Introduction

This volume is the fourth in the series of ***The North Slope Borough Economic Profiles and Census Reports (NSBEP&CR)***. It retains and expands the ability to compare aspects of life in the eight communities of the North Slope and thus provides an increased ability to accomplish a more detailed analysis of changes occurring in those communities. This volume also continues the increased focus on the eight separate communities as opposed to the more in-depth analysis of the North Slope Borough itself, in the belief that understanding the dynamics of change in the communities provides a stronger basis for analysis of the socio-economic and cultural changes occurring throughout the North Slope Borough.

Among the changes in this volume is an increased emphasis on collection of data regarding the total household income of residents, which required expanding the number and type of questions asked of respondents in that section to enable a *calculated total household income* to be determined in addition to the *estimated total household income* found in the earlier volumes.   The methodology used in this effort is explained in more detail later in this section.

This volume also includes an expanded section on the health of North Slope Borough residents on a community-by-community basis. This section was analyzed by Jana Mcaninch as a part of the NSB Health Department's *Baseline Community Health Analysis* project funded in part with NPR-A grant funds made available through the Department of Commerce, Community and Economic Development.

It also features an analysis of recruitment into subsistence activities in the communities of the North Slope. We also asked additional questions relating to changes in subsistence activities that may be related to climate change and/or industrial activities. The section on respondents' satisfaction with schools in their community was also expanded to include perceptions of the reasons for students dropping out of school before graduating, of parents' understanding of whether and how children are connected and involved in their schools, and whether innovations and changes in the schools' curricula are meeting the needs of students.

The expectation at the beginning of the data collection effort was that a serious decline in the population of the separate communities as well as the entire North Slope Borough would be found, based on statistics available from the Alaska Division of Labor and Workforce Development as well as anecdotal evidence from several generally reliable sources. The thought was that the economic downturn nationally, in conjunction with rising energy costs, had resulted in a large exodus of individuals from rural Alaska communities (particularly Alaska Natives) to Anchorage and other cities in the state. Relying on residents in each community to indicate which housing units were vacant and which occupied, the field workers attempted to survey all household heads in the communities. Based on the completed interviews, a determination of the total population of the community was made using the approach also explained in the methodology section below

This iteration of the North Slope Borough's series of Economic Profiles and Census Reports has taken longer to complete than normal, due at least in part to the fact that the

second phase of the project, originally due to begin in July 2010, did not begin until February 23, 2011. A second delaying factor concerned unresolved differences between the study and the Alaska Division of Community and Regional Affairs within the Department of Commerce, Community and Economic Development (DCCED) regarding the population count and methodologies used. The Division (and the Department) challenged the methodology used in this report, the numbers of both occupied and vacant housing units in the North Slope Borough communities and the population determinations and subsequent conclusion reached as a result.

The Demography and Population Estimates section below addresses the approach taken by this study to obtaining, through an interview schedule, valid and reliable estimates of the population of North Slope Borough communities and an estimate of the total Borough population. The intent was to interview the universe of North Slope Borough heads of households, with the knowledge that subsistence cycles and social patterns would make it virtually impossible to contact all heads of household within the time frame of the fieldwork, which took place beginning December 4, 2009 and continuing until the end of April. Field workers attempted to contact all household heads in each community, successfully interviewing 1,604 or 70.6 percent of the estimated 2, 271 occupied households in the Borough.   A subsequent audit of occupied households found there were an additional 69 occupied households, increasing the total to 2,340 occupied households. This was determined by reviewing a list of total electrical hookups supplied by the Borough, the results of which were then clarified and refined through an independent audit conducted for the North Slope Borough by a hired consultant. The total resulting 2010 population estimate for the North Slope Borough is 7,998 residents.

The DCCED disagrees with this estimate for at least two reasons. First, DCCED states that their population data is based on the United States Census data, which concludes that the resident population of the North Slope Borough is approximately 7,256[1], based upon the 2010 United States Census and data from the Alaska Department of Labor and Workforce Development.   Second, the DCCED claims that U.S. Census workers interviewed every occupied household in the Borough and therefore that their total population numbers are correct, while this study consists of a sample of households on the North Slope and is therefore neither accurate nor acceptable. This conclusion is demonstrably incorrect for at least 2 reasons. First, according to the data released by the Bureau of the Census, the participation rate in the North Slope Borough was only 36 percent[2], which clearly challenges the claim that 100 percent of the occupied households in the borough were interviewed. In addition, our rate of return or number of households interviewed was 70.6 percent of our original estimate of 2,271 occupied households. Second, and equally important, our 'sample' of 63 percent of the 1,057 household heads in Barrow contained data on 2,028 self-identified Iñupiat, a number that exceeds that cited by an article in the Anchorage Daily News   which claimed, according the US Census initial population report on the number of Iñupiat residing in Anchorage (4,018) is...."*double the number of self-described Inupiat in Barrow (1,989)*."[3] (Emphasis added).

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[1] Memo from Susan Bell, Commissioner of the Department of Commerce, Community and Economic Development, June 21, 2011.

[2] http://2010.census.gov/2010census/take10map/2010textview.php

[3] Anchorage Daily News, July 10, 2011.

A third area of disagreement between DCCED and this report concerns the former's claim that the population has not increased, but instead has decreased between 2003 and 2010. Supporting that argument is a study by the Alaska Department of Labor and Workforce Development using student attendance numbers from the North Slope Borough School District to demonstrate that the falling birth rates alleged for the North Slope are reflected in falling school enrollments and that rural populations have been declining or remaining stationary since 1990.[4] While falling birth rates and migration to urban areas may account for most of the changes in other rural areas, there has not been a significant decrease in births in the North Slope for the decade between 1998 and 2008 [see Table 1]. The birth and fertility rates from 2006-2008 are higher than the period 1996-1998.

Table 1. Comparative Birth Rates for North Slope Borough (NSB), Alaska, & the United States*

Category	NSB 1996-98	NSB 2006-08	Alaska 1996-98	Alaska 2006-08	US Rate 2007
Crude Birth Rate**& Crude Births	20.2 445	27.2 551	16	16.5	14.3 4,317,000
Teen (15-19) Birth Rate	78.8	92.7	50.0	41.5	42.5
Fertility Rate***	95.8	132.3	71.7	79.3	69.5
*Sources: State of Alaska Vital Statistics and Statistical Abstracts 2010. **Crude birth rates are live births per 1,000 population ***Fertility rates are the number of live births per 1,000 females age 15-44					

Rather than a decrease, there has been an increase of 177 individuals in the 0 to 9 age cohort on the North Slope between 2003 and 2010. This translates to a decrease of the non-Iñupiat population in these age cohorts of 25 individuals and a net increase of Iñupiat children in this category of 202. Sixty-four percent of that increase is in the 0 to 4 age group, which would not be contained in the School Attendance data. Birth rates are increasing and the total numbers are skewed by a decrease among non-Iñupiat children, reflective of the overall decline in the non-Iñupiat population of the Borough between 2003 and 2010.

Finally, none of the studies to date take into account the in-migration (or *back-migration*) of North Slope Iñupiat families as a result of the improved employment opportunities and the decrease, however slight, in the cost of living on the North Slope over the past two to three years.

Methodology

Demography: Population Estimates:

A critical element and objective of the 2010 North Slope Borough (NSB) Census is to provide valid and reliable estimates of each community's total population and a population

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[4] Alaska Department of Commerce, Community, and Economic Development (November, 2009) **Rural Population Report: The Trends are Changing.** (Alaska Community and Regional Affairs)

estimate of the entire NSB. The research design for this project called for a total sample of all existing NSB households, what the Alaska Department of Fish and Game (ADF&G), refers to as a "Census" sampling approach. Field leaders and field researchers attempted to contact and interview every household on the North Slope. Of course this is not possible given the mobile nature of contemporary human populations. Some households in occupied dwellings were not at home and despite repeated attempts could not be contacted or interviewed. These households missed during the period of field research in their community could have absent for a variety of reasons, including medical, vacation, attendance at meetings, statewide school events, shopping and so forth.

Field researchers attempted to keep track of occupied dwellings through a variety of techniques including community-mapping efforts, detailed log sheets (enumerating the number of contact attempts) and by the use of on-the-ground, well informed community coordinators. In addition, every incentive was provided for household's to participate – including advertising and communication by the NSB leadership as to the importance of their participation. Finally, the project provided all respondents cash remuneration for their participation, a significant incentive.

Naturally not all resident households could be contacted and/or interviewed. However, to deal with this uncertainty demographers and statisticians have methods to deal with this uncertainty. This project chose to use the standard error of the proportion (because of significant amounts of nominal data in the NSB questionnaire to set bounds around our sample estimates (i.e., small [or lower case] n, all the households we interviewed) with respect to the population estimates (large [or upper case] N all the households in a community including those not interviewed. As it turns out statisticians have found that errors are normally distributed and one can calculate how confident (in our case 95% [plus/minus two standard errors) we are that our sample estimate of population was to the actual population parameter.

The formula for the standard error of the proportion (s.e.) is as follows:

$$\text{s.e.} = \sqrt{(1 - f)\left(\frac{pq}{n-1}\right)}$$

where f=n/N is the ratio of our sample to the total population and p and q are the probabilities associated with the proportion of some variable (e.g., the presence or absence of a health morbidity such as high blood pressure). During these calculations we took the most conservative possible outcome for p and q - 50:50 {i.e., 50% had high blood pressure}. The symbol n is our sample size (number of households interviewed) and the symbol N is the total number of households in the community (the population parameter).

Crucial to the calculation of the standard error is the determination of large [upper case] N. How can we know what the actual numbers of occupied dwellings are in a community? With respect to this project we initially obtained the large N from the total number of residential electricity hookups in the community – gathered from power equalization records and carefully analyzed to eliminate possible bias, e.g. from over enumeration through the inclusion of commercial hookups.

These figures for N and our sample sizes (n) were input into the formula detailed above and standard errors were calculated for each community (see the Table below). Our estimates met disagreement with the Division of Community and Regional Affairs (DCRA) statisticians who felt the electrical hookup numbers were inflated by a number of non-

residential dwellings and also because this projects estimates were higher than numbers derived from state permanent fund rolls and from numbers provided by the 2010 U.S. census.

While feeling entirely confident about our figures, nevertheless the NSB responded to DCRA criticism by contracting for an independent consultant to map and enumerate every occupied dwelling for each community within the NSB. This project, to be described below, had population estimates remarkably close to the electrical hookup methodology. In fact, although community estimates varied somewhat the actual total aggregation of the NSB population varied between both methodologies by less than a handful of individuals!

Barrow will be used as an example of the project's methodology to estimate the population and as a basis on how to interpret the table below. In calculating community population we took the mean household size, e.g., 3.3 people per household for Barrow (derived from our 943 interviews) and added and subtracted 1.9% of 3.3. The 1.9 percent represents that given our sample proportion (n/N) we can be 95 percent certain that the actual household average is within plus or minus 1.9 percent of the 3.3 sample parameter. That is we are 95 percent confident that the population mean for household size falls within the interval 3.24 people per household and 3.36 people per household. Multiplying the community N (electrical hookup method) by both these numbers gives us a confidence interval for Barrow's population of between 4709 and 4879.

To be conservative one might take the lower bound (4,709) although because N from the mapping project is higher than the electrical hookup N in Barrow the upper limit seems more reasonable. Ultimately, we accepted the N resulting from the mapping project which, after adjusting for an increase of occupied housing in Barrow and decreases in Nuiqsut and Wainwright, arrived at a total of 7998 individuals in the 2340 occupied housing units in North Slope Borough communities.

Table 2: North Slope Occupied Housing Units (Sample and Total) and Population Estimates

Community	HH Sample Size (n)	#HH's Estimate (N)*	Standard Error of Proportion {+/-}**	Sample - Ave. Household Size	Low Pop. Estimate	High Pop. Estimate
Anaktuvuk Pass	80	114	5.2%	3.61	349	388 (389)
Atqasuk	61	70	4.1%	3.79	247	268 (268)
Barrow	943	1507	1.9%	3.3	4709	4869 (4974)
Kaktovik	68	93	5.2%	3.44	272	300 (300)
Nuiqsut	103	114	4.2%	3.64	436	474 (415)
Point Hope	165	211	3.6%	3.84	774	831 (831)
Point Lay	50	73	7.5%	3.7	263	274 (274)
Wainwright	134	158	3.8%	3.46	552	596 (547)
North Slope Borough	1604	2340	1.4%	3.45	7602	8000 (7998)

Numbers in parentheses are the results of the independent consultant's mapping process of occupied housing units in each community. *Residential Electrical Meters ** See text for formula

Dependency Ratio's:

Each community chapter contains a table that compares the proportion (%) of the total community population that fall into various age intervals (cohorts). These age intervals are selected to create a total dependency ratio, in the case of our calculations this is represented by the equation:

  individuals 0-15 years of age + individuals ≥ 65/individuals 16-64.

The child dependency ratio is calculated by dividing the number of individuals 0-15 by the number of individuals 16-64. Similarly the age dependency ratio is calculated by dividing the number of individuals' ≥ 65 by the number of individuals 16-64. The interpretation of these ratios is to try and understand how many labor force participants (16-64) are available to support the supposedly dependent age cohorts of the community population, that is - children (0-15) and elderly (≥65).

Undeniably there are problems with this measure. In western countries the 0-15 year old age category seems to ignore the fact that in our society most children are in school (and thus dependent financially on their parents) until at least 18 years of age. Thus many U.S. and British statistics use a 0-18 year old age cohort in their calculations. This "0-18" age cohort has been provided in the table but it has not been used in the calculations preferring to standardize on the NSB planning department's usage.   The dependency ratio also fails in other areas. In our society many 65-year-old individual are still in the workforce. In addition, many commentators note that the ≥65 age cohort, due to medical costs and so forth, are actually much more expensive to support. In some indices the elder cohort are weighted (i.e., equal 1.5 times the number of individuals in the child cohort). We have not weighted our indices.

Total Household Income:

Analysis of income for individuals and households in NSB communities is going to be much more complicated than analysis contained in previous surveys. These complications arise from two features of the 2010 data set. In 2010, for the first time an attempt was made to ascertain all the major income inputs to each household. To accomplish this goal questions were asked of social security income, pension income, food stamp monies, child support, dividend income from regional and village corporations, permanent fund dividends and of course wage income. These income amounts were ascertained for all members of the household and aggregated into a total household income through a compute statement in the SPSS program ("calculated total household income").

In addition, in 2010, each household head (respondent) was asked to estimate their total household income from all sources ("estimated total household income").
In contrast the 2003 questionnaire only asked for wage income from all household members, regional and village dividend income for the household head only. Thus in 2003 no specific enumeration of total household income from a variety of sources was attempted. Nevertheless in 2003 each household head was asked to estimate their total household income from all potential sources, even from sources not enumerated on the 2003

questionnaire. Given that "estimated total household income" is the only variable common to both the 2003 and 2010 questionnaires this will be the measure used to interpolate changes in total household income between 2003 and 2010. Note the "raw" 2003 average income figure will be subject to a multiplier to turn this number into constant dollars (accounting for inflation in the seven year interval between surveys).

The second factor confounding the results for 2010 is the large amounts of missing information. For example, in Barrow there was a high proportion of missing information for the variable "estimated total household income" in the research. In 2010 about 78 percent (736/943) of the households provided information to the question – "What was the total household income that you and all other members of your household received in 2009?" This meant about 22 percent of the households did not contain information on this variable. The vast majority of this non-response (70 percent) was due to missing information. By missing information we mean that the coding boxes for this variable were empty – why they were empty is difficult to discern. It could be the case the respondent could not come up with an answer or it might be that after getting no response the interviewer didn't push the question and it might be a case of a polite or tacit "refused to answer".

In 2003 and 2010 "estimated average household income" was calculated by dividing the sum of reported income by the number of households reporting income.

Using Barrow again as an example, this means that in 2010 the sum of all 738 Barrow households, who reported income, was $67,588,769. This sum of sixty-seven and a half million dollars is divided by the 736 households yielding an average "estimated" household income of $91,832. Calculating per capita income is trickier. In 2010, as we noted above, only 738 households out of 943 households estimated their total household income ($67,588,769). So 78 percent of the households reported income (736/943). We then multiplied this proportion (78 percent) times all the individuals enumerated in the total sample of 943 households, which is 3,121 individuals. Seventy-eight percent of all household members enumerated in the sample yields 2,436 individuals, that is the approximate number of individuals living in those households that reported income. We then divided the aggregation of all household incomes ($67, 588,769) by 2,436 individuals to yield an estimated per capita income of $27,746. A similar procedure was followed in calculating 2003 Barrow and other community's average household and per capita incomes.

However, a few statistical points need to be made. First, in 2003 only 71percent of all Barrow households estimated their total household income. In 2010 78 percent of all households reported estimated total household income. The standard error of the mean for 2003 (in constant dollars) is slightly larger at $2,376 than the same measure for 2010 ($2,355). At the 95 percent confidence level (i.e. plus or minus two standard errors) the lower error bound for 2003 is $91,911 [$96,663 - $4,752]. In short if we take into account measurement error (the whiskers on box plots) it is entirely possible that total ("estimated") household income has remained the same or even increased slightly during the period 2003 to 2007. On the other hand it is fairly certain the per capita income, in constant dollars, has decreased by a minimum of 5 percent during this same period.

Estimated versus Calculated Total Household Income:

Prior to our analysis of the 2010 questionnaire we anticipated that the calculated total household income will be higher than the estimated amount because it is more likely that the respondent will forget about one or more sources of household income when they estimate the total dollar amount. Conversely, explicitly asking every major source of income and then having the computer add them up will likely be a more inclusive and accurate reckoning of income.

In fact this assumption was borne out in Anaktuvuk Pass where the summation of both measures - the total <u>estimated</u> amount for 55 households was $3,227, 020 whereas the aggregation for the <u>calculated </u>total household income for 79 households was $4,371,866, a difference of $1,144,846 (26.2 percent).

One should be cautious, however, in dismissing the estimated approximations. First, a regression analysis with estimated income as the independent measure and calculated income as the dependent variable reveals an r of .912 and r^2 = .831 (53 df)[5]. Thus, knowing only the estimated household income one can be confident that about 80 percent of the variation in calculated income has been explained. Note, however, that the SPSS statistical package only measured the relationship between the 55 households that we have estimated income for against the calculated income for the same households. In addition, one must also be aware that to use a compute statement in SPSS (e.g., sum all eight income variables) requires that any missing, non-response or not applicable information be treated as zero. This latter fact has implications for any averages that one might compute, i.e., missing information is treated as a real number which in some cases may influence the denominator

<u>NSB Responses To Opinions about Community Schools</u>:

The NSB 2010 Census questionnaire has an entirely new section on community opinions about the functioning of local schools. Since previous censuses don't contain these questions changes over time cannot be analyzed. However, comparisons can be made between individual community responses and how these opinions compare or contrast with the "average" opinion of the NSB as a whole. The following two figures Chart 1 and Table 3 below are derived from responses from the entire North Slope Borough. The total NSB sample is comprised of about 1,600 respondents, although on these questions we only have valid responses from 1038 household heads. About 300 respondents, presumably without children, were classified as "not applicable" and around another 200 simply failed to reply to this suite of questions. The frequency totals for every attribute for each variable were converted to percentages to provide a basis of comparison on the individual community sample. The NSB sample of opinions about school attributes, from the uses of textbooks in classes to the quality of teacher instruction, is so uniform (note: the uniform height of the bars in Chart 1, below, especially for the attribute "satisfied") as to preclude individual variable analysis. Perhaps an analysis using ethnicity, gender, education or income of respondent will be conducted in a separate report. However, the very low frequency of dissatisfaction within the NSB sample indicates this might be a marginal effort. As it now stands over 1,000 household heads in NSB, who provided their opinion, are clearly satisfied with these aspects of their school system. In most cases about 65 percent of respondents were satisfied or very satisfied with their textbooks, range of subject and classes and quality of instruction. The one exception is the response to the adequacy of assigned computer

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[5] df = degrees of freedom

support. For this variable nearly 80 percent of NSB respondents were satisfied or very satisfied.

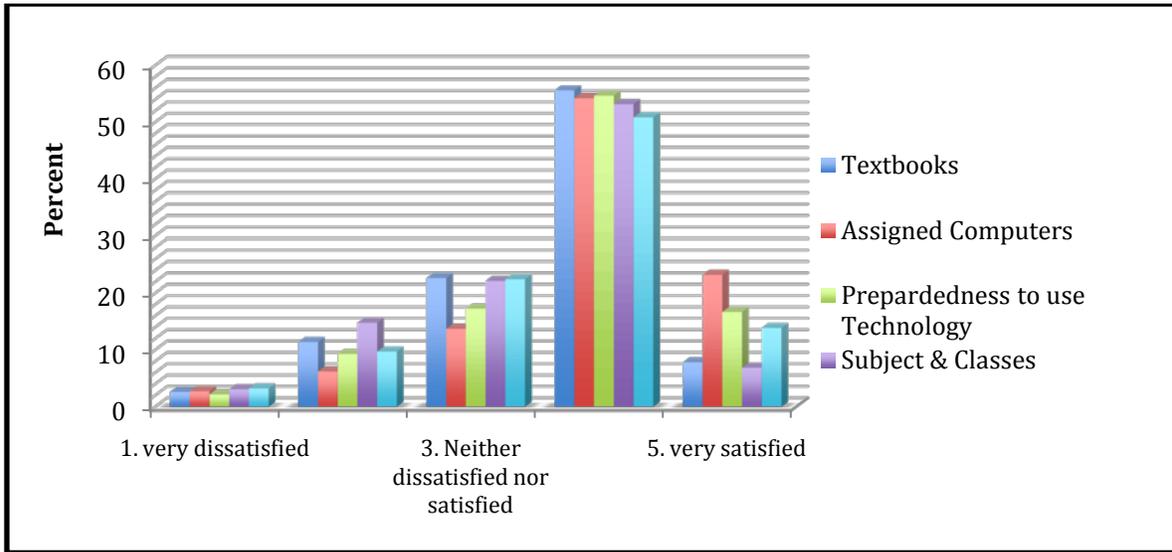Chart 1: North Slope Borough 2010 - Household Head Respondent's Satisfaction with School Attributes.

Table 3: North Slope Borough 2010 - Household Head Respondent's Satisfaction with School Attributes.

Household Head Opinions about School Attributes.	Textbooks	Assigned Computers	Preparedness to use Technology	Subjects & Classes	Quality of Instruction
Very dissatisfied	2.6%	2.7%	2.1%	3.1%	3.2%
Dissatisfied	11.4%	6.2%	9.3%	14.8%	9.7%
Neither dissatisfied nor satisfied	22.6%	13.7%	17.3%	22.1%	22.4%
Satisfied	55.6%	54.2%	54.6%	53.2%	50.8%
Very satisfied	7.8%	23.2%	16.7%	6.9%	13.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

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assistance he has given to the project. Without his guidance and assistance, the final product would not look as well as it does nor be completed within the time frame it has taken.

We would also like to acknowledge the work of the census enumerators, most of them graduate students from Western Washington University in Bellingham, Washington. They worked administering surveys in the communities during the coldest period of the year, leaving at about the time the sun was providing some warmth and comfort. In addition, we want to express our appreciation to everyone who assisted the field workers in their effort to administer surveys, that assistance is greatly appreciated.

Finally, we would like to acknowledge the support given by our families, especially the understanding and awareness they exhibited of the importance of this project, and their unselfish grant of time and space, particularly their ignoring our ill-tempered outbursts, allow this report to be completed.

As always, any and all errors contained in this report are ours alone.

ces, dgc, dcm 20 November 2011