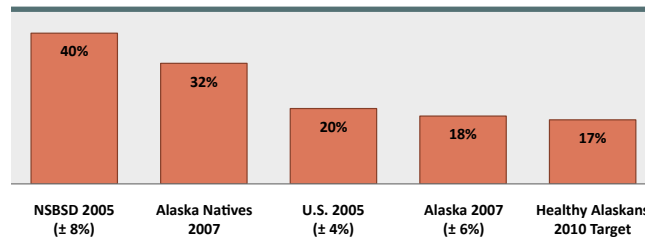
\*According to the household head

\*\* Cell-count less than five.

AKP=Anaktuvuk Pass

Based on the 2005 YRBS survey data, estimated smoking rates among NSB high school students are roughly double statewide and national estimates. Again, rates were similar among male and females students.

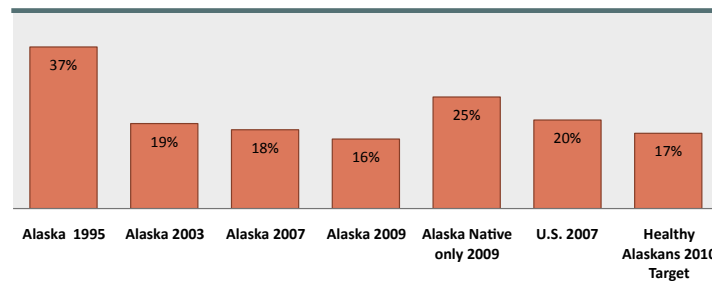
**Figure 1.51: Statewide and National Comparisons of Tobacco Smoking Among High School Students: Percent of students who reported smoking cigarettes on one or more of the past 30 days**



Data source: YRBS 2005 and 2007.

Youth smoking in Alaska has decreased considerably since the mid-1990s. In 2009, however, Alaska Native youth still smoked at significantly higher rates than their non-Native counterparts. Whereas overall, the smoking rate among Alaska high school students in 2009 achieved the 2010 Healthy Alaskans goal, this target has not been reached in certain subgroups, including Alaska Natives.<sup>9,36</sup>

**Figure 1.52: Smoking Among Alaskan High School Students, 1995–2009: Percent of students who reported smoking cigarettes on one or more of the past 30 days**



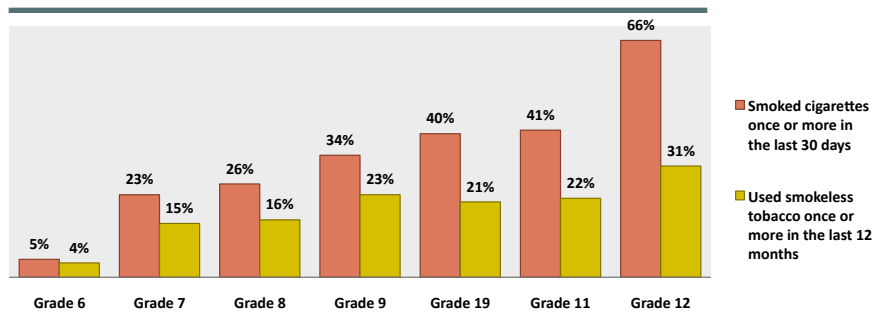
Data source: YRBS 2005 and 2007

In the 2005 YRBS survey, 26% of NSB high school students reported smoking cigarettes on at least 20 of the last 30 days; 8% of percent of NSB high school students reported using chewing tobacco, and 9% reported smoking cigars or cigarillos. Overall, an estimated 43.7% NSB high school students had used some form of tobacco in the past 30 days. Of students who had smoked in the past 12 months, four of five had tried to quit.<sup>36</sup>

### Other Youth Tobacco Use Data

Smoking starts early. According to a separate anonymous survey of NSB students, by 7th grade, about 25% of NSB children reported having smoked cigarettes. The 2004 survey data also suggest that smokeless tobacco use is fairly common among NSB students, with more than one in five high school students reporting using smokeless tobacco in the last 30 days.<sup>128</sup>

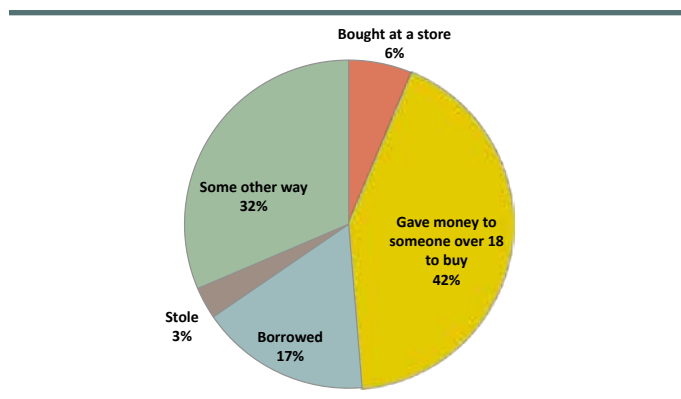
**Figure 1.53: Youth Tobacco Use in the NSB School District (2004)**



Data source: NSB Developmental Assets Survey 2004.

Of the NSB high school students who smoked, the most common way cigarettes were obtained was by giving an adult money to purchase them. Only a small minority (6%) reported buying cigarettes at a store.<sup>36</sup>

**Figure 1.54: How NSB High School Students Obtained Cigarettes**

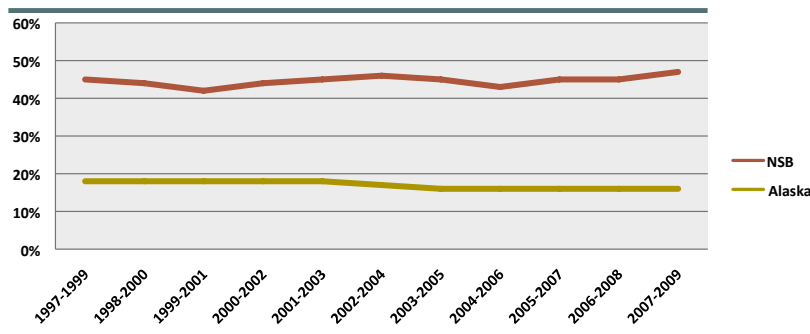


Data source: YRBS 2005.

### Prenatal Tobacco Smoking

Reported rates of smoking during pregnancy are also high in the NSB, roughly three times statewide rates, and do not seem to be declining. Smoking during pregnancy is associated with a number of poor birth outcomes.<sup>5</sup>

**Figure 1.55: Prenatal Smoking, 1997–2009: Percent of mothers who reported smoking tobacco during pregnancy**



Data source: Alaska Bureau of Vital Statistics Birth Profiles.

### 1.2.3.2. Diet and Nutrition

Diet and exercise have long been known to play an important role in health. The nationwide obesity epidemic and associated increase in obesity-related health problems, such as diabetes, have brought nutrition and physical activity into the national spotlight. Diets in rural arctic regions consist of both traditional, or subsistence, foods, and non-traditional, or market foods. Subsistence foods and activities have been associated with lower rates of impaired glucose tolerance (a risk factor for diabetes)<sup>97-100</sup> and high blood pressure,<sup>101</sup> and a favorable cholesterol profile.<sup>102</sup> Moreover, traditional subsistence foods are believed by many Iñupiat and other Alaska Natives to be the very foundation of health and well-being. According to one NSB resident:<sup>32</sup>

All these animals that they ate are very rich in minerals and vitamins.... We were the healthiest people with good set of teeth before coffee, sugar, etc. We hunted by walking; cutting up seal was an exercise in itself; picking greens; berries and other edible plants; getting ice for water; maintaining dogs for hunting; checking the nets for fish. Iñupiat were very active and maintained their overall health.

Good nutrition in childhood is particularly important. Nutrient deficiencies can result in conditions such as anemia and bone disorders that affect physical development. Inadequate nutrition can also impair a child’s cognitive development and school performance. The overuse of high-calorie, low-nutrient foods and beverages has also contributed to the national epidemic of childhood obesity, which often begins well before a child even begins school.

With increasing modernization, many arctic communities have come to rely more on store-bought foods, replacing the relatively healthy and nutrient-rich traditional subsistence foods with market foods that are often high in sugar, calories, and unhealthy types of fat. The often highly-processed foods available in Alaskan village stores are typically low in nutrients as well. A number of important dietary surveys have been conducted in rural Alaska; however, data from North Slope communities are extremely limited. Findings from other regions of Alaska suggest a higher reliance on non-traditional, or “store” foods by younger residents,<sup>103,104</sup> and a general trend has also been observed of increasing store-bought food and sugared beverages compared with past nutritional surveys.<sup>105</sup> Considerable dietary variation exists among different regions of Alaska, however, and findings from a sample of regions cannot reliably be generalized to all of rural Alaska or to North Slope communities.

#### Subsistence Food in the NSB

Subsistence food use in the NSB remains high. Some residents believe that, with the increasing cost of living in the NSB, many Iñupiat are relying more heavily on a subsistence way of living.<sup>32</sup> Data from the 2003 and 2010 NSB Census, presented in Table 1.18, demonstrate persistently high levels of subsistence food use among Native NSB households. The proportion of households reporting that more than half of their diet came from subsistence foods was higher than in two smaller separate surveys from 1977 and 1988.<sup>106</sup>

#### Subsistence Food Use Data from the NSB Census

More than 95% of NSB Iñupiat household heads in every age group reported that their households used subsistence foods in 2009. A high percentage of NSB Iñupiat respondents reported that at least half of their household food came from local subsistence resources. Older Iñupiat household heads in the NSB were more likely to report high levels of subsistence food use than were younger household heads, however. Among Iñupiat households in most villages, households with heads who are employed full time and those with higher education levels still relied heavily on subsistence resources,<sup>4</sup> supporting other research that has found that employment and wage income opportunities do not adversely affect subsistence participation.<sup>22</sup>

**Table 1.18: Subsistence Food Use Among NSB Iñupiat Households: Percent of households for which at least half of household diet came from subsistence foods in the previous year**

	AKP	Atqasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	NSB
2010 NSB Census	77%	67%	60%	76%	79%	72%	67%	75%	67%
2003 NSB Census	79%	67%	66%	76%	67%	75%	79%	82%	

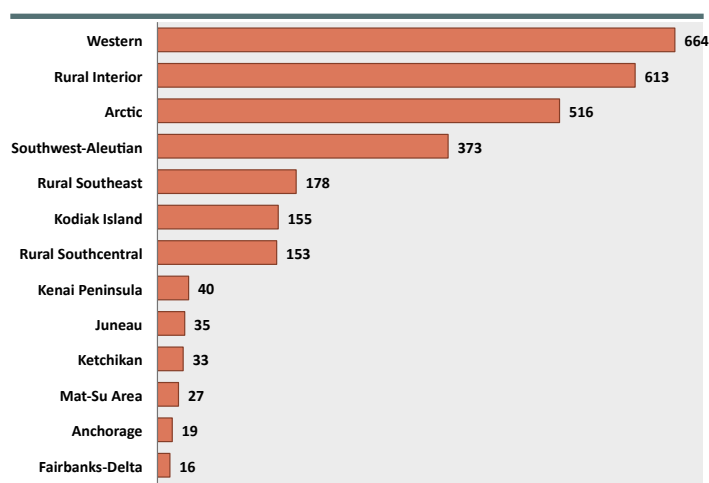
Data source: 2003 NSB Economic Profile and Census, and 2010 NSB Census  
AKP=Anaktuvuk Pass

## Harvest Data

The NSB Department of Wildlife Management, in collaboration with other organizations and researchers, has collected extensive harvest survey data on the large variety of subsistence species for each of the North Slope villages.<sup>107</sup>

Harvest data also provide some measure of comparison of subsistence food harvest across the state. Although harvest data are imperfect measures of actual wild food consumption, they suggest that wild, or subsistence, foods continue to comprise a substantial portion of the diets of many rural Alaskans, particularly in western, interior, and northern (arctic) regions. Subsistence food use in the arctic region is more than twice the amount of store-bought meat, fish, and poultry bought by the average American per year.<sup>108</sup>

**Figure 1.56: Wild Food Harvests in Alaska in the 1990s, by Region (pounds per person per year)**



Data source: Wolfe, R. Subsistence Food Harvests in Rural Alaska, and Food Safety Issues, 1996. ADFG Division of Subsistence.

## Nutrients in NSB Subsistence Foods

Whereas the nutritional content of arctic subsistence foods has not been fully analyzed, an increasing amount of information on this topic has become available in recent years. In general, arctic subsistence foods, including many that are harvested and used in North Slope communities, have been found to be nutrient-dense, providing important sources of protein and energy as well as many other important nutrients. Among these nutrients are iron, zinc, selenium, vitamins A, E and C, and particularly the essential long-chain omega-3 fatty acids.<sup>75,109</sup> These have been suggested or shown to be important in the prevention of many chronic diseases, including elevated blood pressure and cholesterol, heart disease, stroke, diabetes, arthritis, depression, and some cancers.<sup>110</sup> Omega-3 fatty acids are also important for healthy fetal development.

Information on the composition and nutritional content of the diet of NSB residents is limited, but the research that has been conducted locally has confirmed the high nutritional value of a number of major subsistence foods in the NSB. The variety of species used for subsistence in the North Slope is large—encompassing marine mammals such as whale, walrus, and seal; caribou and other land mammals; and a wide variety of birds, fish, plants and berries. Moreover, the variety and balance of subsistence foods harvested varies considerably across the eight North Slope villages.<sup>107</sup> An essential subsistence food resource in the NSB, the bowhead whale has been the particular focus of recent subsistence nutrient research. Analyses of bowhead whale tissues that are used as food, including the skin and blubber (mak-tak), skeletal muscle, and some organ meats, have found them to be rich in protein, the healthy omega-3 fatty acids,<sup>75,110</sup> and important elemental nutrients.<sup>110</sup> The skin of bowhead whale was also found to contain a considerable amount of dietary fiber,<sup>111</sup> which has generally been found to be low in other Alaskan subsistence diets<sup>112,105</sup> as well as typical American diets. An analysis of seal and sheefish in prepared forms traditionally consumed in the Kotzebue area also found them to be rich in omega-3 fatty acids and other essential nutrients.<sup>69</sup>

The muscle of bowhead whale has been found to be much richer in iron than most store-bought meats.<sup>75</sup> This finding is of particular importance given the high prevalence of iron deficiency observed in rural Alaska and among Alaska Natives in particular.<sup>113,114</sup> Using stored serum samples from the 1980s, researchers found 31% of female Alaska Natives and 20% of male Alaska Natives in the Barrow service unit to have evidence of iron deficiency (ferritin level <12). These estimates are similar to statewide estimates for Alaska Natives from the same time period.<sup>115</sup> The cause of iron deficiency in these populations is not completely understood, but inadequate nutritional intake does not appear to explain the high documented levels. Chronic gastrointestinal infection with the *Helicobacter pylori* bacteria is thought to play a role in many cases.<sup>114</sup>

The oils and blubber of arctic marine mammals and fish have also been found to contain vitamin A and D.<sup>109</sup> Vitamin D is of particular importance, as people living at high latitudes with low exposure to sunlight, increased skin pigment, and low intake of vitamin-D-fortified dairy products are at particularly high risk of vitamin D deficiency. Roles for vitamin D have been suggested in immune function, cancer prevention, and rheumatoid arthritis in addition to its known role in prevention of skeletal disorders such as childhood rickets.

Again, because the nutritional content of the large variety subsistence foods used has not been completely analyzed, the nutritional value of the NSB subsistence diet may yet be underestimated.

### **Fruit and Vegetable Consumption**

Although not a large part of traditional arctic diets, research has shown that a diet rich in fruits and vegetables can have many positive health effects, from reducing the risk of certain types of cancer to alleviating symptoms such as constipation. National guidelines recommend at least five servings of fruits and vegetables per day. The high cost and relatively limited availability of fruits and vegetables in the NSB makes this recommendation particularly challenging. The availability of fruits and vegetables in some of the outlying North Slope villages is extremely limited. For example, Atqasuk does not have a commercial village store, and residents generally must fly out to buy groceries.<sup>116</sup> Fruits and vegetables that are available in village stores are often of poor quality as well.<sup>116</sup>

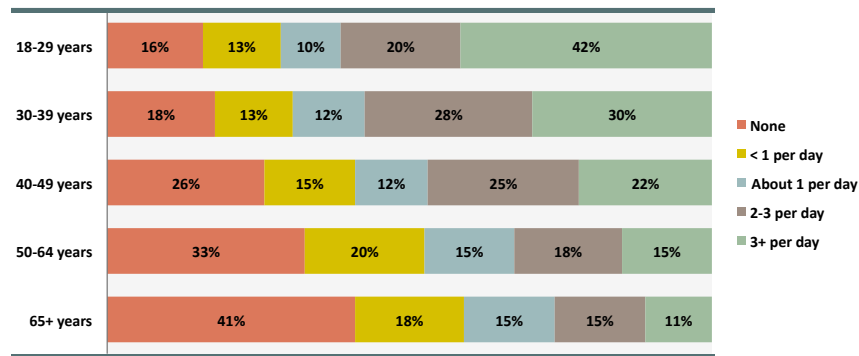
According to combined BRFSS data from 1991–2007, fewer than one in four NSB adults reported eating the recommended five servings of fruit or vegetables per day.<sup>2</sup> This proportion is similar to state and national estimates, however. In the 2005 YRBS survey, fewer than one in five NSB high school students reported eating five servings of fruits and vegetables a day and 18% had not eaten any fruit in the past seven days.<sup>36</sup>

### **Soda and Sugar-Sweetened Beverage Consumption**

Sugar-sweetened beverages (SSBs) such as soda pop, fruit punch, sports and energy drinks, and sweetened milk, tea, and coffee drinks, are a major source of added sugar and calories in the U.S. and typically have minimal nutrient value.<sup>117</sup> Consumption of these beverages has increased dramatically in the last 30 years. High consumption of these beverages is associated with a number of health problems such as obesity, diabetes, cardiovascular disease, gout, and fatty liver disease, and dental caries (cavities).<sup>117</sup> Recent research also suggests an association between soda consumption and pancreatic cancer.<sup>118</sup>

In the 2010 NSB Census, consumption of sodas and other SSBs among household heads was strongly associated with age. Younger age groups reported significantly higher levels of consumption than older groups. Household heads were asked only about their own consumption; thus, data on children and teens are not available.<sup>4</sup>

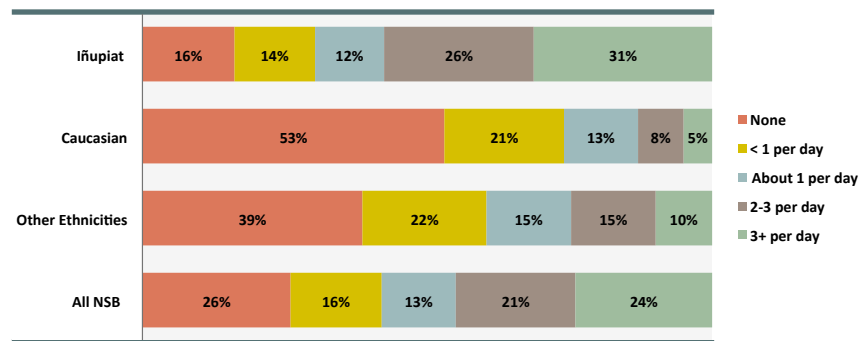
**Figure 1.57: Average Number of Sodas and Other SSBs NSB Household Heads Report Drinking Each Day, by Age Group**



Data source: 2010 NSB Census.

Iñupiat household heads in the NSB reported significantly higher levels of SSB consumption than did Caucasians and those of other ethnicities. Iñupiat household heads were more than six times as likely as Caucasian household heads to report drinking more than three of these beverages per day (31% vs. 5%, respectively). The relationship between ethnic group and consumption of sodas and other SSBs was statistically significant in all age groups.<sup>4</sup>

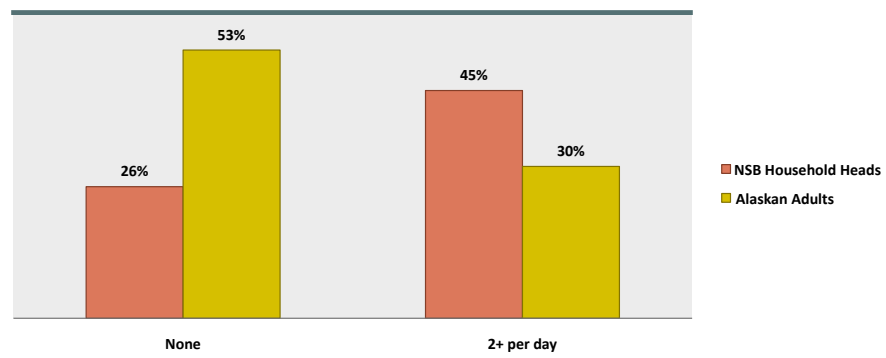
**Figure 1.58: Average Number of Sodas and Other SSBs NSB Household Heads Report Drinking Each Day, by Ethnic Group**



Data source: 2010 NSB Census.

NSB household heads were about half as likely to report drinking, on average, no sodas or other SSBs per day in the last week as adults statewide. NSB household heads were also more likely to report drinking two or more of these beverages per day than were adults statewide.<sup>2,4</sup>

**Figure 1.59: Average Daily Number of Sodas and Other SSBs Consumed by NSB Household Heads and Alaskan Adults**



NSB data source: 2010 NSB Census.

Alaska data source: 2009 Alaska BRFSS (Data cited in "Obesity Facts: Sugar-Sweetened Beverages in Alaska," State of Alaska Department of Health and Social Services, August, 2011).

Consumption of sodas and SSBs was significantly associated with community of residence among Iñupiat household heads. Of all the villages, household heads in Anaktuvuk Pass and Atqasuk were least likely to report drinking two or more of these beverages per day (49% and 48%, respectively) and most likely to report drinking none (25% and 21%, respectively). Iñupiat household heads in Nuiqsut were least likely to report drinking, on average, no sodas or SSBs per day (11%). More than 60% of Iñupiat household heads in Nuiqsut, Point Hope, Kaktovik, Point Lay reported drinking two or more of these beverages per day. Household heads living in villages other than Barrow, on the whole, were significantly more likely to report higher levels of consumption of these beverages than were their counterparts in Barrow. This was true when comparing only Iñupiat household heads as well.<sup>4</sup>

**Table 1.19: Soda and Sugar-Sweetened Beverage Consumption Among Iñupiat Household Heads**

Reported average daily consumption	AKP	Atqasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	NSB Iñupiat
None	25%	21%	16%	15%	11%	16%	18%	14%	16%
Two or More	49%	48%	53%	65%	68%	66%	63%	64%	58%

Barrow vs. Other North Slope Villages: All Household Heads and Iñupiat Household Heads				
	Barrow		Other North Slope Communities	
	All	Iñupiat only	All	Iñupiat only
None	29%	16%	21%	16%
Two or More	39%	53%	54%	62%

Data source: 2010 NSB Census.  
AKP=Anaktuvuk Pass

Rural Alaskans have been found to drink three times as much soda per day as their urban counterparts,<sup>117</sup> and two-year-olds in northern and southwestern regions of the state are twice as likely to regularly consume SSBs (58%) as two-year-olds statewide (29%).<sup>117</sup> In 2009, Alaska Native high school students were more likely than their white counterparts to drink at least one can/glass of SSB per day (62% vs. 43%, respectively).<sup>36</sup> Reasons for the high consumption of soda and SSBs in rural Alaska are multiple and not completely understood. Some reasons may include the relative ease and low cost of transporting and storing these beverages, limited availability of potable and palatable drinking water in some regions, social and cultural norms, and their low cost per calorie in areas of relatively high food insecurity.

## Food Security

Simply having reliable access to enough food is an important driver of nutritional behavior and overall health. The term “food security” refers to the ability to procure enough food, at all times, for an active healthy life for all household members. Although food security is not an individual health-related behavior but rather a social, political, and economic phenomenon, a discussion of food security is included in this section because of its close association with diet and nutrition.

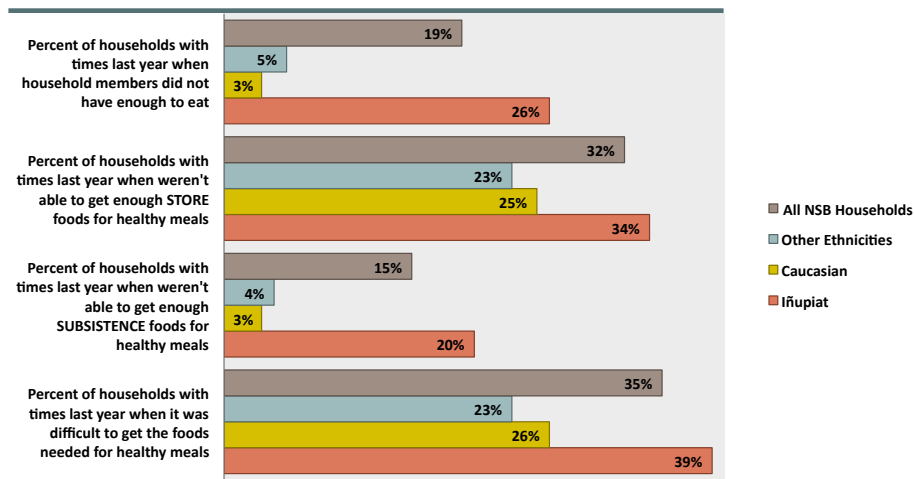
Food insecurity—the inability to access enough food at all times to meet basic needs—is a major public health concern and, paradoxically, contributes to obesity and chronic diseases like diabetes because people who do not always have enough food tend to choose cheaper, high calorie food with low nutrient value.<sup>119</sup> “Research indicates the following negative outcomes are associated with food insecurity among children: poor health status; more frequent colds, ear infections, and other health problems; greater incidence of hospitalization; higher levels of aggression, hyperactivity, and anxiety as well as passivity; difficulty getting along with other children, and increased need for mental health services; impaired cognitive functioning and diminished capacity to learn; lower test scores and poorer overall school achievement; and increased likelihood of repeating a grade, school absences, tardiness, and school suspension.”<sup>119</sup> Increasing food security in Alaska was one of the *Healthy Alaskans 2010* goals. The target set was for 94% of Alaskan households never to lack access to enough food to meet basic needs.

In the 2010 NSB Census, household heads were asked several questions about their household’s ability to procure enough food to sustain a healthy life for all household members.<sup>4</sup>

- Overall, 35% of NSB household heads reported that there were times last year when they found it difficult to get the food needed to make healthy meals.

- Of the household heads who reported difficulty getting the food needed to eat healthy meals, 43% overall and 51% of Iñupiat household heads reported that this was because they could not get enough subsistence foods. The vast majority of household heads (90%) who reported difficulty getting food for healthy meals stated that it was because (at least in part) they couldn't get enough store foods.
- Overall, 19% of all household heads and 26% of Iñupiat household heads reported times last year when household members did not have enough to eat.

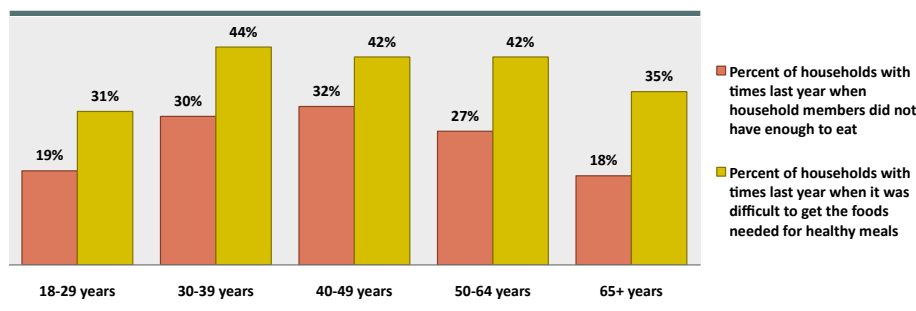
**Figure 1.60: Food Insecurity in the NSB, by Ethnic Group of Household Head**



Data source: 2010 NSB Census.

None of the measures of food insecurity was significantly associated with the gender of the household head. Iñupiat household heads in the middle-aged groups were most likely to report that at times, household members did not have enough to eat. There was a similar relationship between age group and difficulty getting foods for healthy meals. The associations between age of household head and both measures of food insecurity were statistically significant. Age group was not significantly associated with whether Iñupiat household heads reported difficulty getting enough subsistence or store foods.<sup>4</sup>

**Figure 1.61: Food Insecurity Among Inupiat Households, by Age Group of Household Head**



Data source: 2010 NSB Census.

Levels of reported food insecurity varied widely across the North Slope. Iñupiat household heads living in villages other than Barrow were significantly more likely than those living in Barrow to report food insecurity. They were more likely to report difficulty getting foods for healthy meals, more likely to report difficulty getting enough subsistence foods, and more likely to report household members who at times did not have enough to eat, compared with Iñupiat household heads living in Barrow.<sup>4</sup>

Among Iñupiat household heads, those living in Anaktuvuk Pass were the most likely to report difficulty getting food for healthy meals, and a very high proportion reported this difficulty to be caused by not being able to get enough subsistence foods. Almost half of Iñupiat household heads in Anaktuvuk Pass reported household members who, at times last year, did not have enough to eat.<sup>4</sup>

**Table 1.20: Food Insecurity in Households with Iñupiat Household Heads**

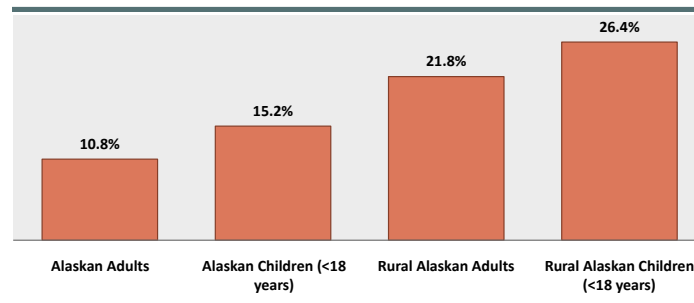
	AKP	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	Villages other than Barrow
Percent of households that, at times last year, found it difficult to get the foods they needed to eat healthy meals	62%	56%	33%	39%	38%	38%	50%	47%	46%
If yes, because not able to get enough subsistence foods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

Data source: 2010 NSB Census  
 AKP=Anaktuvuk Pass

**Subsistence food-sharing networks:** The sharing of subsistence foods is extremely important in North Slope communities, both culturally and as protection against food insecurity. The 2010 NSB Census found that 94% of households reported that they shared subsistence foods within their own community and well over half (64%) reported that they shared subsistence foods with other NSB communities. Three of five household heads aged 65 years and older reported that at least half of their subsistence diet came from other households.<sup>4</sup> Surveys conducted by the NSB Department of Wildlife Management have also documented substantial sharing of whale and other subsistence foods within communities, with other North Slope communities, and with family members living in urban areas of the state.<sup>107</sup>

**Food insecurity in Alaska:** Food insecurity in Alaska is recognized as a significant and growing problem, and in 2006, the Alaska BRFSS added a food insecurity module to its annual survey. Statewide and national food insecurity data are not easily comparable to NSB census data because the state and national surveys did not ask about subsistence food security, the role of food-sharing, or the lack of availability of many foods in remote communities. For reference, 10.6% of Alaskans were found to be food insecure, meaning that at times members of the household were uncertain of having, or unable to acquire, enough food for all household members. This number is similar to the U.S. estimates. Approximately 4% of households were found to have “very low food security,” with disrupted eating patterns or reduced food intake. Estimates for rural Alaska, however, are dramatically higher, with 21.8% of adults and 26.4% of children being food insecure.<sup>119</sup> Although the NSB census data are not directly comparable with statewide estimates, the 2010 NSB Census results suggest that food insecurity is a serious problem across the North Slope and, like in other rural areas, exists at levels higher than statewide estimates.

**Figure 1.62: Food Insecurity in Alaska (2006): Percent of residents living in households that were food insecure**



Data source: “Food Insecurity in Alaska,” Alaska Division of Public Health, Section of Chronic Disease Prevention and Health Promotion.

### 1.2.3.3. Physical Activity

Like a healthy diet, physical activity has innumerable health benefits, both mental and physical. Regular exercise lowers the risk of diabetes, heart disease, and cancer and can also improve mood and concentration and help problems like back pain. Many factors influence the amount of exercise a person gets,

including social norms, educational and income level, occupation, leisure time, health problems, and physical environment.

Increased reliance on snowmachines, four-wheelers, and other motorized vehicles, have changed physical activity patterns in rural Alaska and may be having significant effects on health. An inverse relationship has been shown between non-mechanized physical activity and the prevalence of glucose intolerance (a risk factor for diabetes)<sup>98</sup> and hypertension in Alaska Natives.<sup>101</sup>

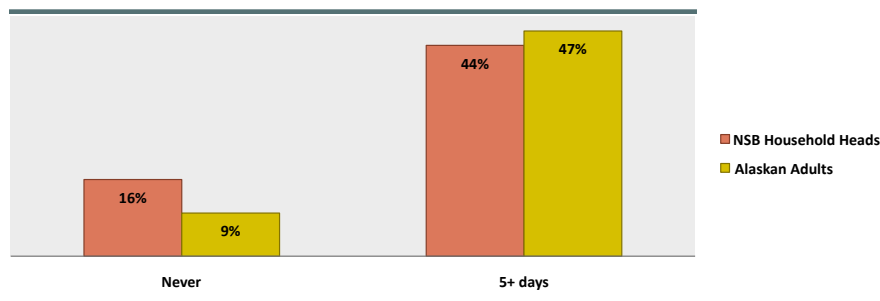
### Physical Activity Among Adults

The North Slope Borough, Native Village of Barrow, and other local organizations have made increasing physical activity in the community a goal. Publically available indoor exercise facilities are available to residents of Barrow. A local collaborative coalition organized the Move-It campaign in 2010, a program aimed at facilitating and encouraging regular exercise for local residents. For one week each year just after Christmas, Barrow holds games for residents of all ages, focusing on traditional sports and skills. The Native Village of Barrow also organizes various adult sport leagues.

#### Physical Activity Data from the 2010 NSB Census

The 2010 NSB Census included one question on physical activity, asking specifically about the frequency of moderate-intensity physical activity such as outdoor work, brisk walking, heavy housework, or other activities that cause an increase in breathing or heart rate. Based on 2010 NSB Census data, NSB household heads appear to be roughly equally as likely to report getting the recommended 150 minutes of moderate physical activity (at least 30 minutes five days per week) as adults statewide were in 2007.<sup>24</sup> The *Healthy Alaskans 2010* target was for at least 40% of adults achieve this recommended amount of physical activity.<sup>9</sup>

**Figure 1.63: Physical Activity Among NSB and Alaska Adults:**  
*Number of days per week with at least 30 minutes of moderate physical activity*



NSB data source: 2010 NSB Census.  
Alaska data source: 2007 Alaska BRFSS.

In the 2010 NSB Census, reported frequency of physical activity was significantly associated with community of residence among household heads. Residents of Atkasuk were most likely to report getting, on average, no moderate exercise of 30 minutes duration per week and least likely to report five days or more per week (31%). Household heads in Point Lay and Wainwright reported the highest levels of exercise, with 59% reporting getting at least 30 minutes of moderate exercise on five or more days per week. Compared with their counterparts in Barrow, Iñupiat household heads in the other villages overall reported a significantly higher number of days that included at least 30 minutes moderate physical activity.<sup>4</sup>

**Table 1.21: Physical Activity Among Household Heads: Number of days per week, on average, get at least 30 minutes of moderate physical activity**

	AKP	Atkasuk	Barrow	Kaktovik	Nuiqsut	Point Hope	Point Lay	Wainwright	All NSB
"Never"	18%	24%	16%	17%	19%	10%	8%	11%	16%
"Five days per week or more"	39%	29%	41%	50%	44%	49%	59%	59%	44%

**Barrow vs. Other North Slope Villages**

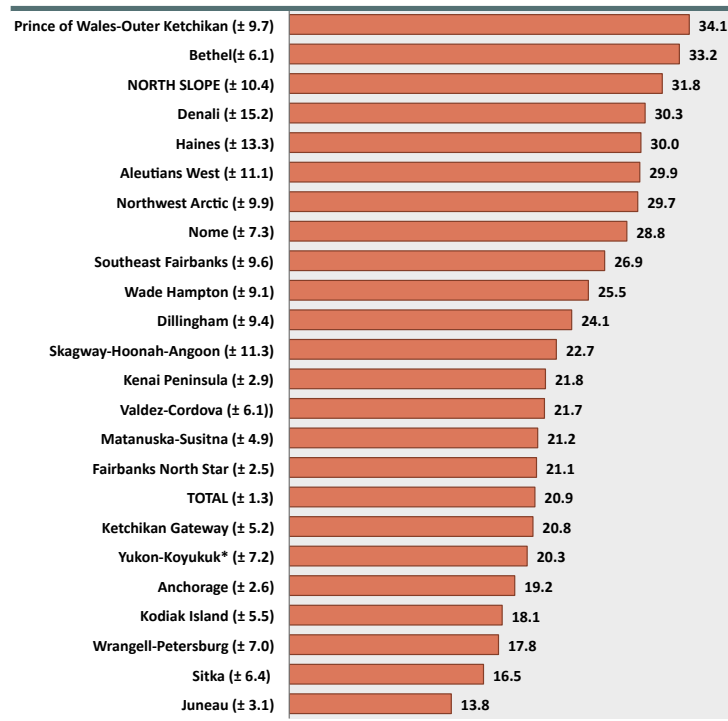
	Barrow		Other North Slope Communities	
	All	Iñupiat only	All	Iñupiat only
"Never"	16%	20%	15%	15%
"Five days per week or more"	41%	41%	48%	49%

Data source: 2010 NSB Census  
AKP=Anaktuvuk Pass

**Physical Activity Data from the Alaska BRFSS**

According to three years of combined BRFSS data, NSB adults are more likely than adults statewide to report no leisure-time physical activity, with almost one in three NSB adults reporting no leisure-time physical activity.<sup>2</sup> The *Healthy Alaskans 2010* target was for less than 15% of Alaskan adults to report no leisure-time physical activity.<sup>9</sup> It is possible that physical activity in the NSB is more likely to be incorporated into the work and daily routines of the subsistence way of life. Statewide, a greater percentage of Alaska Natives reported engaging in regular, moderate physical activity than do U.S. adults of all races.<sup>96</sup>

**Figure 1.64: Percent of Adults Reporting No Leisure-Time Exercise, 2005–2007**



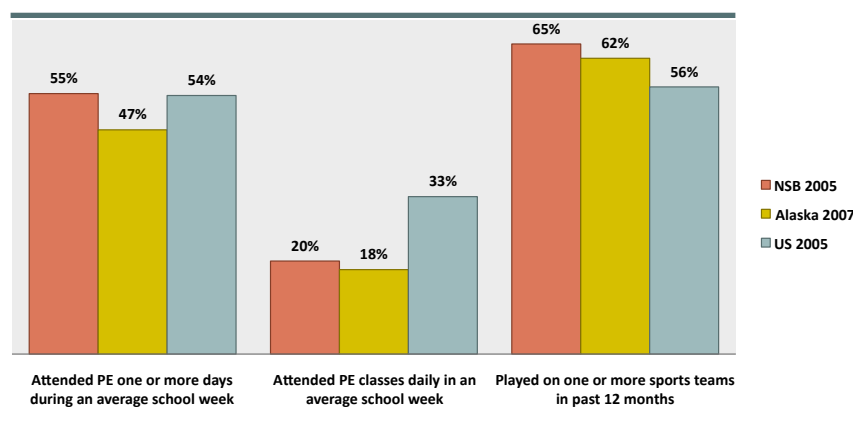
Data source: Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System (BRFSS).  
Alaska Department of Health and Social Services, Chronic Disease Prevention and Health Promotion, Division of Public Health.  
Results are weighted according to the five Alaska BRFSS regions and not post-stratified to individual census areas. Results are not age-adjusted.

## Physical Activity Among Youth

Lifestyle patterns, such as regular exercise, are often established during the childhood and teenage years. The NSB Healthy Communities Initiative has contracted with an outside group that has successfully organized numerous basketball teams and sports camps for youth across the North Slope in an effort to increase youth participation in healthy physical activity. The Native Village of Barrow also organizes little league teams and other organized sports opportunities for children and teens.

In the 2005 YRBS survey, 58% of NSB high school students (41% of females and 64% of males) reported exercising vigorously for at least 20 minutes at least 3 out of the past 7 days. The Healthy Alaskans 2010 target for this indicator was 85%. A slightly larger proportion (64%) of NSB high school students (57% females, 70% males) reported exercising either vigorously for at least 20 minutes at least three days per week or moderately for 30 minutes at least five days per week. Only 14% of students reported getting no exercise in the last seven days. About half of NSB high school students attended physical education (P.E.) classes at least once a week in 2005, similar to state and national estimates. Only one in five attended P.E. daily however, and this was significantly lower than the national average. The *Healthy Alaskans 2010* target was for at least 45% of high school students to attend P.E. classes daily. A significantly higher percentage of NSB high school students did report playing on a sports team than did their nationwide counterparts, however.<sup>36</sup>

**Figure 1.65: Physical Education and Sports Participation Among High School Students**

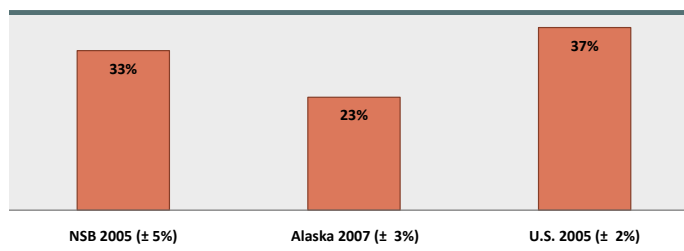


Percentage of U.S. students who reported attending P.E. classes daily was significantly higher than NSB and Alaska percentages ( $p < 0.05$ ). Percentage of U.S. students who reported playing on a sports team was significantly lower than NSB and Alaska percentages ( $p < 0.05$ ).

Data source: YRBS 2005, 2007

Excessive time spent watching television or playing video games can interfere with getting enough physical activity. It may also have detrimental cognitive effects. In the 2005 YRBS survey, high school students in the NSB were significantly more likely to report watching three or more hours of TV than in the statewide sample, but the percentage was not significantly different from the national sample.<sup>36</sup>

**Figure 1.66: Screen Time Among High School Students: Percent of students who watched three or more hours of TV on an average school day**



NSB percentage was significantly higher than the Alaska percentage ( $p < 0.05$ ).

Data source: YRBS 2005 and 2007.

## 1.2.4. Access to Health Services

### 1.2.4.1. Overview of Health Services and Access to Care in the NSB

Overall, 97% of NSB household heads report having some form of health insurance<sup>4</sup>—including the eligible use of Indian Health Service, Medicare, Medicaid, and private insurances—compared with 83% of adults statewide.<sup>4</sup> The remote location of the NSB presents many challenges to the delivery of health care services, however. Travel by plane is necessary for many services, and extended stays away from family are common. The associated costs and inconveniences of travel can be a substantial barrier to patients.<sup>120</sup> Similar to many other remote rural Alaskan regions, the NSB suffers from chronic health care workforce shortages. It is categorized as a medically underserved area and a health professional shortage area by the U.S. Health Resources and Services Administration.<sup>121</sup> Hospital and clinic facilities in Barrow experience high turnover of providers, nurses, and ancillary health care personnel. At times, severe nurse staffing shortages at Samuel Simmonds Memorial Hospital (SSMH) have necessitated transferring all women to Anchorage or Fairbanks for deliveries,<sup>122</sup> and as of March, 2010, only half of physician positions were filled by permanent staff doctors.<sup>123</sup> The public health nursing program, too, has suffered extreme staffing shortages in recent years.<sup>124</sup>

In an effort to increase the local health care labor workforce, the NSB has implemented the Allied Health Training Program at Ilisagvik College, a two-year tribal college located in Barrow. The college provides associate degree programs, certificates, and training in various health fields to college and high school students, as well as summer camps. The NSB Health Department also offers college students a chance to work in any of the eight Health Department facilities to gain on-the-job experience in their respective fields.

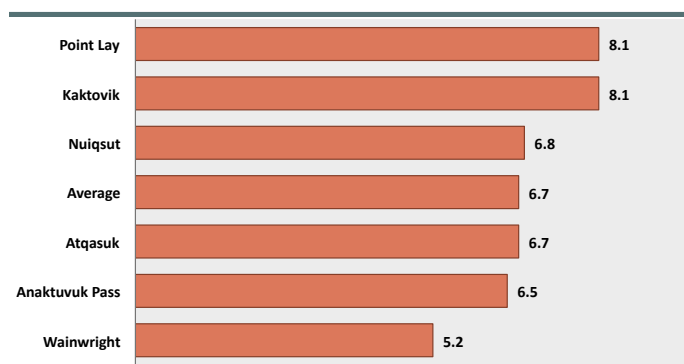
The NSB and Arctic Slope Native Association share responsibility for providing health care services to the residents of the North Slope Borough. Other than the municipality of Anchorage, the NSB is unique in Alaska in that it offers services similar to city and county governments in other states. The NSB also oversees programs—for example the Community Health Aide and Behavioral Health Programs—that are typically run by tribal health organizations in other rural parts of the state. This unique distribution of responsibilities creates challenges in communication and coordination of services. In multiple interviews with health care providers, health department managers, public health nurses, and tribal leaders, concerns were raised regarding fragmentation of services and a need for improved communication between tribal and Borough organizations, departments, programs, and services. Care providers who were interviewed for this report were concerned about how difficult it can be for patients, especially young mothers and frail elders, to navigate multiple different programs, often in separate geographical locations.

### 1.2.4.2. Health Services Provided or Coordinated by the Borough

#### Village-Based Primary and Urgent Care Services

With the exception of those living in Barrow, residents of the NSB primarily access the health care system through the village clinics, staffed by community health aides. The health aides are non-medical personnel, typically from the communities in which they work, who are trained in the provision of basic health services according to protocols and under the supervision of medical providers in Barrow. A small minority (5–8%) of health aide visits are for preventive services. The utilization of these village clinic services varies across NSB communities.<sup>125</sup>

**Figure 1.67: Average Annual per Capita Number of CHAP Clinic Visits in NSB Villages, 2005–2008**



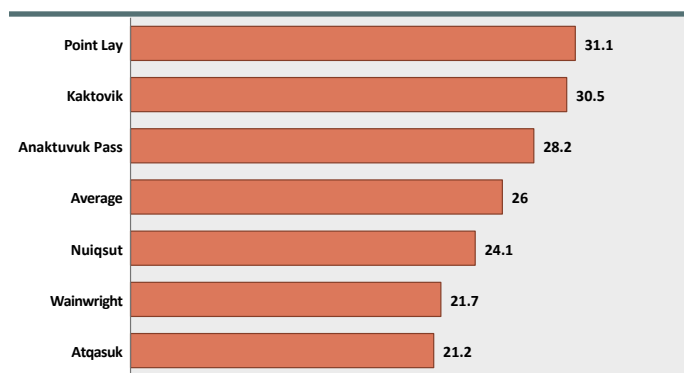
Data source: NSB Community Health Aide Program monthly reports.

### Emergency and/or First Responder Services

A high level of coordination is necessary for urgent medical transport from outlying villages to Barrow and from Barrow to referral centers in Fairbanks and Anchorage. The NSB Department of Health and Social Services provides first-responder services through its Community Health Aide Program (CHAP) to all NSB villages, with the exception of Point Hope. Health aides consult with physicians in Barrow, with the exception of Point Hope, where Maniilaq physicians in Kotzebue are generally consulted, and Anaktuvuk Pass, where physicians with Tanana Chiefs Conference in Fairbanks are consulted regarding incoming medevacs. Unlike in some regions of rural Alaska, all the North Slope villages have health aides, with only rare days without health aide availability.<sup>125</sup>

The NSB Fire Department and NSB Search and Rescue Department provide ambulance and medevac services for NSB communities. Emergency transport to the Alaska Native Medical Center in Anchorage is coordinated between ASNA physicians in Barrow, accepting ANMC physicians in Anchorage, and NSB Search and Rescue or a contractor, Guardian Flight service. Utilization of medevac services varies among North Slope villages.<sup>125</sup>

**Figure 1.68: Average Annual Number of Medevacs per 100 Persons in NSB Villages, 2005–2008**



Data source: NSB Community Health Aide Program monthly reports.

### Preventive Health Care

The NSB Health Department provides direct health care services to North Slope communities through the Public Health Nursing program, which provides:

- Well-child screenings and immunization
- School-based screenings and immunization campaigns
- Screening, treatment, and contact investigation for tuberculosis and sexually transmitted infections
- Health education and referrals

Community Health Aides also provide some preventive care, with an estimated 5–8% of visits being for preventive care.

## Integrated Behavioral Health Services

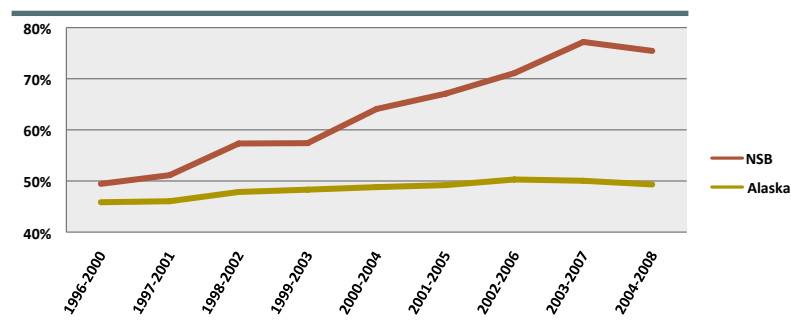
There are five core behavioral health programs provided by the NSB. The NSB Integrated Behavioral Health Services (IBHS) include

- *Behavioral Health Services*: IBHS provides emergency services, prevention, outreach, psychiatric services, treatment, and support for individuals, families, and communities affected by mental health and substance abuse issues
- *Arctic Women in Crisis (AWIC)*: AWIC is an eight-bed emergency shelter for victims of domestic violence and sexual assault, and oversees the Domestic Violence Intervention Program for men and women. AWIC also has prevention and outreach programs, and AWIC staff travel to outlying villages regularly.
- *Gathering Place*: The Gathering Place is a day program open to the mentally disabled and provides counseling services, case management, and assistance with state and local resources, in addition to assisting clients with daily living skills and providing a safe, social environment.
- *Iñupiat Teens Taking Control (ITTC)*: ITTC is an alternative youth program designed for adolescents 14–18 years of age that offers substance abuse assessments, individual, and group counseling, off-slope referrals and enhanced life skills education.
- *Children & Youth Services (CYS)*: CYS is a 10-bed emergency shelter for children 17 years of age and younger, where family or foster placements are not available.

## Nutrition Services

The NSB Women, Infants and Children (WIC) program is operated by the NSB Health Department. WIC is a national nutrition program for infants and children up to age 5 years, and pregnant, postpartum, and breastfeeding women who meet financial eligibility guidelines. WIC provides nutritional risk assessments, nutrition and breastfeeding education, free healthy food vouchers, and referrals to other health and social services agencies. Between 1996 and 2008, reported WIC enrollment in the NSB increased 53% in the NSB.<sup>126</sup>

**Figure 1.71: Prevalence of WIC Participation in the NSB:**  
*The percent of NSB women (delivering live births) who report participating in WIC, 1996–2008*



Data source: Alaska Pregnancy Risk Assessment Monitoring System (PRAMS). NSB-specific data for this report was provided by the Alaska Department of Health and Social Services, Maternal and Child Health Epidemiology Unit of the Alaska Division of Public Health.

## Optometry Services

Optometry services are provided by the Wellness Center Eye Clinic, a NSB Health Department program.

## Services for Infants with Special Needs

Although it does not formally coordinate the program, the NSB Health Department provides local housing and acts as a local contact for the Infant Learning Program. The North Slope Infant Learning Program (ILP) provides specialized services for children birth to 3 years of age who have developmental delays and/or disabilities. Parents with concerns about their child's development may request a developmental screening or evaluation to determine if their child is eligible for services. If the child is eligible and families choose to enroll in the Infant Learning Program, the ILP provider will meet with them to develop an individual plan of services for their child. The primary provider will assist with service coordination and provide information and support to promote the child's development. Consultations by physical, occupational and speech/language therapists may be available. No family will be denied services because of inability to pay. The North Slope Infant Learning Program has an office in Barrow and travels to the North

Slope communities of Anaktuvuk Pass, Atkasuk, Barrow, Kaktovik, Nuiqsut, Point Lay and Wainwright. It is a component of ACCA (Alaska Center for Children and Adults), a non-profit agency in Fairbanks that also provides Infant Learning Program services in the Fairbanks North Star Borough, Delta-Greely School District and the Copper River area.

It is estimated that at least 8% of children aged birth to 3 years may be eligible for specialized services in the NSB because of developmental delay or conditions that put them at risk for developmental problems, based on a model that incorporates community variables known to predict eligibility for Infant Learning Program services such as OCS reports of harm, prenatal care and preterm birth rates, poverty rates and education levels. The prevalence of children served in the NSB was 1.67% in December of 2003, however, suggesting that a high proportion of eligible children may not be receiving services. Regional or local differences in percent of children served may reflect not only the prevalence of children meeting eligibility requirements, but also “local system structure and visibility, availability of providers, community knowledge, etc.”<sup>127</sup>

### **Services for Elders and Disabled Adults**

The NSB Health Department also runs the Senior Program, which provides services such as Meals on Wheels, Handicap/Elder van, temporary and long-term housing in Barrow, and safety programs.

## **1.2.4.3. Health Services Provided or Coordinated by ASNA**

### **Outpatient Medical Care**

ASNA primary care physicians and mid-level practitioners provide general outpatient and prenatal care at SSMH for residents of the NSB, except those living in Point Hope and Anaktuvuk Pass, who usually receive direct medical services from other tribal health organizations. Prenatal care was previously provided by the NSB Public Health Nursing Program but is now the responsibility of ASNA. ASNA providers also provide consultation and supervision for the Community Health Aides, although the CHAP program is operated by the NSB Health Department. Specialty physicians hold clinics on a periodic basis in Barrow, but NSB residents must travel to Anchorage for many specialty services, including high-risk obstetrics, intensive care, surgery and other major procedures, and in-depth consultations. These referrals are coordinated by ASNA providers and case managers.

### **Preventive and Screening Services**

In 2005, ASNA assumed responsibility for the Screening for Life program, providing breast and cervical cancer screening to NSB women via mammograms, breast exams, and pap smears. Previously, the NSB Public Health Nursing Program was contracted to provide these services. In July 2009, the program received additional funding from CDC to provide colorectal cancer screening and will be expanding services to include colonoscopies to males and females age 50 and over.

### **Inpatient Hospital Care and Ancillary Services**

Constructed in 1963 and operated by ASNA since 1966, Samuel Simmonds Memorial Hospital in Barrow has a small (14-bed) inpatient facility, providing general medical inpatient care, inpatient pediatric care, and telemetry to residents of the NSB. The hospital also provides a 24-hour emergency room, obstetric care and uncomplicated deliveries, optometry, pharmacy, laboratory, audiology, physical therapy, respiratory therapy, and radiology services. Diabetes education and nutritional services are also provided. A new, larger hospital building is currently under construction.

### **Dental Health Services**

SSMH Dental Clinic provides dental services for Barrow and outlying villages. The dental clinic staff also runs oral health promotion programs through local schools and other community-based programs. Dental specialists travel to Barrow periodically to provide specialty dental care.

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