

**DETERMINANTS OF WELL-BEING IN INUPIAT AND YUPIIT ESKIMOS:
DO COMMUNITIES MATTER?**

APPROVED BY SUPERVISORY COMMITTEE:

Brian J.L. Berry, Chair

Euel Elliott

Richard K. Scotch

Matthew Berman, Professor,
Institute of Social and Economic Research
University of Alaska, Anchorage

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DO COMMUNITIES MATTER?**

by

STEPHANIE LYNNE MARTIN

DISSERTATION

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CHAPTER 1 INTRODUCTION

This is a study the determinants of the individual well-being of Inupiat, Yupiit and Siberian Yupiit Eskimos in three regions of Alaska, the North Slope, Northwest Arctic and Bering Straits. It is an exploratory analysis to understand the importance of individual characteristics, households, family ties, social support and communities for individual well-being.

This research uses the theoretical work of Sen (1993, 1998) and Ringen (1995) to conceptualize a model of well-being. They theorize well-being as freedom. Freedom is a function of personal resources and opportunities. Personal resources and opportunities are inputs for the model. Social capital theory expands Ringen's notion of personal resources to include resources that come from group participation. It develops an outcome measure of well-being that incorporates social indicators and subjective well-being.

This inquiry is a contribution to development theory because it links theory and empiricism by operationalizing and testing a theoretical model of well-being. In doing this, it explicitly addresses estimation problems of identification and simultaneity.

Methodologically, it models determinants of individual employment and subsistence participation and their relationship to satisfaction. It uses factor analysis to characterize communities and structural equation modeling to analyze choices and the relationship between choices and satisfaction.

Information collected in the Survey of Living conditions in the Arctic provides individual level data for the analysis. Community level data come from the US Census, State of Alaska and other sources.

Chapter 2 describes the conceptual model, beginning with its roots in the work of sociologist Stein Ringen and economist Amartya Sen. The chapter also describes how social indicators and research on subjective well-being are used to identify, define and measure a dependent variable for the model.

In chapter 3 Ringen's idea of personal resources are expanded to include household attributes, extended family ties and social support. It identifies measures of individual, household resources, family ties and social support to use in the estimation model. It also identifies and defines community measures.

Chapter 4 is an overview of the research strategy and hypothesis. It presents a diagram of the estimation model, showing the relationships among measures. It also discusses problems of simultaneity and identification and how they will be addressed in the estimation model.

Chapter 5 describes the sources of data for the project. It gives an overview of Survey of Living Conditions in the Arctic which is the source for individual level data. It presents community indicators of the measures identified in chapter 3.

The methods for operationalizing variables are discussed in chapter 6. This chapter describes the calculation of an instrumental variable for self-reported health and the use of principal components analysis to create community variables.

In chapter 7 describes the three equations used to estimate the model of well-being, how the estimators were selected and how the models are specified. This chapter

presents results of statistical tests to determine appropriate models. It also describes how the identification problems are resolved.

Chapter 8 presents results of the analysis. For each equation, results are described in terms of significant regression coefficients and results are interpreted to understand how changes in the independent variables affect outcomes.

In chapter 9 are the conclusions.

CHAPTER 2

THEORETICAL CONCEPTS RELEVANT FOR CONCEPTUALIZING, DEFINING AND MEASURING WELL-BEING

2.1 Theoretical basis for the conceptual model

The theoretical background for conceptualizing well-being comes from work in economics and sociology linking freedom, well-being and choice (Ringen 1995, Sen 1993, 1999). In this context personal resources combined with opportunities expand, or in some cases limit choices. Resources and opportunities are inputs, termed ‘indirect’ measures of well-being (Ringen 1995). Choices are outputs or ‘direct’ measures. More personal resources and more opportunities mean more available choices. For Sen and Ringen, this is more freedom and a higher level of well-being.

The theoretical work begins with Sen’s (1993, 1999) conceptualization of well-being as made up of functionings and capabilities. He refers to actual achievements as “functionings”. Capabilities are opportunities. Capabilities are the complete set of all possible functionings. Freedom of choice is central to Sen’s theory. Having choices among lifestyles requires resources, opportunities and freedom of choice.

Ringen (1995) clarifies Sen’s conceptualization and makes it easier to operationalize. Ringen agrees with Sen that freedom of choice is central to a theory of

well-being. Ringen combines welfarist approaches which measure subjective well-being, with non-welfarist approaches measuring objective life circumstances, by using freedom as the final measure of well-being. He defines freedom “in terms of choices available and accessible” (5). Choice is desirable and necessary. Resources and opportunities are essential.

For Ringen (1995), well-being is freedom and freedom is a function of personal resources and structural options. Personal resources enhance or constrain choices. Personal resources include knowledge, skill, money and connections. The areas of life where people make choices, Ringen calls “arenas”, which he describes as the socio-economic environment. “The more arenas are open to you, the more options these arenas offer ... the greater your range of choice” (7). The political implication of this conceptualization is concern for individual freedom. “The question of how to live is left to the people themselves, and the concern of others ... is limited to the domain of opportunities” (5).

Ringen (1995) developed a typology of approaches to measure well-being. Figure 2-1 reproduces the typology (9). Ringen conceptualizes measuring well-being in terms of ‘indirect’ and ‘direct’ approaches. Indirect measures focus on inputs. He characterizes indirect and direct approaches as being on a continuum from narrow to broad. Narrow approaches have single indicators, broad measures have multiple indicators. The income approach is the most narrow, using income as the single indicator of well-being. The resources approach is broader and includes information on non-income resources in addition to income. The broadest is the capabilities approach. It combines resources with opportunities to use those resources. Of the direct approaches, the expenditure approach

is the most narrow, using only information on consumption expenditure. The consumption approach uses information on non-market consumption. The way of life approach is the broadest direct approach to measuring well-being. It includes information on health, leisure and social relations. Ringen associates the way of life approach with social indicators.

	Indirect	Direct
Narrow	(1) The income approach	(4) The expenditure approach
	(2) The resource approach	(5) The consumption approach
Broad	(3) The capabilities approach	(6) The way of life approach

Figure 2-1. Ringen's typology of approaches to the measurement of well-being

Structural options provide opportunities for people to use their resources. More opportunities and more resources allow higher levels of well-being. In summary, the basis for the conceptual model is:

$$\text{Well-being} = f(\text{personal resources, structural options}).$$

This research clarifies Ringen's "structural options" by equating them with community characteristics. Community characteristics provide people with opportunities, options from which to choose. Not all community characteristics are options for all people. The relevance of community characteristics depends on a person's resources. The conceptual model then becomes,

$$\text{Choices and satisfaction} = f(\text{personal resources, community characteristics})$$

Theoretical work from sociology expands personal resources in the conceptual model. It is the basis for including participation in groups as part of personal resources. Beginning with Durkheim (1984) who said that group life prevents anomie, sociologists theorize that individuals benefit from participation in groups. “Individuals experience and are sustained by the social and economic life of the group”. Based on his research in aboriginal communities in Northern Canada, Usher writes that well-being is grounded in kinship, community and the natural environment (3). Alejandro Portes and others writing on social capital also say that individuals benefit from participation in groups (Portes 1993, Coleman 1988). This research expands indirect measures of well-being by including household, extended family ties and social participation as personal resources.

Sen and Ringen’s preference is for indirect over direct measures. Ringen writes that measuring directly well-being in terms of the choices people make requires information about preferences. It is more important to focus on indirect measures of well-being and their relationship to freedom. More resources and arenas mean more freedom to choose.

Dasgupta (2002) discusses indirect and direct measures in terms of constituents and determinants. He writes, “neither captures all there is in the idea of social well-being, and so it helps to make use of the two avenues simultaneously” (75). Following Dasgupta, this research expands Ringen and Sen’s theoretical model by combining indirect and direct measures to develop an operational model of well-being. This research includes both objective and subjective measures of well-being in the conceptual model.

2.2 Theoretical basis for defining and measuring variables

2.2.1 Social indicators

This research uses social indicators as the basis for identifying, defining, and measuring variables. Social indicators were originally designed to describe the non-economic parts of people's lives. They are defined as a "limited yet comprehensive set of coherent and significant indicators that can be monitored over time and which can be disaggregated to the level of the relevant social unit" (Andrews and Withey, 1976). In most cases, social indicators are outputs (Braund et al. 1985).

The term "social indicators" came into wide use following the publication of a book of the same name in 1966 edited by Raymond Bauer. In the 1970's, research involving social indicators came to be known as the 'social indicators movement' (Land 2000). Interest in the 1960s in reporting on the non-economic aspects of life was not new. In the middle ages, the Latin term, *ratio status*, referred to the factual study of politics and government (Biderman 1966). Precursors to the social indicators movement were work by William Ogburn in the 1930s on behalf of President Hoover (Braund, et al 1985) and that of the United Nations in the 1950s. In 1933, Ogburn and his colleagues at the University of Chicago produced *Recent Social Trends* (Land 2000). The United Nations (UN) efforts were toward measuring the 'level of living' and to do so in such a way to allow international comparisons. The UN (1961) identified health, nutrition, housing, employment conditions and education were identified as components of levels of living.

The momentum behind social indicators research in the 1960s came from the realization that increased prosperity was accompanied by increased disaffection (US HEW 1969, Land 2000). The change that began with Ogburn and the UN, and expanded

in the 1960s, was development of a more sophisticated system for data collection and monitoring. The purpose of the social indicators work in the 1960s was to design a system to collect data, monitor changes over time and report on those changes. The system design built on the US economic indicators monitoring system which had been in place for some time and helped business and government understand changes in the national economy.

The initial purpose of the social indicators movement was to develop a system to monitor and measure the secondary consequences of technological innovations. The specific purpose of research reported in *Social Indicators* was to understand some of the secondary consequences of space exploration. Some people speculated that space exploration could change man's conception of himself and of God. Others speculated that communications systems would expand so much that there could be conferences with people in many locations, communicating via a television network (Bauer, 1966). More broadly, the initial purpose of social indicators was to guide social policy (Land 1975).

At around the same time as *Social Indicators* was published, the US Department of Health and Human Services, at the request of President Lyndon Johnson, published *Toward a Social Report* (1969). It was also known as 'The Olson Report' because it was prepared under the direction of Mancur Olson (Terhune 1973). The document identified health and illness, social mobility, physical environment, income and poverty, public order and safety, learning science and art, and participation and alienation as key areas to monitor. The document established a link between social indicators and systematic reporting for public enlightenment (Land 2000).

The initial emphasis of the social indicators movement in the US was collecting national level data over time to measure change. The UN focus was to make cross-sectional comparisons among nations. The move towards collecting and monitoring social indicators at the individual level came with Land's (1975) work on understanding the interrelationship among indicators. He modeled interrelationships among indicators as happening "not at the institutional level, but at the level of distributive consequences for individuals" (Land 1975).

Social indicators are 'direct measures of welfare' (US HEW 1969). They are objective, quantitative measures of quality of life. Like economic indicators, they are objective in the sense that they do not rely on people's perceptions. They can be measured with precision and little measurement error (Diener and Suh 1997).

Biderman (1966) notes that social indicators as outputs often become inputs for other indicators. Ringen (1996) writes that social indicators lists are arbitrary and unsystematic. He says that the social indicators movement is unable to 'get beyond the piling up of statistics' (12). He suggests a way to remedy the problem by using his typology of resources, capabilities and outcomes (Figure 2-1) to classify social indicators. He writes that the capabilities approach can be operationalized by distinguishing between personal resources and resources people might seek access to, such as education, consumer goods, health care and recreational facilities.

Social indicators continue to be important. In a 2003 report, the US Census Bureau acknowledged that income alone is insufficient to measure well-being. It extended the measurement of well-being for US households to include safety, public services, cost of living, age, disability and sudden changes in circumstances. Even though

well-being measures for the US have been expanded, they need to be modified to describe Alaska study regions.

As in the rest of the world, in the Arctic, economic measures alone are not adequate to describe life. Earlier research in the Arctic using income and education showed that the region is materially poor and that many people are unemployed, yet people chose to remain in small communities when regional centers and cities offer better employment, housing and services. Previous studies in Greenland failed to explain why people continued to remain in villages despite their income and housing conditions and government programs to relocate them to larger towns (Anderson 2002). Canadian research notes the need to expand beyond health, demography, education, income and housing to include indicators of culture, heritage and self-reliance that are important to aboriginal people (Armstrong, 1994).

The Canadian Department of Indian Affairs and Northern Development (DIAND) notes that one of the barriers to collecting data on the aboriginal population in Canada is the high cost of data collection relative to the small size and remote location of the populations. There is also pressure in Canada and Alaska to avoid respondent response burden. Residents in small villages are more likely to be selected as survey respondents in repeated surveys (Armstrong 1994).

2.2.2 Subjective well-being

Prosperity and rising discontent in the 1960s (US HEW 1976) was also the impetus behind the development of subjective measures of well-being (Campbell and Converse 1972). Subjective well-being researchers believe that social indicators alone do not define quality of life (Diener, Suh, Lucas et al. 1999). Well-being was no longer a

matter of physical comfort but depended as well on satisfaction and fulfillment of values and beliefs (Terhune 1973). Subjective well-being has its origins in the work of Campbell and Converse in the early 1970s (Land 2000).

The study of subjective well-being refers to human experience and is measured in terms of levels of satisfaction (Terhune 1973). Subjective factors cannot be reproduced with certainty, they indicate 'states of mind' of society and its citizens (Livingston 1973). Subjective quality of life research focuses on the individual, as opposed to the national focus of the social indicators movement. Unlike social indicators, which build on work in economics, subjective quality of life is linked to research in psychology.

Subjective well-being relies on survey research (Diener, Suh, Lucas et al. 1999). Converse and Campbell (1972) write that people's perceptions of their happiness, satisfaction and fulfillment are essential for understanding well-being. People's perceptions of the quality of their own lives provide the most direct measures of well-being (Braund et al. 1985).

In the 1970s the focus of studies of subjective well-being was on the relationship between individual life circumstances and subjective well-being. Studies found that age, income, race, education and marital status account for little of the variation in subjective well-being (Campbell, Converse and Rogers 1976, Andrews and Withey 1976, Marshall et al. 1996). Based on the lack of findings of a relationship between life circumstances and satisfaction, researchers theorized that subjective well-being has 'state-like' and 'trait-like' properties. State-like properties are those that can be influenced by outside events. Trait-like properties are those that can be influenced by personality traits. Traits associated with happiness are self esteem, a sense of personal control, optimism and

extroversion (Meyer and Diener 1995). Based on their research on happiness, Diener, Suh, Lucas et al. write that the influence of traits on satisfaction is moderated by the environment (1999).

The lack of a relationship between individual life circumstances and well-being has been the subject of a large body of research. Some conclude that people adapt to the levels of their resources (Diener and Fujita 1995). Others write that researchers are measuring the wrong resources. Income is weakly correlated with subjective well-being in the US because people have their basic needs met (Campbell, Converse and Rogers, 1976).

Further efforts to understand the relationship between individual characteristics, life circumstances and subjective well-being placed goals as intermediate between life circumstances and subjective well-being. In the late 1980s the focus of subjective well-being research shifted to the understanding of the relationship between goals and subjective well-being (Burnstein 1993). Diener, Suh, Lucas and Smith (1991) write that ‘temperament and cognition, goals, culture and adaptation moderate the influence of life circumstances and events on subjective well-being. Diener (1991) writes about satisfaction in terms of goals in what he calls a ‘telic’ theory. Satisfaction is related to success in achieving goals. Cantor et al. (1991) further develop this idea, linking resources indirectly to satisfaction, working through goals. They theorize the ability to pursue goals increases satisfaction and resources enhance the ability to achieve goals. Their research provides some explanation for the lack of a direct relationship between resources and satisfaction. Diener and Fujita (1995) report similar findings. They found that resources contribute more to well-being when people have goals related to those

resources. They define resources as material, social or personal characteristics that help a person make progress toward goals. Their list of resources includes a mix of information, both objective and subjective. The list includes money, expert knowledge, health, attractiveness and self-confidence.

Other research shows cultural differences underlie systematic differences in subjective well-being. Triandis (1989) identifies individualism-collectivism as influencing subjective well-being. Individuals in collectivist cultures subordinate their desires to those of the group. People in collectivist cultures tend to report lower subjective well-being (Meyers and Diener 1995).

Researchers recommend examining multiple measures of satisfaction. Michalos (2003) writes that a single best measure does not exist. Diener (1994) writes that life satisfaction can be broken down into finer and finer units. The finer and finer units are 'domains', i.e. aspects of life having to do with physical or social settings (Andrews and Withey 1976). Marshall, et.al, (1996) advocate a hierarchal conceptualization of life satisfaction, in which satisfaction is both an overarching general domain and has multiple discrete dimensions measuring satisfaction with specific life spheres. Diener, Suh, Lucas et al (1999) recommend researchers assess domain satisfaction and overall satisfaction separately. The distinction between overall satisfaction and domain satisfaction is important for policy-makers. If overall well-being is a social goal, and domain satisfaction is related to overall satisfaction, policies can focus on determinants of satisfaction related to parts of life in order to further overall satisfaction (Braund et al. 1985).

Lehman (1988) building on earlier work, (Land 1975, Andrews and Withey 1976, Campbell, Converse and Rogers 1976) provides a conceptual model of the relationship between personal characteristics, objective life circumstances, domain specific subjective quality of life and global well-being. Figure 2-2 reproduces Lehman's conceptual model. He views global well-being as the product of personal characteristics, objective life conditions in various domains and satisfaction with life conditions in those domains.

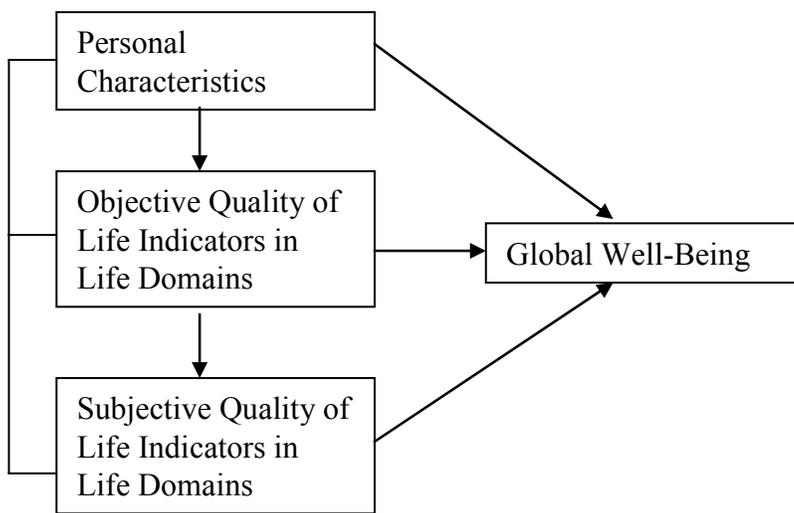


Figure 2-2. Lehman's (1988) conceptual model of subjective quality of life

2.2.3 Combining social indicators and subjective well-being

This research combines social indicators and subjective well-being. This is supported by other research (Braund et al. 1985, Deiner and Suh 1997, Land 2000).

Diener and Suh (1997) write that combining subjective and objective measures provides a better measure of well-being than either objective or subjective measures alone.

Expanding the conceptual model to include social indicators and subjective well-being in the outcome measure, the model becomes,

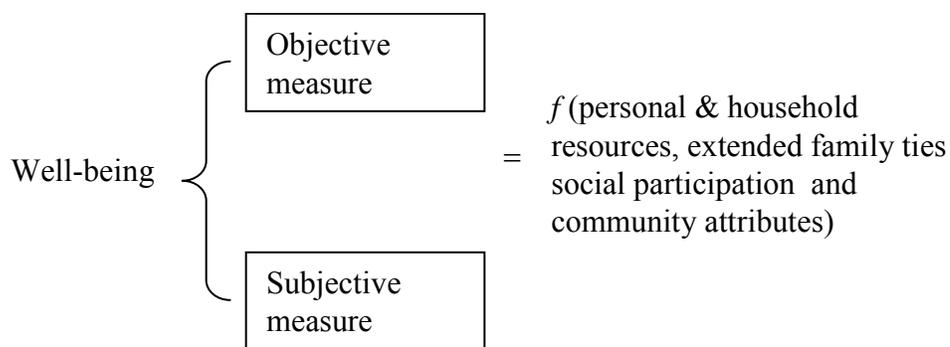


Figure 2-3. Conceptual model of well-being with objective and subjective measures as functions of personal & household resources, extended family ties, social participation and community attributes.

Most of the research on subjective well-being has used correlations to understand the relationships involved (Diener, Suh, Lucas et al. 1999). Some researchers estimate structural equations. McFarland (1976) discusses the application of mathematical models to social indicators. He outlines a structural model to predict racial disturbances. The first stage forecasts the level of frustration in black neighborhoods. The second stage uses frustration to estimate racial disturbances. The methods used in this research are closer to the latter.

2.3 Applying social indicators and subjective well-being to define and measure variables

Social indicators research provides guidelines for including both traditional and model elements in the conceptual model. Andrews and Whitley emphasize the importance of selecting a 'limited but comprehensive set' of elements (1976). Traditional and modern aspects of life more completely describe life among Inupiat and Yupiit Eskimos than either one alone. Land's (1975) emphasis on the importance of

understanding the interrelationship among social indicators guides conceptualizing how traditional and modern as interrelated.

This research uses “traditional” acknowledging that it is a dynamic concept. In their work developing social indicators, Braund, Andrews, Kruse (1985) noted that a “long history of outside influence has affected the concept of ‘traditional’” (62). They substituted “cultural continuity” for “traditional”. “Traditional” doesn’t refer to pre-contact practices that have remained unchanged, but practices that are tied to pre-contact values, traditions and practices. Traditional practices continue to be important to Alaska Natives. “Alaska Natives have changed in some respects and remained the same in others.” (Fienup-Riordan 1992).

Building on social indicators and subjective quality of life, the dependent variable in this research has two parts: individual choices and satisfaction. Social indicators research is the basis for the first part, individual choices. Subjective quality of life is the basis for satisfaction. Measures of choices are individual employment and subsistence participation. These correspond to Ringen’s (1995) ‘arenas’.

Individual employment and subsistence participation meet the criteria of a limited but comprehensive set of social indicators (Andrews and Withey 1976). Subsistence in Alaska does not connote a meager, poor, primitive society (Steve Langdon, quoted in Juneau Empire 2000, Kruse 1991).

Subsistence is defined as,

...activities that require special skills and a complex understanding of the local environment that enables people to live directly from the land. It also involves cultural values and attitudes: mutual respect, sharing, resourcefulness, and an understanding that is both conscious and mystical of the intricate interrelationships that link humans, animals, and the environment. To this array of activities and deeply embedded values we attach the word “subsistence”, recognizing that no one

word can adequately encompass all these related concepts (Alaska Natives Commission 1991).

Other research shows subsistence is important for the overall well-being of Alaska Natives. “Subsistence has value beyond the food it produces. It is more than economics. It is the well-being of the community.” (Mary Pete, quoted in Juneau Empire, 2000). Subsistence is essential to Native ways of life, it is essential for cultural survival (Morehouse 1994). In studies of sustainability of Arctic communities, Kofinas and Braund (1999) identified “continued subsistence hunting as a way of life” as an important goal in each of the five communities participating in the research.

Censuses in the North Slope borough show that subsistence participation is as strong now as it was 25 years ago (NSB Censuses 1978, 1988, Survey of Living Conditions in the Arctic 2003). Figure 2-4 presents subsistence participation data from the 1978 and 1988 North Slope Borough censuses and from the North Slope portion of the Survey of Living Conditions. Questions about subsistence participation were replicated in all three surveys. The figure shows subsistence participation has not declined significantly in the North Slope Borough over the past 25 years. From 1978 to 1998, participation in all subsistence activities increased. In 2003, participation in all subsistence activities except hunting birds and trapping is higher than it was in 1978. Participation rates for helping whaling crews, fishing and picking berries are higher in 2003 than any other year.

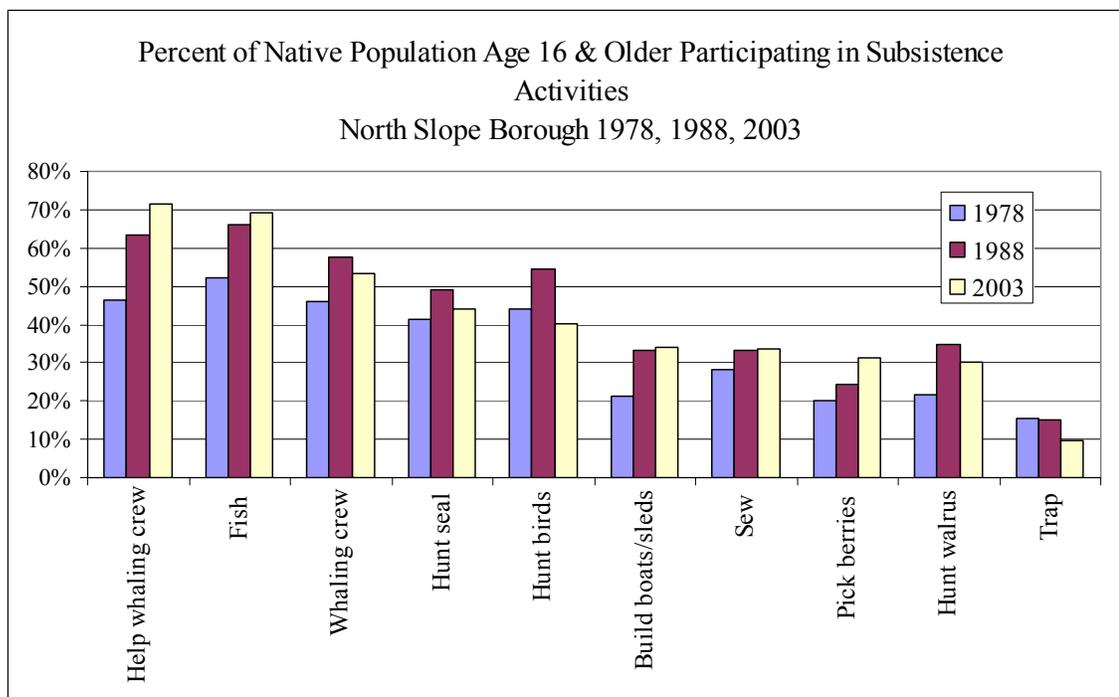


Figure 2-4. Subsistence participation on the North Slope has not declined significantly in the twenty-five years of oil development.

This finding is noteworthy because of the increase in wage employment over the past 25 years associated with oil development. This adds to similar findings in earlier studies (Wolfe et al. 1984, Kruse 1991, Kirkvliet and Nebesky 1997, Berman 1998).

Besides providing justification for including subsistence as a measure of choice, this finding is important because it dispels one of the myths of Arctic living: Nobody hunts anymore. “The Inuit living in arctic communities in 2025 will be made up of individuals barely able to recollect a life lived independently ‘out on the land’” (Irvin 1989).

One reason for the continuation of subsistence practices is there is no market for subsistence foods in Alaska. Harvesting subsistence foods for sale is prohibited. Another reason is the benefits of subsistence activities beyond household production. Subsistence is a cultural practice, in addition to providing food (Kruse 1991).

Individual employment status is the second objective measure of well-being. Employment a key measure of the economic dimension of people's lives (US Census 2000). In their work with Arctic communities, Kofinas and Braund (1999) identified participating in the wage economy as important to Alaska Natives. Diener, Suh, Lucas et al. (1999) report that other researchers found unemployment to be associated with lower levels of subjective well-being.

Employment and subsistence taken together, account for a large portion of well-being. They are also interdependent (Kruse 1991, Huskey, 1992, Usher 1992, Kirkvliet and Nebesky 1997, Berman 1998). Employment has become necessary for subsistence. Inupiaq Eskimos have used transportation technology to continue subsistence while taking advantage of community based employment and public services. They can live in villages near jobs and schools and hunt and fish on the weekends or in their spare time. "Snow machines have replaced dog teams, power boats have replaced skin boats ... Subsistence now requires much more money for equipment and fuel" (Berman 1998). Usher (1992) writes the Northern Natives communities have "mixed, subsistence-based economies". Mixed-subsistence based economies have elements of both market economies and subsistence and the two are inextricably linked.

Research on subjective well-being provides the basis for the second part of the dependent variable, satisfaction. The measures of satisfaction are people's reported satisfaction in life domains related to employment and subsistence, and overall satisfaction. Researchers posit that the subjective measure derives from the objective (Andrews & Withey 1976, Near, Rice and Hunt 1978, Michalos 2003). But subjective well-being studies have relied almost exclusively on cross-sectional correlational designs

with inadequate tests of causality (Diener, Suh, Lucas et al. 1999). Marshall, et al. (1996), use panel data to empirically demonstrate a causal relationship between objective life measures and domain specific satisfaction.

Looking at the relationship between jobs, subsistence and satisfaction in Figure 2-5, satisfaction in domains related to employment and subsistence are separate from overall life satisfaction. Individual employment and subsistence participation and affect domain satisfaction and overall satisfaction. Other researchers find work is associated with higher levels of subjective well-being. According to Meyers and Diener (1995) work provides personal identity, a sense that life matters, it helps people define who they are.

The measurement model of the dependent variable is,

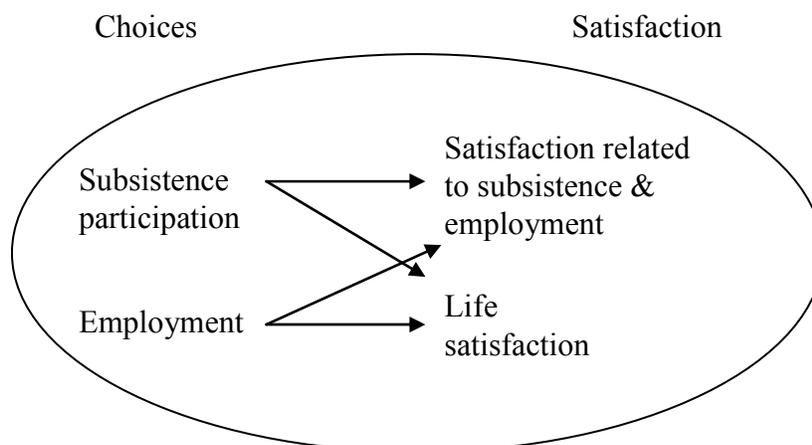


Figure 2-5. Relationships between individual employment, subsistence and satisfaction

CHAPTER 3

HOW AND WHY CHOICES AND SATISFACTION VARY

3.1 Variations Among Individuals Community Considerations Held Constant

To develop measures of personal resources, this research follows Ringen's (1995) recommendation to use indirect measures and classify them as either personal resources or resources to which people want to gain access (opportunities). Ringen provides examples of personal resources. His examples are income, skills and social resources. Other studies provide justification for including household characteristics, family ties and social support as personal resources. Household level measures are considered to be personal resources because people's choices depend on what others in the household are doing (Durlauf 2003, Usher 1992). Family ties and social support are included as personal resources because households are connected to other households and extended families (Usher 1992; Magdanz and Utermohle 2003). People's connectedness to extended family and their social support networks affect their choices. "Socio-economic functioning of Inupiaq households is seldom accomplished by a single households ... households often form social networks to maintain their socio-economic welfare" (Craver 2003). Subsistence involves extended family groups (Huskey 1992). Sharing among households is not limited to subsistence harvests. It also involves equipment for subsistence, cash and market goods (Berman 1998, Magdanz and Utermohle 2003).

3.1.1 Individual, household and social support measures

Individual measures are age, gender, marital status, education including whether a person attended boarding school, traditional skills a person was taught as a child, migration, health and housing.

Other research has found that subsistence participation varies with age (Kruse 1991). But there is little evidence of a link between age and satisfaction. Meyers and Diener (1995) write, “knowing someone’s age gives no clue to the person’s average sense of well-being” (11). Other researchers find that life satisfaction does not decrease with age.

Kruse (1991) also found higher levels of subsistence for married than for unmarried people. Diener, Suh, Lucas et al. (1995) report that other research has found consistently higher levels of subjective well-being for married than for unmarried people.

There are important differences in individual employment and subsistence participation based on gender. Hamilton and Seyfrit found that a higher proportion of Native women than men hold full-time jobs (1994). Men and women have different levels of subsistence participation and perform different subsistence activities (Kruse 1991). Hamilton and Seyfrit (1994) write that women’s jobs serve to support men’s activities—purchasing snow machines or boats, for instance.

Data from the Survey of Living Conditions in the Arctic do not show significant differences between male and female employment. Fifty-three percent of male respondents and 55 percent of female respondents reported working in the past week. Survey data show differences in subsistence participation based on gender.

Male respondents perform an average of seven subsistence activities. Female respondents reported an average of five activities. Figure 3-1 presents data from the

Survey of Living Conditions in the Arctic showing men perform different kinds of activities than women perform. In general, men do more whaling, hunting and trapping. Women do more gathering and processing, sewing and handicrafts. Because women do more processing work, their participation depends on successful harvests and men's activities. This might mean that other variables affect women's subsistence participation differently than they affect men's participation.

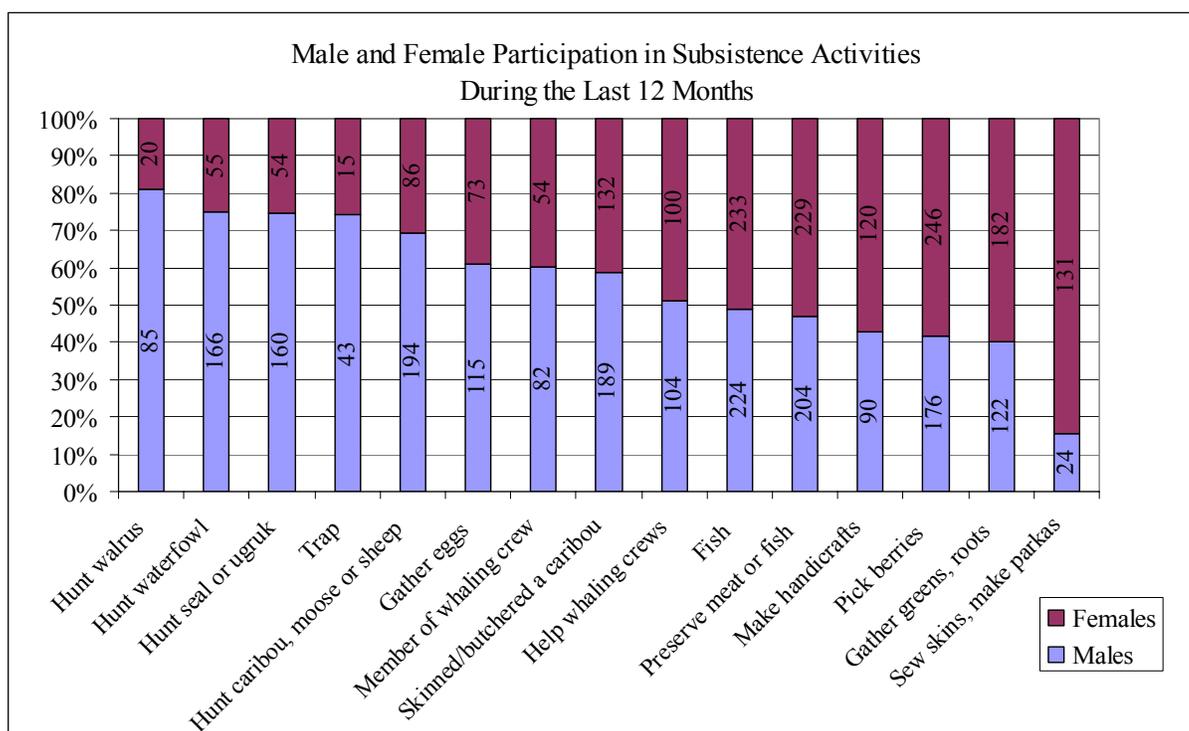


Figure 3-1. Participation in subsistence activities varies by gender.

Diener, Suh, Lucas et al. (1999) report on other research investigating the relationship between gender and subjective well-being. They write women usually report higher levels of subjective well-being but note that differences disappear when other demographic variables are controlled. Meyers and Diener (1995) reporting results of other research, conclude that there is no relationship between gender and global well-

being. Different levels and patterns of subsistence participation and satisfaction for men and women are important for structuring the estimation model later on.

Boarding school is included as a measure based on informal discussions. Natives who went away to boarding schools missed out on learning important skills for subsistence and do less subsistence than people who did not attend boarding school (Ongtogook conversation, November 2001). In his research on the North Slope, Kruse (1982) found the opposite to be true. Men who were educated outside of their home communities and returned home performed more subsistence activities and spent more time doing subsistence than did men who were educated in their communities.

Neumann, et al (2000) in their study of Southern Cheyenne and Arapaho Indians found that positive childhood experiences were associated with success. Traditional skills learned as a child are a measure of positive childhood experiences. Traditional skills and their relationship to subsistence are also a corollary to education and its relationship to employment. Data from the Survey of Living Conditions in the Arctic show that men and women respondents in our survey were taught different skills as children. On average, men were taught more skills than women (13 compared to 10). Figure 3-2 shows men and women were taught different skills. Men were taught more hunting skills than women when they were children. Women were taught more processing skills.

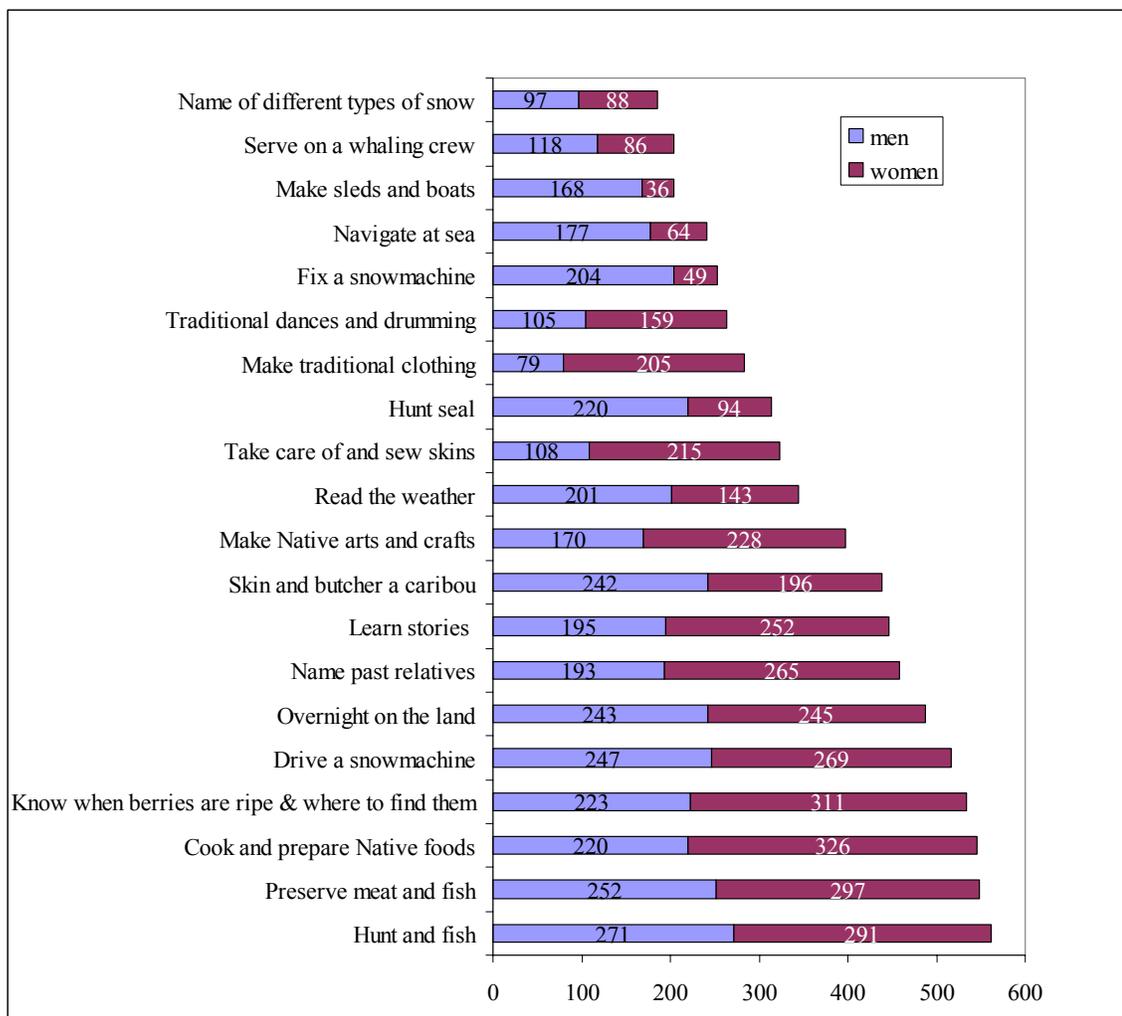


Figure 3-2. Men and women were taught different traditional skills as children.

Self-reported health can be a determinant of subsistence because people in poor health are less likely to be able to go out and do subsistence. Other research shows the reverse is also true. Subsistence can have both positive and negative effects on health. Past research on subsistence foods shows positive health benefits from eating subsistence foods (Nobmann 1997). Inupiat people maintain that subsistence foods are nutritionally superior to store-bought foods. They believe that native foods provide protection from cold and hunger (Kruse et al. 1983). In recent years however, concerns have risen about contaminants in native foods. Contaminants come from local mines, military and oil

development sites as well as from industrial sites outside of the US, transported through the atmosphere (Wolfe 2000). There are several on-going projects monitoring the effects of contaminants in subsistence foods on Native health. Reporting on other research on subjective well-being, Diener, Suh, Lucas et al. 1999 write that self-reported health, but not objective health, is strongly correlated with subjective well-being.

Household measures are language used at home, household type, ethnicity and age of household members. A person living in a household where a Native American language is spoken most of the time might reports a higher level of subsistence participation—or be less likely to have a job--than a person who does not live in a traditional household.

Household type is related to both subsistence participation and whether or not a person has a job. Magdanz (2003) found that lone male households harvested more per capita than any other type of household. Kruse (1982) found that within households, people who worked provided cash for other people to do subsistence.

Family ties is a measure of closeness of extended family. A person with close family ties might be more likely to have a job, because other families can provide child care. A person might do subsistence because of other people help by loaning equipment and cash.

Social support is a measure of connectedness to other people in the community. Research on social networks and sharing (Craver 2003, Magdanz and Utermohle 2003, Usher 1992, Berman 1998) shows it is associated with subsistence. Summarizing other research, Meyer and Diener (1995) report that close relationships are associated with

higher levels of happiness. Similarly, Chamberlain (1985) reports personal and social relations are better predictors of subjective well-being than are prosperity and wealth.

Other researchers (Andrews and Withey 1976, Marshall, et.al 1996, Michalos 2003) identify housing conditions as a measures associated with subjective quality of life. For that reason, this research includes it in the measures.

3.2 Variations among communities

In Ringen's conceptualization, structural options are opportunities and access. Ringen's examples of measures of opportunities are the education system, consumer goods, political rights, health care, job opportunities, cultural and recreational facilities. This research uses Ringen's conceptualization as a starting point for developing measures of opportunities. Opportunities are measured by community attributes. The communities in the study vary in these measures. If available, opportunities can be accessed by the people in each community who have the resources to use them. Community level measures are also associated with differences in choices and satisfaction. Other research shows individual outcomes are associated with community attributes (Durlauf 2001). Working in Northwest Arctic borough and Aleutian communities, Jorgensen, McCleary and McNabb (1985) found that community attributes were associated with differences in individual well-being.

Other research, as well as information from meetings and discussions with Alaska Natives, helped to identify community measures to use. The community measures are: local economy, migration, wildlife resources, whaling, public safety, local control, culture, history and access.

Figure 3-3 shows the study area, most of which lies above the Arctic Circle. The North Slope and Northwest Arctic are boroughs. Bering Straits is a census area. Each region has a regional center, Barrow on the North Slope, Kotzebue in the Northwest Arctic and Nome in the Bering Straits region. Each of the three regions is also an Alaska Native Claims settlement area. Alaska Native Claims Settlement Act (ANCSA) was approved in 1971. As settlement of their aboriginal claim to land in the state, Alaska Natives received title to 44 million acres of land in Alaska, and about \$1 billion in cash. ANCSA also set up regional and village Native corporations to manage the lands and cash payments. In this area, the regional corporations are Arctic Slope Regional Corporation (ASRC), Northwest Arctic Native Association (NANA) and the Bering Straits Native Corporation (BSNC).

Communities are located on the coast or along major rivers. Communities are distinct from each other. None in the study area are connected by roads. There are important differences between regional centers and villages. The average populations of regional centers are about ten times that of villages. A larger share of their population is made up of non-Natives. Regional centers have hospitals, government offices and Native corporation offices. They are linked to by jet service to Anchorage or Fairbanks. Villages rely on scheduled and unscheduled air service by single engine aircraft. In the winter, some villages are linked to regional centers or to the road connecting Fairbanks with the Prudhoe Bay oil fields by ice roads, constructed on frozen rivers.

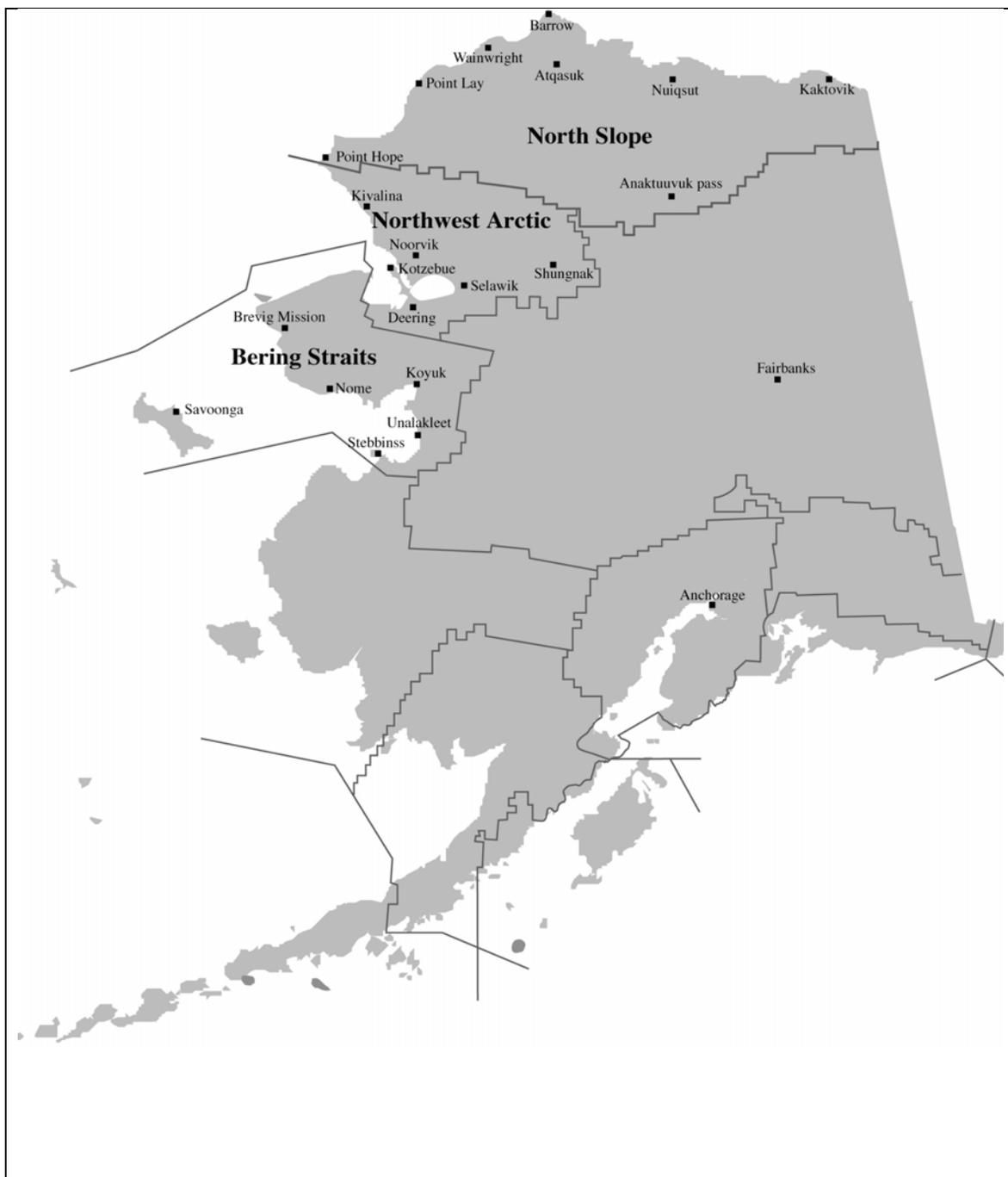


Figure 3-3. Map of Alaska showing borough boundaries and communities participating in the project.

Local economies are “mixed” (Wolfe and Walker 1987, Kruse 1991, Huskey 1992) relying on subsistence, transfers and wages. Subsistence provides food, but it also keeps people from migrating to other places for employment because subsistence

knowledge, hunting crews and sharing networks are place specific (Huskey 1992). Transfers come to individuals, local and tribal governments. Individual transfers come as Aid to Families with Dependent Children (ADFC), public assistance, payments to Elders and the Alaska Permanent Fund Dividend (PFD). In the survey area, each of the twenty communities is a federally recognized tribe. Tribes compact directly with the federal government for funding. Funding for housing and health care makes up the largest portion of transfers to tribes. Wage employment in the communities is mostly in the public sector. Most of the villages are also incorporated as cities and receive state funding. Although because of funding cuts, some communities have dissolved their city governments. Every village has a K-12 school, a city office and a health clinic which together account for most of the employment. Most of the school jobs are filled by non-Native immigrants. Many village residents work seasonally in summer fire fighting jobs and construction (DCED 2004). The communities on the North Slope are relatively wealthy because the Prudhoe Bay oil fields lie within the borough and provide tax revenues. The North Slope Borough government is funded by oil tax revenues; it provides public services to all of its communities and is the primary employer of local Native residents. The North Slope borough has a local hiring preference. A primary goal of the borough has been to increase employment opportunities for Natives (Knapp, Colt and Henley 1986).

Table 3-1 shows the population in 2000 of the communities in the study region. The communities are ranked from largest to smallest.

Table 3-1 Communities in the study area ranked by population

Community	Population 2000
Barrow	4581
Nome	3536
Kotzebue	3082
Selawik	764
Pt Hope	760
Unalakleet	752
Savoonga	702
Noorvik	676
Stebbins	585
Wainwright	558
Nuiqsut	422
Kivalina	375
Anaktuvuk	316
Koyuk	299
Shungnak	291
Brevig Mission	278
Kaktovik	274
Pt Lay	245
Atqasuk	203
Deering	139

A healthy local economy provides job opportunities. People in rural Alaska cite lack of jobs as the main reason why they do not work. Other researchers note the “discouraged worker” effect. Discouraged workers are those who stopped looking for work because there are no jobs. Huskey (1982) showed this in rural Alaska.

Other researchers discuss migration as having adverse effects on communities. Hamilton and Seyfrit (1994) discuss gender imbalance resulting from female out-migration as having broad effects on communities. Some describe out-migration as a

possible measure of a weakened community level subsistence network (Magdanz, conversation, June 2004). Wolfe and Walker (1987) showed that increased in-migration is associated with lower subsistence productivity in rural Alaska.

Healthy wildlife populations are essential for Native subsistence. Whether a village has a bowhead whale harvest is an additional measure of wildlife resources. In whaling communities, nearly everyone participates in whale harvests, either as a member of a crew, helping to prepare for the hunt or in the butchering and distribution of the harvest. The distribution of whale harvest is a collective action. Huntington (1992) writes, “The bowhead provides life, meaning, and identity to the Eskimo whalers and their communities. Sharing the whale with the whole community is an old and highly-valued practice”.

The level of public safety varies among the communities in the study region. Public safety as a community characteristic associated with well-being. A 2003 US Census Bureau report found that public safety was important for well-being. In the Survey of Living Conditions in the Arctic, many people said that no public safety officer was the biggest problem in their community.

Working with local communities in the Arctic, Kofinas and Braund (1999), identified local control and responsibility as an important community goal. Community support for alcohol control is a measure of local control and responsibility. Research by Berman, Hull and May found that communities with alcohol control measures reported lower levels of accidental injuries and deaths (2000).

“A thriving culture that has a clear identity is based on time on the land and language, which honors and respects elders’ (Kofinas and Braund 1999). Respect for

Elders and knowing Inupiaq language are important Inupiat Eskimo values. Magdanz and Utermole (2003) found that Elders in a community was associated with increased subsistence harvests. Elders are considered to be repositories of the most important information (Kruse et al. 1983).

Ostrom (1990) writes that history matters. Granovetter (1973) advises avoiding temporal reductionism. He writes that researchers should not treat events as if they had no history that shapes the present situation. In some communities in the study area, groups of families left a long time ago (1915 in Deering) leaving a leadership void for a whole generation. Other research shows historical settlement patterns have an effect on how communities function today (Usher 1992, Burch 1998).

Access varies among the communities in the study region. In other parts of rural Alaska, Wolfe and Walker (1987) showed that road access was associated with lower subsistence productivity. Increased access lowers the cost of living and lower costs of living can alter subsistence practices. For some communities in this study, ice roads lower the cost of living because more goods (fuel in particular) can be brought in by truck in the winter months. In more remote communities, groceries are more expensive because of higher transportation costs. Access also means easier access to alcohol which can increase local social problems of domestic violence, alcohol related disease, accidents and deaths.

CHAPTER 4

MODELS AND HYPOTHESES

4.1 Research Strategy

The conceptual model of well-being as a function of personal resources and structural options is operationalized in two parts. The first part models choices. The second part models satisfaction. The interdependence of individual employment and subsistence determines the way they are estimated. Individual employment and subsistence are jointly determined or “simultaneous”. Subsistence affects a person’s choices to work. Anything that changes subsistence participation also changes employment. Because individual subsistence participation and employment are simultaneous, separate equations estimate model subsistence participation and employment, without using one to explain the other.

Results from the models of subsistence participation and employment become inputs to the model of satisfaction. Satisfaction is a function of the probability that a person is employed, estimated subsistence participation, the interaction between estimated subsistence and the probability of employment as well as individual, household, social support and community characteristics.

Figure 4-1 shows the operational model of choices and satisfaction expressed as functions of individual and household resources, family ties, social support and community characteristics. Choices are measured by employment and subsistence

participation. Satisfaction is measured by domain and life satisfaction. Personal resources are measured by individual and household characteristics, family ties and social support. Structural options, opportunities, are measured by community attributes. The form of the model, with choices as intermediate outcomes follows directly from Ringen's typology. It parallels the model theorized by Cantor et al. (1991) with choices, instead of goals, as intermediate between resources and satisfaction.

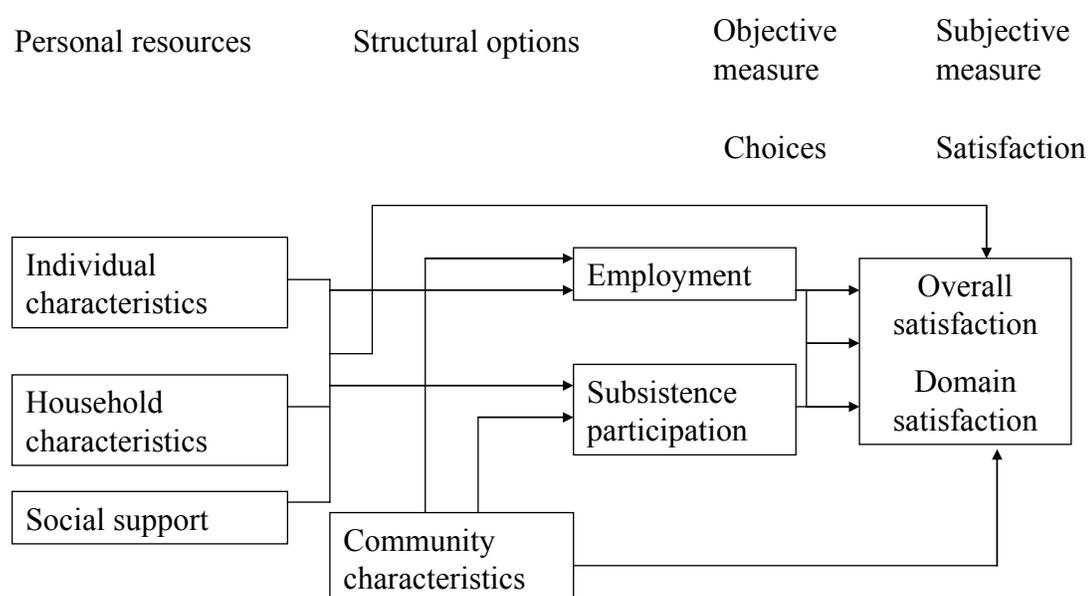


Figure 4-1. Operational model of well-being

In the model, satisfaction is measured as domain satisfaction and overall satisfaction. Domain satisfaction includes satisfaction in eight different domains related to individual employment and subsistence. Overall satisfaction is satisfaction with life as a whole. Individual choices of employment and subsistence participation are associated with different levels of satisfaction in domains. Individual choices are also related to overall satisfaction. Individual, household and social support characteristics have direct,

as well as indirect effects on satisfaction. Their indirect effects work through subsistence participation and employment. Similarly for community characteristics, they are directly and indirectly associated with satisfaction.

4.2 Identification

Mansky (1993) writes that identification is a fundamental problem in social sciences. The model in Figure 4-1 needs to be modified before it can be fully operationalized. As it is drawn, the model is unidentified. The same variables cannot be included in all the equations in a structural model. Otherwise there is not a unique solution. If it is possible to form a linear combination of the system's equations that looks just like one of the equations in the system (in the sense that they both include and exclude the same variables), a researcher would not know if the estimated parameters should be identified with the parameters he/she is trying to estimate or with the parameters of the linear combination (Kennedy 1996).

The model in Figure 4-1 is unidentified because the same exogenous variables are used to estimate domain satisfaction and overall satisfaction as are used to estimate individual employment and subsistence participation.

To identify this structural model requires that exogenous variables be excluded from the equation estimating satisfaction that are used to in the equations creating instrumental variables for individual employment and subsistence. The number of excluded variables from the satisfaction equation must be greater than the number of included endogenous variables. (Kennedy 1996).

Identification problems can be resolved if economic theory and extraneous information can be used to put restrictions on the set of simultaneous equations (Kennedy

1996). In this research, variables eliminated from the satisfaction equation were conceptually important for employment and subsistence participation but unrelated to satisfaction.

4.3 Hypotheses

Hypotheses explore the validity of the theoretical work of Sen (1993, 2000) and Ringen (1995). They are designed to test the idea that choices and satisfaction are functions of personal resources and structural options. Variables are assigned as controls based on findings from other research. In terms of the conceptual model, the null hypothesis regarding individual employment and subsistence is: H_0 : Individual choices to work or engage in subsistence vary randomly, there is no relationship between individual, household characteristics, family ties, social support or community characteristics and people's choices to work or to engage in subsistence. The alternative hypothesis is: H_1 : Individual choices to work and individual subsistence participation levels vary with individual, household characteristics, family ties, social support and community characteristics. The null hypothesis related to satisfaction is: H_0 : Satisfaction varies randomly. There is no relationship between choices to work or engage in subsistence and satisfaction. Nor is there any relationship between individual, household characteristics, family ties, social support or community characteristics and satisfaction. The alternative hypothesis is: H_2 : Individual satisfaction is associated with choices as well as individual, household resources, family ties, social support and opportunities. The remaining hypotheses are grouped by dependent variables. In each of the three groups hypotheses are stated in terms of the measures defined in the previous chapter.

The first set of hypotheses regards the relationship between individual employment and individual and household characteristics, family ties, social support, community characteristics. The underlying hypothesis regarding individual employment is: community characteristics affect the probability of employment differently in regional centers than villages. Controls are age, education, health and marital status.

Null Hypothesis: There is no relationship between the probability that an individual is employed and individual and household characteristics, family ties social support or community variables.

H1: The probability of employment is higher for people who attended boarding school.

H2: The probability of employment is lower for individuals who have lived in a community their whole life.

H3: The probability of employment varies with household type and composition.

H4: The probability of employment is higher for individuals with closer family ties.

H5: The probability of employment is higher for individuals with higher levels of social support.

H6: The probability of employment varies with community characteristics.

The next set of hypotheses regard the relationship between individual subsistence participation and individual, household, family ties, social support and community variables. Underlying the individual subsistence participation model is the hypothesis that the relationships between subsistence choices and individual, household, family ties,

social support and community measures and are different for men than for women.

Controls are age, marital status and skills.

Null Hypothesis: There is no relationship between individual or household characteristics, family ties, social support, community characteristics and men's or women's subsistence participation.

H7: Individual subsistence participation increases as an individual's education level increases.

H8: Individual subsistence participation is lower for people who attended boarding school.

H9: Individual subsistence participation increases as self-reported health increases.

H10: Individual subsistence participation is higher for individuals who live in households where Native language is spoken more higher lower for individuals who have lived in a community their whole life.

H12: Individual subsistence participation varies with household type and composition.

H13: Individual subsistence participation is higher for individuals with close family ties.

H14: Individual subsistence participation is higher for individuals with higher levels of social support.

H15: Individual subsistence participation varies with community characteristics.

The final set of hypotheses regard the relationship between choices and satisfaction. Underlying these is the hypothesis that determinants of satisfaction for men

are different than they are for women. These hypotheses are structured based on the findings of Marshall, et al. (1998): there can be different determinants of satisfaction in specific life domains than of overall satisfaction. Controls in the satisfaction equation are health and housing conditions.

Null hypothesis: Determinants of domain satisfaction are the same as for overall satisfaction.

H16: The determinants of domain satisfaction are different from the determinants of overall satisfaction.

Null hypothesis: Neither employment, subsistence participation nor their interaction are associated with either domain satisfaction or overall satisfaction.

H17: Employment, subsistence and their interaction are associated with differences in both domain specific and overall satisfaction.

CHAPTER 5

DATA SOURCES

5.1 Survey of Living Conditions in the Arctic

The research uses data from the Survey of Living Conditions in the Arctic as the primary data source. The survey took place in 2002 and 2003 in Inupiaq, Siberian Yupik and Central Yupik communities in Alaska. Figure 3-3 shows the communities in the North Slope, Northwest Arctic and Bering Straits regions where the survey took place.

5.1.1 History of the Survey of Living Conditions in the Arctic

The Alaska materials used in this research are part of a larger survey covering Inuit people in eight countries around the Arctic. The initiative for the international project came from the Greenland Home Rule Government, Statistics Greenland. In 1994, Statistics Greenland conducted a Survey of Living Conditions in Greenland, using income, education and housing to measure living conditions. The data showed that people living in remote settlements had low incomes, high costs of living and poor housing conditions, relative to European populations. Analysis of the data caused researchers in Greenland to re-examine their theoretical assumptions because their measures failed to capture important elements of Inuit life in the Arctic. They decided that measurement of living conditions had to be designed specifically for Arctic regions, where many Native

residents still rely on harvests of local resources for food. They also concluded that it is more important to draw comparisons between Greenland and other Arctic regions than between Greenland and European countries. (<http://www.arcticlivingconditions.org> accessed 5/01/04).

In 1997, Statistics Greenland approached the Institute of Social and Economic Research (ISER) at the University of Alaska, Anchorage to ask if they were interested in a project comparing living conditions around the Arctic. In turn, ISER contacted Native representatives from the North Slope, Northwest Arctic and Bering Straits regions to see if they were interested in participating in the project. These initial meetings were the basis for establishing an Alaska Native Management Board. The board has members from each of the three regions, the Alaska Native Science Commission and international representation from the Inuit Circumpolar Conference. The Alaska Native Management Board is responsible for reviewing and approving questionnaire design, survey procedures, review by local communities and procedures for publication of results by other researchers. Each country has its own source for funding. The Alaska portion of the project is funded by the National Science Foundation. To date the Alaska portion of the project has received 1.2 million dollars.

The resulting survey is the first to allow comparison of living conditions of indigenous people with similar cultures around the Arctic. The Alaska portion includes information on approximately 3,000 individuals from 663 randomly selected households.

The survey design builds on work in behavior choice, social indicators and subjective quality of life. The survey collects both objective measures and subjective assessments of well-being. It expands measures of living conditions from income,

education and housing measures to cover social relationships, mental and physical health and cultural practices. The survey questions were designed, reviewed and revised by international and Alaska Native review boards.

5.1.2 Sampling

The survey targeted Inupiat and Yupik Eskimos living in the North Slope, Northwest Arctic and Bering Straits regions. An area probability sample yielded a representative sample of the target population. Budget constraints prohibited travel to all the villages in the three regions.

Several stages of sampling achieved an area probability sample. The first stage was the selection of communities. Regional centers were selected with certainty. In the North Slope Borough, all seven villages were selected. To select villages in the Northwest Arctic and Bering Straits regions, villages were sorted by cultural/linguistic groupings, assigned measures of size based on the Native population age 16 and older, then randomly selected. In the Northwest Arctic region, five of nine villages were selected. In the Bering Straits region, five of fifteen villages were selected. The second stage was to select blocks within regional centers. Blocks were assigned a measure of size based on the number of Natives age 16 and older, then randomly selected. In the villages, all blocks were included in the sample. The third stage was to select households within blocks in regional centers and households within villages. Survey field workers mapped and wrote a description of all housing units in a block or village. Households were sampled to take into account non-Native households, vacant housing units and non-responses. The final stage was to randomly select respondents within each household. To do this, interviewers asked whether any of the household members considered themselves

to be Inupiat or Yupiit and was at least 16 years old. Then, the interviewer asked who among the Inupiat or Yupiit people age 16 and older had the next birthday (Hanna 2004).

5.1.3 Survey Implementation

The survey took place in January and February of 2002 and 2003. Surveys were during the winter because people are most likely to be at home. During fall, spring and summer months, many people are away hunting or at fish camps. The Northwest Arctic borough was surveyed in 2002. The North Slope and Bering Straits regions were surveyed in 2003. The survey portion of the project extended over two years because project funding from NSF came in two funding cycles.

Most interviews lasted around 90 minutes. Sometimes when talking with Elders, the surveys extended over several days. The survey includes closed- and open-ended questions. Interviewers were instructed to write down everything the respondent said. The overall survey response rate was 84 percent.

In November 2003, the project team visited villages participating in the survey and reviewed preliminary results in community meetings. People attending the meetings thought that the results accurately represented their communities.

5.2 Other sources of data

Data from other sources operationalize community measures. The sample size at the village level in the Survey of Living Conditions in the Arctic is too small to be representative of individual villages. For community and regional information, this research uses data from the 1980, 1990 and 2000 US Census summary files, Alaska Department of Community and Economic Development (DCED), Alaska Eskimo

Whaling Commission (AEWC), Alaska State Troopers, Alaska Alcohol Beverage Control Board, Alaska Department of Health and Human Services and the Alaska Department of Fish and Game (ADFG) and local commuter airlines.

5.2.1 US Census summary files

US Census summary files 1 and 3 from 1980 through 2000 are the primary source for socio-economic data. The sample size in the census is adequate to provide accurate community level information. In addition, census data cover three decades allowing measures of change.

5.2.2 Alaska Department of Fish and Game subsistence surveys

Community level subsistence harvest data come from the Alaska Department of Fish and Game. The department has been conducting harvest surveys in villages since 1980. The division was created to implement provisions of federal land claims settlements protecting rural subsistence (Fall 1990). Subsistence surveys are not conducted in every community annually. In most communities in the study region, there is only one year of harvest data. In addition, there are no communities in the study region for which subsistence harvest data are available for 2002 or 2003. Some of the data are old. For example, the village of Stebbins was surveyed in 1980. Since then, the salmon fishery has closed. However, the ADFG subsistence harvest data is considered the best available source to estimate wildlife resources.

5.2.3 Alaska Department of Health and Human Services

Counts of homicides, suicides and accidental deaths in each community from 1990 to 2002 come from the Alaska Department of Health and Human Services, Vital Statistics Division.

5.2.4 Alaska Department of Public Safety, Alcoholic Beverage Control Board.

Alaska law allows communities to restrict alcohol sales, importation and possession. There are five choices under the state alcohol local option law. (1) The city government holds the liquor license and operates the liquor store. (2) Restricting the type of alcohol allowed into a village. (3) Banning the sale of alcohol, but people can still bring alcohol into the community for personal use. (4) Banning the sale and importation of alcohol. (5) Banning the possession of alcohol. This is the strongest measure. In addition to banning sales and importation of alcohol, it makes home-brew illegal.

The data on alcohol control for this study are community level counts of votes from the most recent election prohibiting sale and possession of alcohol in each community. These data are available on line at <http://www.dps.state.ak.us/abc/local.asp>

5.2.5 Alaska Eskimo Whaling Commission (AEWC)

Alaska Eskimo Whaling Commission (AEWC) members participate in bowhead whale hunts. AEWC monitors the harvest of the whales in Alaska's whaling communities and reports to the National Oceanic and Atmospheric Administration (NOAA) (Huntington, 1992). AEWC membership defines whaling communities for this research. There are currently nine whaling communities in Alaska: the St. Laurence Island Yupik villages of Gambell and Savoonga, and the Inupiat villages of Wales, Kivalina, Point

Hope, Wainwright, Barrow, Nuiqsut, and Kaktovik. Seven of the nine whaling communities participated in the Survey of Living Conditions in the Arctic.

5.2.6 Local commuter airlines

Cape Smythe Air Service, Bering Air and Arctic Circle Air provided information about the cost of a round trip air ticket from Nome, Kotzebue and Barrow to villages in each region.

5.3 Community measures and their indicators

The nine community measures are local economy, migration, wildlife resources, public safety, local control, culture, history and access.

Indicators for the local economy come from the US Census. Table 5-1 presents economic data for each community. The communities in the table are grouped by region. The table shows employment growth from 1990 to 2000 ranged from a 21 percent decrease in Deering to nearly doubling in Savoonga. In general, communities with higher median incomes also have lower Native unemployment and Native median household income closer to non-Native median household income.

Table 5-1. Local economic indicators

Region	Community Name	Employment growth	Alaska Native median	Median hh	Native
		1990-2000	income as a share of non-	income, 2000	unemployment rate
		EMP90_00	Native median income	HHINC00	2000
		RACINC00		NUN00	
North Slope	Anaktuvuk	0.19	0.59	\$ 51,964	0.23
North Slope	Atkasuk	-0.15	0.65	\$ 63,125	0.30
North Slope	Barrow	0.25	0.58	\$ 54,722	0.24
North Slope	Kaktovik	0.48	0.46	\$ 55,625	0.24
North Slope	Nuiqsut	0.71	0.74	\$ 66,607	0.07
North Slope	Pt Hope	0.45	0.64	\$ 33,333	0.19
North Slope	Pt Lay	0.13	0.36	\$ 25,625	0.39
North Slope	Wainwright	0.15	0.80	\$ 48,036	0.11
Northwest Arctic	Deering	-0.21	0.43	\$ 30,417	0.37
Northwest Arctic	Kivalina	0.71	0.54	\$ 52,500	0.41
Northwest Arctic	Kotzebue	0.23	0.22	\$ 23,125	0.26
Northwest Arctic	Noorvik	0.43	0.55	\$ 30,833	0.28
Northwest Arctic	Selawik	0.31	0.45	\$ 23,438	0.40
Northwest Arctic	Shungnak	0.61	0.55	\$ 68,750	0.06
Bering Straits	Brevig Mission	0.82	0.22	\$ 21,875	0.03
Bering Straits	Koyuk	0.35	0.52	\$ 44,375	0.29
Bering Straits	Nome	-0.01	0.57	\$ 67,097	0.21
Bering Straits	Savoonga	0.91	0.64	\$ 57,163	0.13
Bering Straits	Stebbins	0.68	0.57	\$ 42,083	0.18
Bering Straits	Unalakleet	0.22	0.57	\$ 59,402	0.23

Data from the US Census provide indicators of migration and other basic demographic information (Table 5-2). The counts of people who moved into a community are census counts of people who had changed residences in the past five years. It overestimates the number of people who moved into the community because it includes new housing. Because much of the migration in the study area is from village to village or village to regional center within the same borough, census counts of people moving into the county would under count migrants.

Table 5-2. Demographic information for communities in the study area

Region	Community Name	Percent of the	Share of the	Native males	Population
		population moved	population that is		
	2000	in from 1995 to	Alaska Native or	per 100 Native	growth rate,
			Native in	female, 2000	1990-2000
		MOVPT00	combination with		POP90_00
			another race, 2000		
			NATPCT00	NSEXRT00	
North Slope	Anaktuvuk	0.40	0.96	144.0	0.23
North Slope	Atkasuk	0.29	0.88	124.2	0.21
North Slope	Barrow	0.32	0.93	106.7	0.11
North Slope	Kaktovik	0.44	0.81	112.4	0.17
North Slope	Nuiqsut	0.20	0.90	101.0	-0.05
North Slope	Pt Hope	0.09	0.95	93.1	-0.11
North Slope	Pt Lay	0.32	0.96	114.0	0.32
North Slope	Wainwright	0.32	0.91	158.9	0.26
Northwest Arctic	Deering	0.42	0.97	128.2	0.25
Northwest Arctic	Kivalina	0.24	0.91	106.5	0.16
Northwest Arctic	Kotzebue	0.22	0.94	119.1	0.31
Northwest Arctic	Noorvik	0.19	0.96	120.6	0.23
Northwest Arctic	Selawik	0.25	0.95	97.7	0.37
Northwest Arctic	Shungnak	0.42	0.87	137.9	0.66
Bering Straits	Brevig Mission	0.11	0.92	87.8	0.48
Bering Straits	Koyuk	0.34	0.95	92.7	0.29
Bering Straits	Nome	0.59	0.66	111.1	0.32
Bering Straits	Savoonga	0.54	0.78	101.6	0.12
Bering Straits	Stebbins	0.32	0.90	111.2	0.16
Bering Straits	Unalakleet	0.53	0.59	120.0	0.01

Data from the Alaska Department of Fish and Game provide the indicator for healthy wildlife. Table 5-3 presents subsistence harvest data for the communities in the study region. Note that salmon harvest was subtracted from the total for the village of Stebbins because the survey was done in 1980 and the salmon fishery has since closed. The table shows subsistence harvests are generally higher in whaling villages of Savoonga, Kivalina, Wainwright, Nuiqsut, and Kaktovik where whale harvests are included in the totals. Barrow and Point Hope are also whaling communities but have lower per capita harvests because their populations are higher. Region centers have lower per capita harvests because people who live there have to travel farther to get to hunting areas than people who live in villages.

Table 5-3. Indicators of healthy wildlife populations for communities in the study area

Region	Community Name	Subsistence harvest pounds per capita, various years
		<u>WILDLIFE</u>
Northwest Arctic	Shungnak	888
North Slope	Kaktovik	886
North Slope	Barrow	751
Northwest Arctic	Noorvik	749
North Slope	Wainwright	741
Northwest Arctic	Deering	685
Northwest Arctic	Selawik	676
North Slope	Pt Lay	658
North Slope	Anaktuvuk	647
Bering Straits	Koyuk	643
Bering Straits	Stebbins	609
Northwest Arctic	Kivalina	565
Bering Straits	Brevig Mission	551
North Slope	Pt Hope	539
North Slope	Nuiqsut	526
Bering Straits	Savoonga	520
North Slope	Atkasuk	515
Northwest Arctic	Kotzebue	437
Bering Straits	Nome	289
Bering Straits	Unalakleet	240

5.3.1 Public safety

The public safety indicator is homicides, suicides and accidental deaths during the 5 years prior to the survey. Homicides are a direct indicator of crime. Even though suicides and accidental deaths are not crimes, they are indicators of crime because of their link to alcohol abuse. Many of the homicides, suicides and accidental deaths in rural Alaska are alcohol related (Segal 1998, Berman et al. 2003). In rural Alaska, child abuse, rape and assault are also linked to alcohol abuse (Segal, 1998).

Table 5-4 presents homicides, suicides and accidental deaths. It shows Brevig Mission has the highest rate, just over four per 1,000. In Deering, there were no homicides, suicides or accidental deaths in the five years prior to the survey.

Table 5-4. Public safety indicators for communities in the study area

Region	Community Name	Homicides, suicides and accidental deaths per 1,000 population in 5 years prior to survey
		HSAPCT5
Bering Straits	Brevig Mission	4.1
Northwest Arctic	Shungnak	3.9
Bering Straits	Savoonga	2.7
Northwest Arctic	Selawik	2.6
Bering Straits	Unalakleet	2.4
Northwest Arctic	Kivalina	2.2
North Slope	Anaktuvuk	1.9
North Slope	Pt Hope	1.9
Bering Straits	Stebbins	1.4
North Slope	Nuiqsut	1.3
Northwest Arctic	Noorvik	1.2
Bering Straits	Nome	1.1
North Slope	Wainwright	1.1
North Slope	Barrow	1.1
Northwest Arctic	Kotzebue	1.1
North Slope	Pt Lay	0.8
North Slope	Atkasuk	0.8
North Slope	Kaktovik	0.7
Bering Straits	Koyuk	0.6
Northwest Arctic	Deering	0.0

The indicator for local control is the vote count in the most recent election for alcohol control. Table 5-5 shows there is the least amount of support for alcohol control in regional centers and large villages where there is a large proportion of non-Natives. Nome is coded as zero because alcohol control measures have never been on the ballot.

Table 5-5. Local control indicators for communities in the study area

Region	Community Name	Ratio of votes in favor of alcohol control to those against in the most recent election
		ALCVOTE
Bering Straits	Koyuk	7.1
North Slope	Anaktuvuk	7.1
Bering Straits	Stebbins	4.6
Northwest Arctic	Kivalina	2.4
Bering Straits	Savoonga	2.1
North Slope	Pt Lay	2.0
Northwest Arctic	Noorvik	1.8
North Slope	Pt Hope	1.6
North Slope	Wainwright	1.5
North Slope	Kaktovik	1.4
North Slope	Atqasuk	1.4
Northwest Arctic	Deering	1.3
Northwest Arctic	Selawik	1.3
North Slope	Nuiqsut	1.1
Bering Straits	Brevig Mission	1.1
Northwest Arctic	Shungnak	1.0
North Slope	Barrow	0.9
Northwest Arctic	Kotzebue	0.7
Bering Straits	Unalakleet	0.3
Bering Straits	Nome	0.0

Community level indicators of traditional culture come from the 1980, 1990 and 2000 US Censuses. The indicators are the percent of the population 5 years and older

who speak a Native American language at home and the proportion of the population made up of Elders. The Elder share of the population equals the mean of the proportions in 1980, 1990 and 2000. The data are grouped because in small communities, the death of one or two Elders can significantly affect the share of Elders in the population. Table 5-6 shows the share of the population ages five and older who speak a Native language at home. The share ranges from a high of 0.84 in Savoonga to zero in Deering. There are generally more Native language speakers in the North Slope region. The second column shows the Elder share of the population ranges from 0.19 in Anaktuvuk to 0.72 in Shungnak.

Table 5-6. Community indicators of traditional culture

Region	Community Name	Share of the	Elder share of
		population who speak Native language at home, 2000	population 1980-2000
		LNGPCT00	ELD80_00
North Slope	Anaktuvuk	0.77	0.019
North Slope	Atqasuk	0.61	0.036
North Slope	Barrow	0.37	0.036
North Slope	Kaktovik	0.42	0.045
North Slope	Nuiqsut	0.64	0.057
North Slope	Pt Hope	0.31	0.042
North Slope	Pt Lay	0.36	0.030
North Slope	Wainwright	0.68	0.053
Northwest Arctic	Deering	0.00	0.061
Northwest Arctic	Kivalina	0.34	0.038
Northwest Arctic	Kotzebue	0.26	0.047
Northwest Arctic	Noorvik	0.58	0.058
Northwest Arctic	Selawik	0.78	0.059
Northwest Arctic	Shungnak	0.79	0.072
Bering Straits	Brevig Mission	0.24	0.040
Bering Straits	Koyuk	0.15	0.063
Bering Straits	Nome	0.12	0.057
Bering Straits	Savoonga	0.84	0.049
Bering Straits	Stebbins	0.18	0.048
Bering Straits	Unalakleet	0.21	0.066

Estimates of the number of years of continuous inhabitation by Inupiat or Yupiit Eskimos is the indicator of history for each community. Data come from several sources.

Table 5-7 shows years of continuous inhabitation by Eskimos for each community in the study area. Communities are ranked from longest inhabited to shortest. Continuous inhabitation is limited at 2003 years, starting at year zero. Although Eskimos inhabited the area around Nome prior to the gold rush in the late 1800s, Nome is coded as zero because it was completely transformed by gold miners. In 1900 with over 12,000 residents, Nome had the largest population of any community in Alaska increasing from 41 people 10 years earlier. Communities with shorter continuous inhabitation were either settled by a mix of Natives and non-Natives for resource development or settled by Native families from nearby communities, some of whom were leaving because of resource development in their original communities.

Table 5-7. Indicator of history for communities in the study area

Community	Estimated years of continuous inhabitation	Notes
	INHABIT	
Point Hope	2003	Oldest continuously occupied Inupiat sites Distant Early Warning (DEW) line radar
Kaktovik	2003	site, originally Qikiqtaq, bartering site
Savoonga	2003	Settled prior to Thule Culture in AD800
Unalakleet	2003	Old trading post
Barrow	1003	Birnirk culture site at Point Barrow, whalers Old settlement, began to grow with US military since 1950
Kotzebue	600	
Koyuk	403	Pre-dates 1800s when old site was first
Selawik	403	Old, first noted in 1800s
Stebbins	170	Russian-American company
Brevig Mission	111	Non-Native reindeer station
Shungnak	104	Gold mining, non-Native
Kivalina	103	Wiped out by famine resettled turn of
Noorvik	103	Families from Deering settled in Noorvik Non-Native gold mining community,
Deering	102	original inhabitants disappeared at some
Wainwright	99	Present village established in 1904
Point Lay	74	Families from Point Hope
Anaktuvuk Pass	54	Tribe from area moved to site
Nuiqsut	30	Families from Barrow settled in Nuiqsut
Atqasuk	26	Barrow families moved there
Nome	0	Gold mining settlement

The cost of a round trip airline ticket between each village and its regional center is the indicator for access. Table 5-8 presents communities in the study area ranked by the cost of an airline ticket. The communities with higher airfares are remote in terms of distance and have higher costs of living.

Table 5-8. Indicator of access for communities in the study area

Region	Community Name	Cost of a round trip ticket, village to regional center, 2003
		(\$) <u>AIRFARE</u>
North Slope	Kaktovik	393
North Slope	Pt Hope	375
North Slope	Anaktuvuk	315
Bering Straits	Savoonga	304
Bering Straits	Koyuk	280
Northwest Arctic	Shungnak	280
Bering Straits	Stebbins	280
Bering Straits	Unalakleet	280
North Slope	Nuiqsut	199
Bering Straits	Brevig Mission	160
Northwest Arctic	Deering	160
Northwest Arctic	Kivalina	160
Northwest Arctic	Noorvik	160
Northwest Arctic	Selawik	160
North Slope	Atqasuk	150
North Slope	Pt Lay	150
North Slope	Wainwright	100
North Slope	Barrow	0
Northwest Arctic	Kotzebue	0
Bering Straits	Nome	0

Whaling is an indicator of interdependence in a community as well as healthy wildlife populations. Nearly everyone in the community participates in whaling hunts. People lend equipment and supplies for hunts, other groups help prepare for hunts, crews hunt the whale, additional people help land the whale, cut and transport meat back to the community (Kruse, 1982). Seven of the twenty communities participating in the survey are whaling communities. The whaling communities are Savoonga, Barrow, Kivalina,

Point Hope, Wainwright, Barrow, Nuiqsut, and Kaktovik. All except for Savonnga and Kivalina are on the North Slope.

CHAPTER 6 OPERATIONALIZING VARIABLES

6.1 Operationalizing dependent variables

Subsistence participation, 'SUBSIST' operationalizes one of the choices in the conceptual model. The Survey of Living Conditions in the Arctic asks whether or not the respondent participated in any of sixteen activities during the past twelve months. The activities are: serving on a whaling crew; skin and butcher caribou; help whaling crews by cooking, give money for supplies or cutting meat; sew skins, make parkas and kamiks; make sleds or boats; hunt caribou, moose or sheep; hunt seal or ugruk; hunt walrus; hunt waterfowl; gather eggs; fish; gather greens, roots or other plants; preserve meat or fish; trap; pick berries; or make Native handicrafts. An index from these data, 'SUBSIST', is created by counting all the activities each respondent participated in over the past twelve months. The index ranges from zero to sixteen. Figure 6-1 presents the distribution of respondents over the index of subsistence activities.

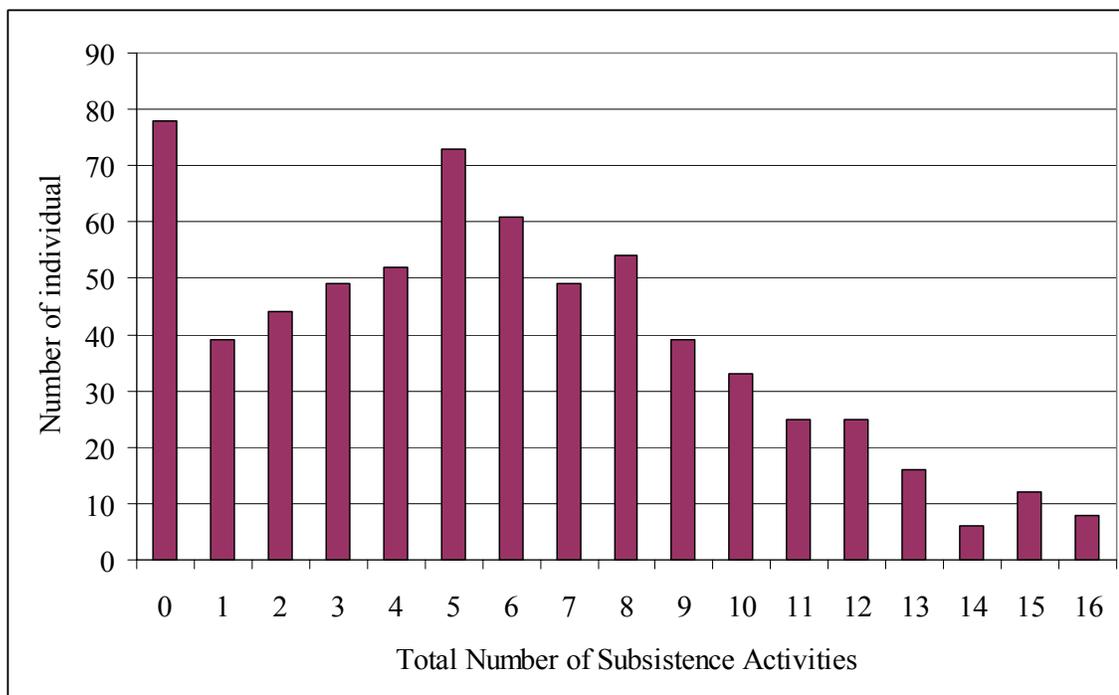


Figure 6-1. Distribution of individuals over subsistence activities in the past 12 months

Kruse (1991) reports that subsistence activities in the past year is a valid measure of subsistence. Analyzing 1977 survey data from the North Slope, he found that a person's reported number of subsistence activities is correlated with the amount of time a person was engaged in subsistence. A 1988 study combining data from the North Slope Borough 1988 census and the Alaska Department of Fish and Game Subsistence survey showed that a person's reported subsistence participation was correlated with the total pounds of meat and fish harvested by that person (Kruse 1991). The Survey of Living Conditions in the Arctic did not ask about time spent on subsistence, or about the amount each personal harvested. It did ask about the share of household traditional food that came from the household's own subsistence activities. A Pearson correlation of .438 shows the index of individual subsistence participation is closely related to household production of its own subsistence foods.

Data from the Survey of Living Conditions in the Arctic operationalize individual choices to work. The survey asks respondents whether they worked for pay or self-employment last week. The variable “RJOB” codes respondents as 1=worked for pay or self-employment last week or 0=did not work for pay or self-employment last week. Table 6-1 shows the number and percent of the respondents who worked for pay or self-employment in the week prior to the survey.

Table 6-1. Forty-six percent of respondents worked for pay or self-employment in the week prior to the survey

	Frequency	Percent
Employed	299	46.0
Not employed	351	54.0
Total	650	100.0

Data from the Survey of Living Conditions in the Arctic operationalize the subjective measure of well-being from the conceptual model—satisfaction. Satisfaction is operationalized as domain satisfaction and satisfaction with life as whole. Domain satisfaction uses nine questions: How satisfied are you with ... the combination of activities you did in the last 12 months to make a living? your household income? your standard of living? this job? opportunities to hunt and fish? job opportunities in this community? the cost of living in this community? quality of life in this community? How easy is it for your household to make ends meet?

There are five response categories to all but the one question: 1=very satisfied, 2=somewhat satisfied, 3=neither satisfied nor dissatisfied, 4=somewhat dissatisfied, 5=very dissatisfied. For the last question, how easy is it for your household to make ends meet, response categories are 1=with great difficulty, 2= some difficulty, 3= fairly easily, 4=very easily. To operationalize the variable, the scale was inverted so that higher

numbers mean more satisfaction and lower numbers mean less satisfaction. Table 6-2 shows satisfaction varies by domain. Most people report being very satisfied with their jobs, opportunities to hunt and fish and the combination of activities they do. A smaller share report being very satisfied with their incomes and standard of living. About a third of the respondents reported being very satisfied with life in their communities. Only six percent were very satisfied with the cost of living in their communities.

Table 6-2 Satisfaction levels vary by domain

	Very satisfied	Somewhat satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Count
	Percent					Count
How satisfied are you with ...						
this combination of activities?	52.1	36.9	6.9	3.0	1.1	624
this job?	54.5	34.5	5.2	4.4	1.6	505
your household income?	28.0	43.2	11.5	12.0	5.3	643
your standard of living?	31.5	44.4	10.9	8.4	4.8	642
job opportunities in your community?	12.2	31.9	18.3	22.0	15.6	633
opportunities to hunt and fish?	49.9	31.7	8.0	6.1	4.2	637
cost of living in your community?	5.6	23.0	18.0	25.9	27.4	638
the quality of life in this community?	29.5	46.7	15.4	6.2	2.2	641

Table 6-3 shows about one in six households are able to make ends meet very easily.

Table 6-3. One in six households make ends meet very easily

	with great difficulty	with some difficulty	fairly easily	very easily	
	Percent				Count
Household able to make ends meet?	6.1	39.7	37.7	16.6	628

The operationalized variable measuring overall satisfaction is responses to the question: How satisfied are you with the quality of your life overall? Table 6-4 shows more the half the respondents reported to be very satisfied with life as a whole?

Table 6-4. Most respondents are very satisfied with life as a whole

	Very satisfied	Somewhat satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	
	Percent					Count
How satisfied are you with your life as a whole?	54.8	34.0	7.6	2.8	0.8	641

6.2 Operationalizing independent variables

Data from the Survey of Living Conditions in the Arctic operationalize personal and household resources, family ties and social support. These, combined with community characteristics, are the independent variables in the model. Most of the independent variables are exogenous, determined outside of the model. Family ties and social support are considered to be exogenous or predetermined in the short run, even though in the long run they may depend on jobs and subsistence. Because self-reported health is endogenous, equations modeling individual employment and subsistence participation and satisfaction use an instrumental variable for self-reported health.

6.2.1 Operationalizing individual measures

Individual measures are age, gender, marital status, education, skills the respondent learned as a child.

Respondent's age, 'AGE' is an integer ranging from 16 to 91, with a mean of 41 and a median of 39. Table 6-5 shows the distribution of respondents by age group.

	Frequency	Percent
16 and 17	25	3.8
18 to 24	94	14.2
25 to 34	130	19.6
35 to 44	157	23.7
45 to 54	112	16.9
55 to 64	64	9.7
65 and older	80	12.1
Total	662	

Respondent's gender, 'RWOMAN', is a dichotomous variable, coded 1=female, 0=male. Table 6-6 shows more than half, fifty-seven percent of respondents are women.

Table 6-6. Respondents by gender

	Frequency	Percent
Men	283	43
Women	379	57
Total	662	

Respondent's marital status, 'RMARRY', is a categorical variable, coded 1=married and 0=not married. Table 6-7 shows just over one third of the respondents are married.

Table 6-7. Respondents by marital status

	Frequency	Percent
Married	239	36.0
Not married	424	64.0
Total	663	

The highest level of schooling or training the respondent completed, 'EDUC' is a categorical variable. Table 6-8 shows the largest share of respondents, 43 percent, have a high school level education. Thirty percent have an elementary school level education or less.

Table 6-8. Respondents by education level

	Frequency	Percent
Advanced traditional training	2	0.3
Less than elementary school	32	4.9
Elementary school	162	24.6
High school	283	42.9
Vocation training, community college	148	22.5
College BA	27	4.1
University MA	5	0.8
Total	659	

Boarding school attendance is the other variable operationalizing education. It is coded as 1 if the respondent attended all or part of elementary or high school outside his or her home community and zero otherwise. Table 6-9 shows just over one-quarter of all respondents attended boarding school.

Table 6-9. Respondents by boarding school attendance

	Frequency	Percent
Attended elementary or high school outside of community	183	27.6
Did not leave community for school	480	72.4
Total	663	100.0

The variable 'SKILLS' is an index operationalizing traditional skills respondent learned as a child. The survey asks which of twenty traditional skills the respondent was taught. The index is a count of all the activities. It ranges from 0 to 20, with a mean of 11.4 and a median of 12. The traditional activities are: serve on a whaling crew; hunt and fish, ;hunt seal; read the weather; overnight on the land; name the different types of snow in Iñupiaq; skin and butcher a caribou; preserve meat and fish; take care of and sew skins; make sleds or boats; cook and prepare traditional Native foods; know when the berries are ripe and where to find them; know the names of past generations of Iñupiat relatives; make traditional clothing; learn stories passed on by your parents and grandparents; make Native arts and crafts; know traditional dances and drumming, navigate at sea; drive a snow machine; and fix a snow machine. Figure 6-2 shows over 40 percent of respondents were taught between eight and sixteen traditional skills when they were children.

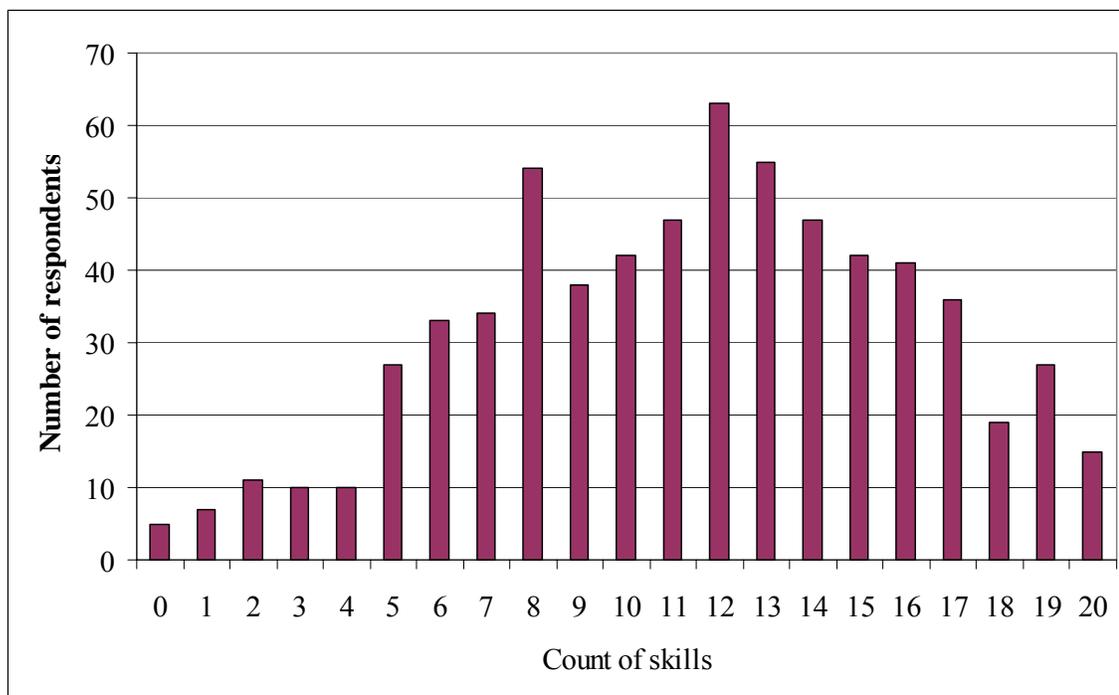


Figure 6-2. Distribution of respondents over skills learned as a child

Whether or not a person lived in the community their whole life, ‘LIVEHERE’, operationalizes migration. Table 6-10 shows about one quarter of all respondents have lived in the community their whole life.

Table 6-10. Respondents by migrant status

	Frequency	Percent
Lived in community whole life	156	23.5
Moved to community	507	76.5
Total	663	

‘HEALTH’ is the instrumental variable for self-reported health. The instrument is created from an ordered probit regression equation. The dependent variable in the regression is the response to a question about health from the Survey of Living

Conditions in the Arctic. The question is: How would you describe your health in general? The response categories are: excellent, very good, good, fair or poor?

When response variables are measured ordinally rather than continuously, ordinary least squares (OLS) regression has been shown to be inadequate (SAS Institute 1999). Because the integer values of self-reported health are rankings rather than a continuous variable an ordered probit regression is appropriate to use. The difference between 4 and 5, very good and excellent, cannot be treated as being the same as the difference between 1 and 2, poor and fair (Kennedy 1996).

The independent variables are exogenous variables related to health as well as exogenous variables related to jobs and subsistence. The exogenous variables directly related to self-reported health are: diseases diagnosed, whether a person has undiagnosed diseases and whether a person takes medication for diagnosed diseases. Diseases diagnosed, 'DIAGNOSE' is an index created by counting 'yes' responses to a series of questions about diseases for which the respondent has been diagnosed by a doctor. The survey asks about 16 diseases: arthritis or rheumatism, asthma, chronic bronchitis, emphysema or shortness of breath, cancer, effects of a stroke, high blood pressure, heart problems, stomach problems or intestinal ulcers, hepatitis, diabetes, other kidney diseases, tuberculosis, chronic depression, obesity, any other long term condition. The index ranges from 0 to 9, with a median equal to 1. Figure 6-3 shows the distribution of respondents over the number of index of diagnosed diseases.

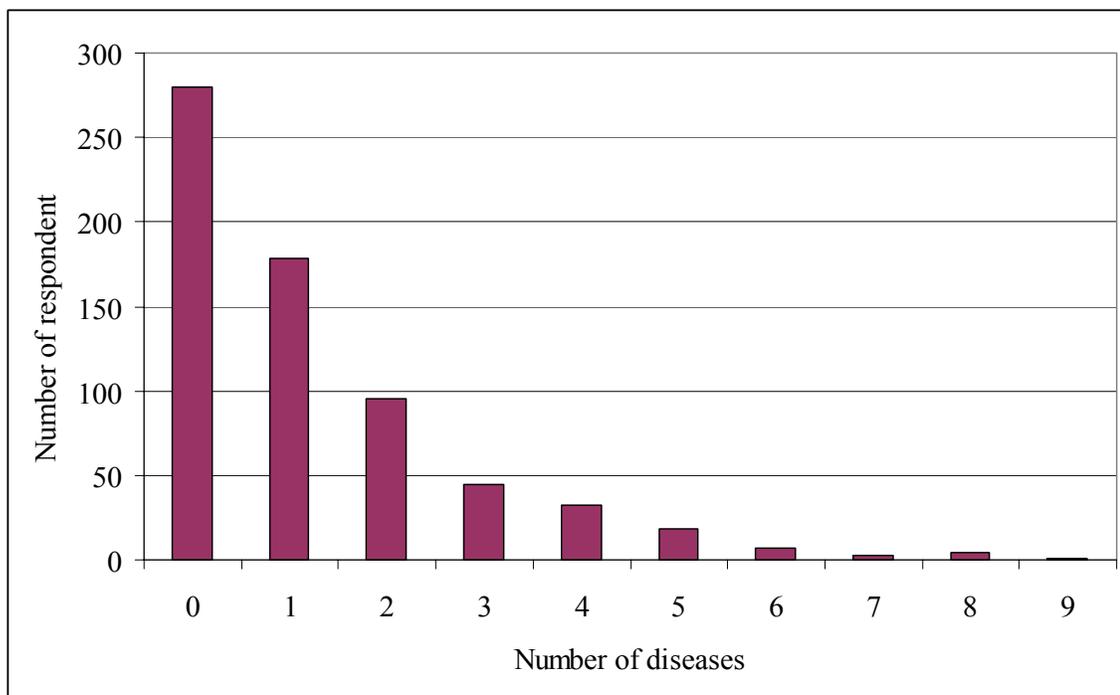


Figure 6-3. Number of diseases for which respondent has been diagnosed by a doctor

Whether a person has undiagnosed diseases, 'UNDIAGNOSED' came from a question in the survey: Do you have an untreated medical problem? Responses are coded 1=yes and 0=no. Whether a person takes medication for diagnosed diseases is operationalized by is an index, 'MEDICATE', created by counting diseases for which the respondent has been diagnosed and for which the respondent takes medication. The index ranges from 0 to 7, with a median equal to 1. The independent variables are: age, gender, marital status, education, skills learned as a child, household size, Elders in the household, children under 5 in the household, family ties and social support.

Fitted values from the regression of self-reported health on exogenous variables becomes the variable operationalizing self-reported health in the individual employment, subsistence participation and satisfaction equations. The instrument, 'HEALTH' is a

categorical variable ranging from 1=poor to 5=excellent. Figure 6-4 shows the distribution of respondents over the fitted values self-reported health.

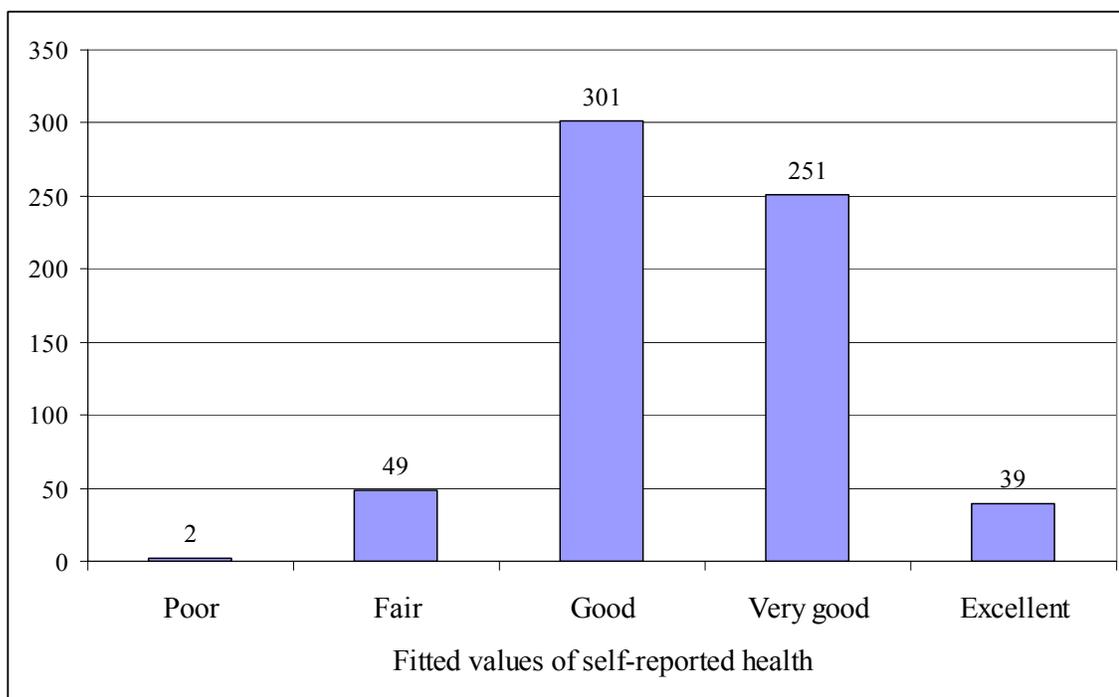


Figure 6-4. Distribution of respondents over fitted values of self-reported health

6.2.2 Operationalizing household characteristics

Variables operationalizing household characteristics are: Inupiaq or Yupik language spoken at home, household type and household composition.

The variable 'HOMELANG' operationalizes language spoken at home. It comes from the survey question: How much of the time do you currently use Inupiaq/Yupik in your household? 'HOMELANG' is a categorical variable coded as 5=all the time, 4=most of the time, 3=some of the time, 2=very seldom, 1=not at all. Table 6-11 shows the amount of time the respondent uses Inupiaq or Yupik language at home. Almost half of all respondents reported using Inupiaq or Yupik not at all or very seldom. About

twenty-three percent of the respondents use Inupiaq or Yupik language at home most of the time or all of the time.

Table 6-11. Amount of time respondent currently uses Inupiaq/Yupik language at home.

	Frequency	Percent
Not at all	120	18.5
Very seldom	198	30.5
Some of the time	183	28.2
Most of the time	82	12.6
All the time	67	10.3
Total	650	

Five household types are operationalized using survey information about the ages and relationships among household members. ‘LONEMALE’ is a variable coded as 1 if there is one adult, non-Elder male in the household and no other people.

‘LONEFEMALE’ is a variable coded as 1 if there is one adult, non-Elder female in the household and not other people. Single parent, ‘SINGLPAR’ is coded as 1 if there is one non-Elder adult in the household who does not live with a spouse or partner and has children ages twelve and under living with them. Twelve years and under was chosen as a cut-off point because that age group is more likely to need childcare and thus is more likely to affect an individual’s employment or subsistence participation.

Multigenerational households ‘MULTIGEN’ are coded as 1 if there are Elders, adults and children under eighteen years old living in the household. An Elder household,

‘ELDERHH’ is coded as 1 if there are Elders and no other adults in the household. Elders who are living with grandchildren and Elders who are not living with grandchildren are grouped into one variable. ‘COUPLEK’ is coded as 1 for households with couples, either married or partners, and children twelve years old and under living in the same house.

The remainder of the households are coded as 1=‘OTHER’. ‘OTHER’ is the comparison

category in the statistical model. It is a mix of households, including households with teenage children, households with unrelated members, and adults living with their parents. Figure 6-5 shows the distribution of respondents by household type. About half of all respondents live in couple households where all the children are twelve years old or younger.

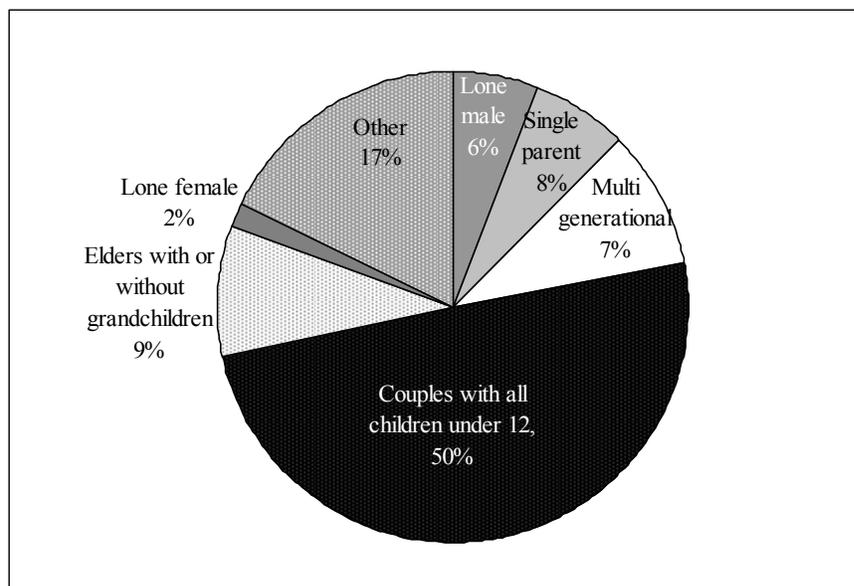


Figure 6-5. Distribution of respondents by household type

Three variables operationalize household composition. These variables are based on survey data about the gender, age and ethnicity of household members. The number of the adult males and females in each household are counts operationalized as ‘ADULTM’ and ‘ADULTF’. The number of non-Natives in each household is operationalized as ‘NONNATIVES’. The variable uses information from a question asking the cultural background of each member of the household. Each person is allowed three responses. The variable is calculated in several steps. First, it calculates whether that each household member considered themselves to be all or part Inupiaq or Yupik in any of the three

responses. Then for each household, it totals the number of people who consider themselves to be all or part Native. This is subtracted from household size to get the number of non-Natives. The number of children under sixteen years is 'U16KIDS'. It is a count of all children under 16 years of age in the household.

'FAMTIES' is an index variable operationalizing the closeness of family ties. 'FAMTIES' is created by summing responses to three questions about family. The questions are: How strong are the links among family members not living with you? During the last month, how often you in touch with members of your family not living with you by phone or mail? During the last month, how often were you in contact with family members not living with you by visiting or being visited?

For the first question, response categories are: 1=very weak, 2=weak, 3=neither weak nor strong, 4=strong and 5=very strong. For the last two questions, response categories are: 1=never, 2=once, 3=a few times, 4=more than a few times, 5=every day. The index variable, 'FAMTIES', is a total of each person's responses to the three questions. It ranges from 3 to 15 with a median equal to 12 and a mode equal to 13. Figure 6-6 shows the distribution of respondents over the index of family ties. Most of the respondents reported close family ties.

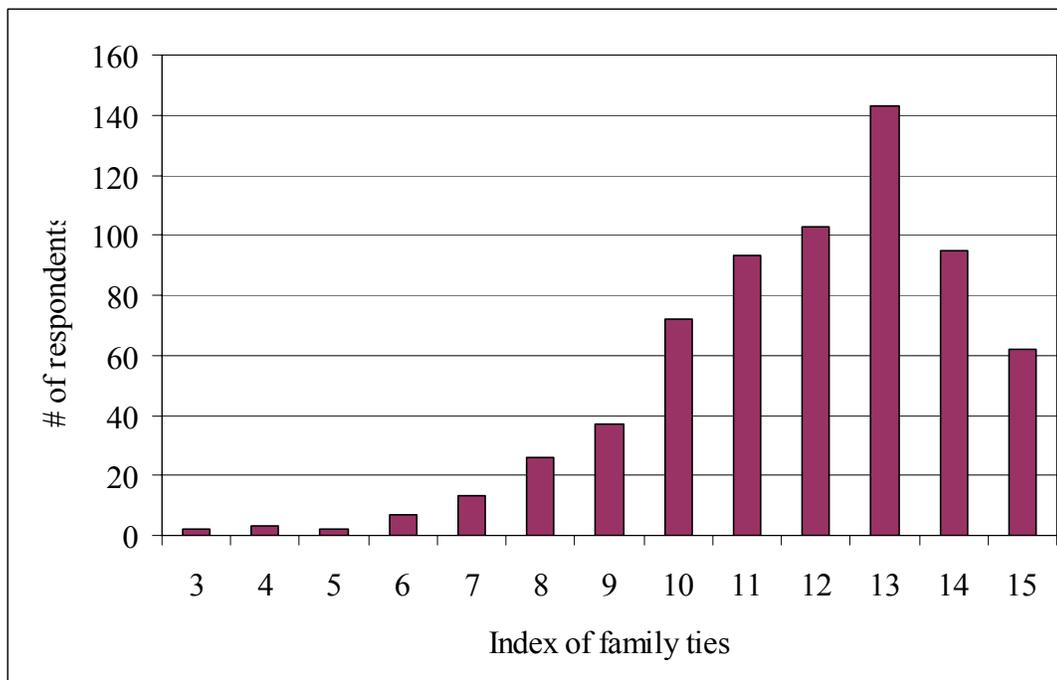


Figure 6-6. Distribution of respondents over the index of family ties

Social support is a measure of ‘the availability of people whom the individual trusts, on whom he can rely, and who make him feel cared for and valued as a person’ (McDowell and Newell, quoted in Larson, 288). ‘SOCSUP’ is an index operationalizing social support. It is based on a series of questions about the kinds of support is available to people when they need it. The questions are: How often are the following types of support available to you when you need it? Someone you can count on to listen to you when you need to talk? Someone you can count on when you need advice? Someone who shows you love and affection? Someone to have a good time with? Someone to confide in or talk about yourself and your problems? Someone to get together with for relaxation? Someone to do something enjoyable with? Response categories are: 1= not at all, 2=very seldom, 3=some of the time, 4=most of the time and 5=all the time. The index is the total of all responses. The index ranges from 7 to 35 with a median equal to 30 and a mode

equal to 35. Figure 6-7 shows the distribution of respondents over the index of social support. Most respondents reported high levels of social support.

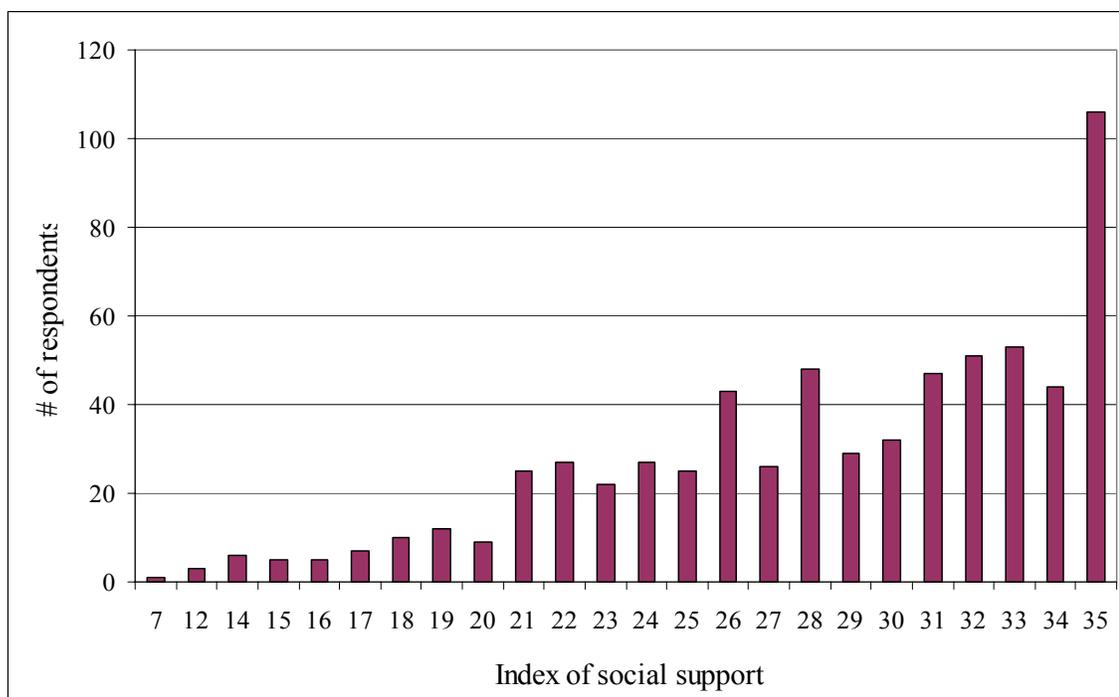


Figure 6-7. Most respondents reported high levels of social support

The variable, 'PERSROOM', operationalizes housing conditions. It is the number of people in the respondent's household divided by the number of rooms in the house.

6.3 Operationalizing community measures as independent variables

In operationalizing community measures, the tasks are: (1) to minimize the number of operationalized variables relative to the twenty communities in the survey, nine measures of community characteristics, and seventeen indicators of those measures, (2) to combine indicators so that they accurately represent measures thought to be associated with differences in individual well-being, (3) to account for differences among

villages and regional centers and, (4) to limit operationalized variables to exogenous variables.

Two methods operationalize community variables. The first method computes a variable to operationalize job opportunities in communities. This is the community level variable hypothesized to be associated with the probability that a person has a job. It is total employment in the community divided by the Alaska Native share of the working age population. This variable takes into account the number of jobs in the community and immigration by non-Natives for employment. It takes into account differences among villages and regional centers. Table 6-12 compares the employment opportunities in each community to the Alaska Native share of the working age population. The table groups regional centers and villages. Looking at regional centers, Nome is the only community in which there are more employment opportunities than there are working age Alaska Natives. Among villages, those in the North Slope have the most employment opportunities relative to the number of working age Alaska Natives. Communities with lowest number of job opportunities have four to five times as many working age Alaska Natives as employment opportunities in the community.

Table 6-12. Community employment compared to the Alaska Native share of the population 15 and older

Regional centers or villages	Region	Community	Employment per Native 15 and older 2000	Total employment 2000	Alaska Native populaton age 15 & older, 2000
Regional Centers	Bering Straits	Nome	1.04	1535	1477
	North Slope	Barrow	0.91	1986	2181
	Northwest Arctic	Kotzebue	0.70	1252	1777
Villages	North Slope	Kaktovik	0.70	117	166
	North Slope	Pt Lay	0.57	96	167
	North Slope	Nuiqsut	0.53	176	333
	North Slope	Wainwright	0.48	204	428
	Bering Straits	Unalakleet	0.46	258	558
	North Slope	Atqasuk	0.45	66	146
	North Slope	Pt Hope	0.43	237	551
	North Slope	Anaktuvuk	0.42	100	236
	Northwest Arctic	Deering	0.42	44	105
	Bering Straits	Brevig Mission	0.42	80	192
	Northwest Arctic	Shungnak	0.38	79	206
	Bering Straits	Stebbins	0.37	161	439
	Northwest Arctic	Noorvik	0.34	181	525
	Bering Straits	Koyuk	0.31	70	226
	Bering Straits	Savoonga	0.29	166	565
	Northwest Arctic	Kivalina	0.27	82	304
	Northwest Arctic	Selawik	0.22	130	586

The second method for operationalizing community variables uses principal components analysis. Principal components factor analysis is a standard method and appropriate to use for this study. Principal components analysis estimates which groups of community indicators belong together and how to weight the individual variables within each group. Exploratory factor analysis is appropriate to use reduce a large number of variables to a smaller number of factors (Kim and Mueller 1978). Varimax rotation ensures that the factors have the least amount of correlation among themselves

(Nunnally 1967). Because factors have the least amount of correlation among themselves, using them in regression equations minimizes multi-collinearity among community variables. Correlation among variables in a regression would make it difficult to see an effect. Multicollinearity increases standard errors and makes t-statistics smaller (Kennedy 1996). With varimax rotation, variables load primarily on only one factor, making factors distinct from each other (Kim and Mueller 1978). Each factor accounts for the maximum amount of variance in the original variables. Factors aggregate indicators and account for a major portion of the variance in the original data (Nunnally 1976).

The variables in the factor analysis are the community indicators discussed in Chapter 6. The five factors retained had eigenvalues greater than one and account for 80.6 percent of the variance in the indicators.

As Table 6-13 shows, all community indicators had factor loadings greater than 0.40. The square of the factor loading equals the amount of variation in a variable explained by a factor. For example, factor one has a loading of 0.77 on AIRFARE. This means that factor one explains 0.59 percent of the variation in AIRFARE.

Factor one has positive loadings on airfare, support for alcohol control, employment growth from 1990 to 2000, length of continuous Native inhabitation, .percent of the population who speak Native language, and wildlife. It has negative loadings on household income and in-migration. This factor describes remote communities which prohibit alcohol possession. These communities are mostly Alaska Native, with low household income and high levels of out-migration. The second factor has high loadings on length of continuous inhabitation, population growth from 1990 to 2000 and whaling. It has a negative loading on share of Elders in the population. Factor

two describes old, whaling communities with little out-migration and large cohorts of younger people. Factor three has positive loadings on employment and population growth from 1990 to 2000, high rates of homicides, suicides and accidental deaths. It has negative loadings on median household income and the ratio of Native to non-Native median household income. In these communities, employment growth may follow from population growth, since most of the jobs are funded by transfers and the amount of funding and number of jobs is tied to population. Median household income is low and non-Natives hold higher paying jobs. Factor four loads on Native unemployment. Factor five has positive loadings on native sex ratio. In these communities there is a surplus of Native males relative to the number of Native females.

Table 6-13. Community indicators and their factor loadings

	Factor1	Factor2	Factor3	Factor4	Factor5	communality
AIRFARE	0.770	0.097	0.232	0.340	0.120	0.80
ALCVOTE	0.522	0.170	0.095	0.339	0.127	0.90
ELD80_00	0.173	-0.773	-0.035	0.255	0.109	0.80
EMP90_00	0.466	0.398	0.674	0.066	0.117	0.85
HHINC00	-0.630	0.277	-0.553	-0.199	0.162	0.88
HSAPCT5	0.266	0.004	0.822	0.076	-0.174	0.90
LNINHABIT	0.421	0.736	-0.011	0.018	-0.322	0.82
LNGPCT00	0.431	0.473	0.207	0.351	0.017	0.77
MOVPT00	-0.801	0.149	-0.286	-0.052	0.125	0.77
NATPCT00	0.956	0.116	0.182	0.058	-0.064	0.97
NSEXRT00	-0.012	-0.062	-0.123	0.081	0.975	0.98
NUN00	0.126	0.013	0.123	0.962	0.067	0.97
POP90_00	0.189	0.637	0.642	-0.102	0.165	0.90
RACINC00	-0.099	0.075	-0.802	-0.180	0.164	0.90
WHALING	-0.010	0.805	-0.019	0.256	0.121	0.77
WILDLIFE	0.908	0.210	0.045	-0.049	0.059	0.88
% variation accounted for by each factor	0.390	0.156	0.105	0.087	0.069	

Factor scores become village level variables in the estimation model. Factor four is dropped to minimize the number of factors relative to the number of communities and

because it provides the least amount of information to test hypotheses. Factor five is substituted for factor four because describes communities where there are more men than women. Because factor five has a low loading on in-migration, this factor probably describes communities there has been female out-migration. Using this variable might allow additional findings related to the work of Hamilton and Seyfrit (1994) on female out-migration. The four remaining factors are renamed to reflect their loadings on village indicators. Factor one becomes REMOTEDRY. Factor two is renamed EMPPOPHSA. Factor three is NATSEX RAT. Factor five is renamed OLDWHALING. Table 6-14 shows community rankings from highest to lowest scores on the four factors.

Table 6-14 Community rankings by scores on four factors

REMOTEDRY	EMPPOPHSA	NATSEX RAT	OLDWHALING
Deering	Brevig Mission	Nuiqsut	Barrow
Nuiqsut	Stebbins	Pt Lay	Pt Lay
Koyuk	Shungnak	Noorvik	Kaktovik
Atqasuk	Savoonga	Koyuk	Pt Hope
Unalakleet	Selawik	Pt Hope	Savoonga
Kivalina	Kivalina	Kivalina	Anaktuvuk
Wainwright	Pt Lay	Nome	Wainwright
Noorvik	Unalakleet	Stebbins	Kivalina
Kaktovik	Barrow	Kaktovik	Nuiqsut
Savoonga	Nome	Barrow	Kotzebue
Shungnak	Noorvik	Selawik	Atqasuk
Anaktuvuk	Nuiqsut	Unalakleet	Noorvik
Pt Lay	Koyuk	Anaktuvuk	Brevig Mission
Pt Hope	Anaktuvuk	Wainwright	Stebbins
Selawik	Pt Hope	Kotzebue	Selawik
Stebbins	Kaktovik	Savoonga	Koyuk
Brevig Mission	Kotzebue	Shungnak	Shungnak
Kotzebue	Wainwright	Atqasuk	Unalakleet
Nome	Atqasuk	Brevig Mission	Nome
Barrow	Deering	Deering	Deering

There are six operationalized variables to describe communities. The four factors, REMOTEDRY, EMPPOPHSA, NATSEXRAT, OLDWHAING, the variable EMPNRT00 and an additional dummy variable for regional centers which accounts for additional differences between villages and regional centers that are not measured in the data.

6.3.1 Relationships between independent and dependent variables

Table 6-15 shows the relationships between independent variables, individual employment and subsistence. For the dependent variables, whether or not the respondent worked in the past week, the table presents chi-square results from two-way cross-tabulations. For subsistence participation and satisfaction, the table presents results from one-way analysis of variance (ANOVA). Interval level independent variables were grouped into categories for the ANOVA. A chi-square test is appropriate to analyze relationships among categorical variables. Analysis of variance is correct to use to analyze relationships between an interval dependent variable and categorical independent variables (Iverson and Norpoth 1987).

The first column of numbers in Table 6-15 shows the chi-square values from the cross-tabulations of whether the respondent has a job with independent variables. The table shows the individual variables associated with differences in employment are age, marital status, education level and whether a person attended boarding school, health and whether the person lived in the community their whole life. The household variables associated with differences in whether or not and individual is employed are Native language spoken at home, the number of children under 16 in the household, the number of non-Natives in the household, the number of Elders in the household, living in an

Elder household, living in a household consisting of couples with children, and multigenerational households. Family ties and social support are both associated with differences in individual employment. At the community level, the number of jobs in the community relative to the Native share of the working age population; whether a community has high population, job growth and high rates of homicide, suicide and accidental deaths; and living in a remote community with alcohol control are associated with differences in individual employment.

The second column of numbers in Table 6-15 shows F-statistics from the ANOVA of subsistence participation and independent variables. All individual variables except whether or not an individual has lived in the community for their whole life are associated with differences in subsistence participation. At the household level, the number of adult males, adult females and Elders in the household are associated with differences in subsistence participation. Elder households, couple with children households and single parent households are all associated with differences in individual subsistence participation. Family ties and social support are both associated with differences in subsistence participation. At the community level, employment opportunities relative to the Alaska Native share of the working age population and living in a remote community with alcohol control are associated with differences in subsistence participation.

Table 6-15. Associations between independent variables and employment and subsistence participation.

	Individual	Subsistence
	employment	participation
	χ^2	F
AGER	102.41 **	6.21 **
RMARRY	6.58 **	18.04 **
RWOMAN	0.35	84.61 **
EDUCLEV	99.60 **	9.56 **
BOARDING	2.71 *	14.47 **
SKILL	2.52	98.12 **
HEALTH	22.62 **	4.08 **
HOMELANG	17.33 **	9.18 **
LIVEHERE	4.67 **	2.28
KIDSU16	6.50 **	1.04
ADULTM	7.25	11.07 **
ADULTFEM	4.43	2.68 **
NONNATIVES	23.76 **	0.71
ELDERS	40.72 **	5.09 **
LONEMALE	0.03	8.01 **
LONEFEMALE	1.05	1.32
ELDERHH	22.86 **	6.31 **
COUPLEK	21.80 **	3.47 *
MULTIGEN	9.46 **	0.15
SINGLPAR	1.76	8.52 **
FTIE	15.27 **	4.78 **
SOCSUP2	36.62 **	3.43 **
EMPNATIVE	23.38 **	20.11 **
EMPPOP	10.97 **	0.06
REMOTE	2.99 *	7.62 **
WHALING	0.41	0.51
NATSEXRT	0.05	2.33

**p<.05

*p<.01

Table 6-16 shows the results of ANOVA of independent variables, domain and satisfaction with life as a whole. The table shows differences among domains and between domain satisfaction and satisfaction with life as a whole. Social support is consistently associated with satisfaction, community variables are associated with domains related to communities, opportunities to hunt and fish and with satisfaction with life as a whole. Individual employment is associated with differences in satisfaction in seven domains. The association between subsistence participation and satisfaction is not as strong. Subsistence participation is associated with satisfaction with the combination of activities you do to make a living, job opportunities in the community and satisfaction with life as whole.

Table 6-16. Associations between independent variables, domain satisfaction and overall satisfaction.

	How satisfied are you with ...				
	the combination of activities you do to make a living?	your household income?	your standard of living?	your job?	job opportunities in your community?
	F	F	F	F	F
AGER	3.724 **	0.403	2.543 **	2.342 **	1.071
RMARRY	7.156 **	5.337 **	1.929	1.157	6.639 **
RWOMAN	0.000	1.117	0.328	0.017	0.367
EDUCLEV	2.473 *	2.554 *	0.368	2.765 **	1.722
BOARDING	0.006	0.036	0.722	1.784	3.051 *
HEALTH	3.270 **	4.238 **	5.568 **	2.071 *	4.962 **
HOMELANG	4.118 **	1.766	4.098 **	1.153	1.150
LIVEHERE	1.015	2.423	2.620	0.326	1.620
LONEMALE	0.523	4.968 **	6.026 **	2.862 *	0.648
LONEFEMALE	0.027	0.009	0.073	2.055	0.006
ELDERHH	3.834 *	0.059	5.532 **	0.098	0.293
COUPLEK	0.037	4.792 **	0.653	0.001	3.372 *
MULTIGEN	0.023	0.227	0.005	0.046	1.313
SINGLPAR	0.184	0.018	4.371 **	1.048	11.512 **
FTIE	2.765 **	1.885	1.127	2.088 *	1.529
SOCSUP2	2.322 *	4.882 **	4.508 **	1.218	3.267 **
PERROOM	1.011	1.011	1.011	1.011	1.011
EMPNATIVE	0.264	0.884	0.080	1.758	7.660 **
EMPPOP	0.356	0.017	0.020	0.066	6.622 **
REMOTE	1.338	4.191 **	0.853	4.515 **	2.572
WHALING	1.919	0.020	3.047 *	0.497	6.481 **
NATSEXRT	0.117	4.463 **	2.930 *	0.403	12.986 **
RJOB	3.812 *	5.996 **	0.439	5.454 **	0.156
SUBLEV3	4.348 **	2.031	2.238	1.218	2.368 *

**p<.05

*p<.01

Table 6-16. Associations between independent variables, domain satisfaction and overall satisfaction.

	How satisfied are you with ...				How easily is your household able to make ends meet?
	opportunities to hunt and fish?	the cost of living in your community?	the quality of life in this community?	your life as a whole?	
	F	F	F	F	
AGER	1.660	4.957 **	3.004 **	1.413	2.606 **
RMARRY	2.001	24.195 **	1.165	1.331	0.447
RWOMAN	2.196	0.191	1.645	2.553	3.622 *
EDUCLEV	6.802 **	10.955 **	8.236 **	0.308	5.811 **
BOARDING	0.003	3.542 *	0.078	2.791 *	0.159
HEALTH	0.763	1.158	1.753	5.077 **	5.360 **
HOMELANG	9.801 **	2.601 **	7.264 **	3.714 **	0.870
LIVEHERE	8.821 **	14.041 **	7.427 **	0.040	0.007
LONEMALE	0.958	1.509	0.319	0.431	1.918
LONEFEMALE	0.626	1.828	8.301 **	1.321	0.918
ELDERHH	0.113	0.044	4.964 **	2.695	5.941 **
COUPLEK	1.948	6.901 **	3.022 *	0.043	0.037
MULTIGEN	1.013	0.054	2.068	2.191	0.021
SINGLPAR	0.179	0.089	0.227	0.002	1.189
FTIE	0.364	4.309 **	0.842	2.136 *	2.040 *
SOCSUP2	4.167 **	3.164 **	1.247	3.114 **	4.035 **
PERROOM	1.011	1.011	1.011	1.011	1.011
EMPNATIVE	35.822 **	6.910 **	15.677 **	5.355 **	2.345
EMPPOP	31.342 **	2.459	12.132 **	9.400 **	0.023
REMOTE	67.979 **	9.625 **	22.015 **	7.574 **	0.000
WHALING	61.389 **	2.416	20.387 **	13.320 **	0.091
NATSEXRT	57.173 **	13.188 **	13.463 **	10.235 **	1.699
RJOB	10.386 **	13.994 **	15.511 **	1.835	5.250 **
SUBLEV3	1.741	1.282	0.066	7.056 **	1.757

**p<.05

*p<.01

CHAPTER 7

ESTIMATION PROCEDURES

7.1 Three equation model

A three equation model estimates people's choices regarding employment, subsistence participation, and their satisfaction. One equation estimates the probability of employment and another equation estimates the number of subsistence activities for each person. Fitted values from these enter into a third equation estimating satisfaction.

The three equation model of employment, subsistence and satisfaction is:

$$\text{Employment} = \alpha + \gamma_{11}X_{1t} + \dots + \gamma_{1K}X_{Kt} + u_{1t}$$

$$\text{Subsistence} = \alpha + \gamma_{21}X_{1t} + \dots + \gamma_{2K}X_{Kt} + u_{2t}$$

$$\text{Satisfaction} = \alpha + \beta_{\text{job}} + \beta_{\text{subsistence}} + \gamma_{11}X_{1t} + u_{1t}$$

Where,

Employment and subsistence are endogenous variables (Kennedy 1996)

X_1, X_2, \dots, X_k are predetermined variables.

γ 's are the coefficients of predetermined variables

u_{1t} and u_{2t} are disturbances

t is the total number of observations

β 's are the coefficients of fitted values from the equations estimating employment and subsistence (notation from Gujarati 1995).

Because employment and subsistence participation are endogenous (Kirkvliet and Nebesky 1997) there are separate equations for each. Reduced form equations express subsistence and jobs as linear functions of only exogenous variables (Kennedy 1996). Reduced form equations yield consistent parameters, and in this case, where there are no lagged endogenous variables, the parameters are unbiased as well (Kennedy 1996).

A list of independent variables in each equation is presented in Table 7-1. The employment equations differ from each other in that the regional center equation does not include village level variables. The village equation does not include lone females because there are no lone female non-Elder households in villages. The equations estimating subsistence participation for men and women use the same independent variables. The equations for satisfaction include additional independent variables, the fitted values from the employment and subsistence equations as well as their interaction. The satisfaction equations also include persons per room. So that the equations are identified, skills learned as a child and the variables measuring household composition in terms of gender, age and ethnicity are dropped from the satisfaction equations.

Table 7-1. Variables for equations estimating individual employment, subsistence participation and satisfaction

Variable name	Variable label	Individual employment		Subsistence participation		Domain satisfaction	Overall satisfaction
		Regional Centers	Villages	Men	Women		
AGE	Age	x	x	x	x	x	x
AGE2	Age2	x	x	x	x	x	x
RMARRY	Marital status	x	x	x	x	x	x
EDUC	Education level	x	x	x	x	x	x
RWOMAN	Female	x	x			x	x
BOARDING	Attended boarding school	x	x	x	x	x	x
SKILLS	Skills learned as a child	x	x	x	x		
HEALTHFITTED	Health fitted values	x	x	x	x	x	x
HOMELANG	Native language spoken at home	x	x	x	x	x	x
LIVEHERE	Live in community whole life	x	x	x	x	x	x
ADULTM	Adult males in household	x	x	x	x		
ADULTF	Adult females in household	x	x	x	x		
NONNATIVES	Non-Natives in household	x	x	x	x		
U16KIDS	Children under 16 in household	x	x	x	x		
LONEFEMALE	Lone female	x			x		
LONEMALE	Lone male	x	x	x		x	x
ELDERHH	Elder household	x	x	x	x	x	x
COUPLEK	Couple with children household	x	x	x	x	x	x
MULTIGEN	Multigenerational household	x	x	x	x	x	x
SINGLPAR	Single parent household	x	x	x	x	x	x
FAMTIES	Strength of family ties	x	x	x	x	x	x
SOCSUP1	Social support	x	x	x	x	x	x
PERSROOM	Housing conditions persons per room					x	x
REGCENTER	Regional center			x	x	x	x
EMPNRTOO	Jobs per Native share working age pop	x	x	x	x	x	x
REMOVEDRY	Remote, support for alcohol control, low income		x	x	x	x	x
OLDWHALING	Old whaling communities		x	x	x	x	x
EMPPOPHSA	Pop & job growth, homicide, suicide, accidents		x	x	x	x	x
NATSEXRAT	High Native sex ratio		x	x	x	x	x
PJOB	Individual employment fitted values					x	x
PJOB_SUBFIT	Interaction fitted values employment & subsistence					x	x
SUBFITTED	Subsistence participation fitted values					x	x

7.2 Choice of estimators

A probit equation estimates the probability that the respondent is currently employed. Probit is a better estimation technique for discrete dependent variables than ordinary least squares (OLS) regressions (Gujarati 1995). If the dependent variable is limited, OLS estimates are biased, even asymptotically (Kennedy 1996). From the probit, the probability that a person is employed equals,

$$\Pr (y=1 | X) = \Phi X\beta$$

Where, $y=1$ respondent worked in the past week,

Φ is the cumulative normal distribution function,

β is a vector of coefficients,

X is a vector of explanatory variables

A censored regression is the appropriate model for subsistence participation. Figure 6-1 shows the distribution of the number of subsistence activities by respondents. Twelve percent of all respondents reported no subsistence activities. Because there is a group of people who did no subsistence activities, zero is the lower censor. Censored models are used to analyze dependent variables that are unobserved below a bottom limit (left censored), above a top limit (right censored) or both. Because of the way the data are distributed, censored models are better for analyzing subsistence participation than are OLS regressions (McDonald & Moffit 1980). With zero as a limiting value, there are no

negative deviations around zero. OLS regressions would estimate negative subsistence participation. A censored regression uses more information than a probit. “It is inefficient to throw away information on the value of the dependent variables when it is available” (Tobin 1958). Calculations of the estimated number of subsistence activities for each person use results from a censored regression include the probability that a person will do subsistence activities and, for those people who perform subsistence the number of subsistence activities each person performs.

A likelihood-ratio test (Kennedy 1996) tests whether a censored regression is a better estimator than an OLS regression. The degrees of freedom for the likelihood ratio test equals the number of restrictions being tested. In this case, there is one degree of freedom because the likelihood ratio test is testing scale factor, the probit part, of the censored regression. It is testing the hypothesis that the probit equals 1. When the probit equals 1, the censored regression is identical to the OLS. The equation for the likelihood ratio test is:

$$\lambda = -2(\text{ULLF} - \text{RLLF})$$

Where, ULLF is the unrestricted log likelihood function, the log-likelihood of the censored regression equation.

RLLF is the restricted log-likelihood function, the log-likelihood of the OLS equation.

In this case, the likelihood ratio test is:

$$\lambda = -2(-1583.78 - -1529.36) = 108.85$$

This has a chi-square distribution with 1 degree of freedom and is significant at $>.0001$. This rejects the null hypothesis that the scale factor on the censored regression

equals 1. The likelihood ratio test shows a censored regression is appropriate to estimate subsistence participation.

The third equation estimates respondents' satisfaction with their lives. An ordered probit equation estimates individual satisfaction. Fitted values of the probability that a person will be employed, the number of subsistence activities and the interaction of the two are included in the equations estimating satisfaction.

7.3 Specifying equations

Based on the differences between regional centers and villages, two separate equations estimate the probability that a person is employed, one equation for regional centers and one equation for villages. A likelihood ratio test determines that the unrestricted model is a better estimator than the restricted model (Pindyck and Rubinfeld 1991). In this case, the unrestricted model has separate equations for regional centers and villages and the restricted model combines them in one equation. The null hypothesis is: there is no difference between coefficients for regional centers and villages. The alternative hypothesis is that there is a difference between the coefficients.

$$\lambda = 710.387 - (323.529 + 336.197) = 50.66$$

The statistic follows a chi-square distribution with 25 degree of freedom. It is significant at <.0001 level, indicating that separate models for regional centers and villages is the appropriate specification. This test allows rejection of the null hypothesis underlying the employment model. There are significant differences between regional centers and villages.

A likelihood-ratio test shows using separate equations for men and women is appropriate for estimating subsistence participation of men and women. The test is:

$$\lambda = -2 * (1492.92 - (-641.89 - 819.87)) = 62.304$$

The results of the test follow a chi-square distribution with 27 degrees of freedom and are significant at $<.001$. This test allows rejection of the null hypothesis underlying the employment model. There are significant differences between men and women.

Table 7-2 presents chi-square statistics from tests of whether separate equations for men and women for each of the domains and overall satisfaction are better estimators of satisfaction equations combining men and women. Except for satisfaction with opportunities to hunt and fish, which is significant at the 0.10 level, there are no questions with significant differences between men and women. There is not enough evidence to reject the null hypothesis. The determinants of satisfaction are the same for men and women and so responses are grouped into one equation.

Table 7-2. Determinants of satisfaction are the same for men and women

How satisfied are you with ...	χ^2	p
the combination of activities you do to make a living	19	0.899
your household income	32	0.258
your standard of living	24	0.675
this job	32	0.275
job opportunities in your community	20	0.850
opportunities to hunt and fish	40	0.067
cost of living in your community	26	0.581
the quality of life in this community	21	0.825
your life as a whole	21	0.836
How easy is it for your household to make ends meet	25	0.618

Slightly different model specifications than described in the previous section create instrumental variables for individual employment and subsistence. Regressions of individual employment and subsistence included dummy variables for each community, to include attributes of communities that are not in the operationalized community variables. Regression coefficients on dummy variables representing individual

communities are not significant. From the probit estimating employment, the estimated probability that a person will be employed, 'PJOB', is retained from the regression. PJOB is an independent variable in the satisfaction equations. From the results of the censored regressions of subsistence participation, estimates of the number of subsistence activities for each person, 'SUBFITTED', are calculated using the following equation:

$$\text{SUBFITTED} = [\text{pr}(\text{no subsistence}) * 0] + [\text{pr}(\text{maximum subsistence}) * 16] + [\text{pr}(\text{subsistence between min and max}) * X\beta] + \text{diff}$$

Where,

$$\text{pr}(\text{no subsistence}) = \Phi[(0 - X\beta) / \sigma]$$

$$\text{pr}(\text{maximum subsistence}) = 1 - \Phi[(16 - X\beta) / \sigma]$$

$$\text{pr}(\text{subsistence between zero and max}) = \Phi[(16 - X\beta) / \sigma] - \text{pr}(\text{no subsistence})$$

$$\text{diff} = \sigma * (\phi [(0 - X\beta) / \sigma]) - (\phi [(16 - X\beta) / \sigma])$$

Regression results provide $X\beta$ values for the equation.

Equations estimating satisfaction include other individual, household, family ties, social support and community level variables as well as fitted values from the equations estimating individual employment and subsistence. Identification problems constrain the choice of independent variables for the satisfaction equation. The same variables that are in the jobs and subsistence equations cannot all be included in the satisfaction equations. An equation estimating satisfaction that used the same independent variables as in the individual employment and subsistence equations is under-identified. The task in selecting independent variables for the satisfaction equation is to identify at least one variable in the employment equation and at least one variable in the satisfaction equation

that are significant for jobs and subsistence respectively but are unrelated to satisfaction. These are called 'zero restrictions', specifying that certain structural parameters are zero (Kennedy, 1996). In the equations estimating satisfaction, family composition variables: the counts of non-Natives, Elders, adult males, adult females and children under 16, are associated with individual employment and subsistence participation but are unlikely to be associated with satisfaction. Skills learned as a child is significant for subsistence but is probably not associated with satisfaction.

CHAPTER 8

RESULTS

8.1 Individual employment

8.1.1 Regression results

Table 8-1 presents results from probit equations estimating the probability that an individual is employed. The first column presents coefficients for regional centers. The second column presents coefficients for villages. Results reject the null hypothesis that there is no relationship between individual and household characteristics, family ties, social support, community characteristics and individual employment. The coefficients in the table are directly interpretable in terms of their sign and whether or not they are significant (Liao 1994). Following the discussion of the significant variables in terms of the hypotheses, is an interpretation of coefficients to show their effects on the probability that a person is employed.

Men living alone are more likely to be employed in regional centers but less likely to be employed in villages. This finding supports hypothesis H3. The probability of employment varies with household type. In villages, men living alone may be less likely to be employed because subsistence is their primary activity. This is supported by Magdanz and Utermohle's (2003) finding that lone male households in villages have the highest per capita subsistence harvest of any household type. Another explanation is men

in villages may be less likely to be employed because they work in during the summer in construction and firefighting jobs. They were not working in the winter, when the survey took place.

Another difference is the effect of employment opportunities relative to the Alaska Native share of the working age population. In regional centers, more employment opportunities relative to the Alaska Native share of the working age population, means Natives are less likely to be employed. In villages, the reverse is true. This finding supports hypothesis H5. The probability of employment varies with community characteristics. In regional centers, Natives may be less likely to work because there are more non-Natives immigrating for employment. The opposite result in villages may be because most of the villages where the number of jobs is high relative to the size of the Native working age population are on the North Slope, where there are more jobs and a local hiring preference.

Besides lone male, two other household types influence individual employment in regional centers. The effects of children in the household under 16 years of age, living in a couple with children household and living in an Elder household on employment can be understood in terms of child care. The probability of employment decreases as the number of children in the household increases. More children under 16 in the household means increased child care requirements and less time for work. Living in a household comprising a couple with children increases the probability that a person will be employed. Having children increases the need for income and being in a married couple household means that spouses can share responsibilities for children and work. After

controlling for age, living in an Elder household, compared to other types of households increases the probability of employment.

The number of non-Natives in a household is associated with a higher probability of employment.

Social support increases the probability that an individual is employed. This supports hypothesis H4. Social support may translate into networks for jobs.

For regional centers, there is not enough evidence to support hypotheses H1, H2 or H4. Attending boarding school, living in a community one's whole life and family ties are not associated with statistically significant differences in the probability that a person is employed.

In villages, the number of Elders in a household and family ties increase the probability that an individual is employed. The finding for family ties supports hypothesis H5. Family ties are an indicator of an extended family network. In extended families, some members work to provide cash for subsistence inputs in exchange for a share of the harvest. The relationship between the number of Elders in a household and the probability of employment supports hypothesis H3. Household composition affects the probability of employment. In this case, it is probably because Elders in a household provide child care so that other adults can work.

Gender is assigned as a control variable in the employment equation based on findings of Hamilton and Seyfit (1994). Their research showed that women are more likely to be employed than men. Results from the model did not show that women were more likely than men to be employed. One reason this finding may not concur with that of Hamilton and Seyfit is that they compared women and men in full-time jobs. Their

research also shows many Native men in rural Alaska work part-time. The operationalized variable for employment does not differentiate between full and part-time employment. Another reason for the apparent discrepancy that Hamilton and Seyfrit cited employment statistics at a statewide level. Statewide statistics may look very different from those for the North Slope, Northwest Arctic and Bering Straits regions. Statewide statistics may be dominated by urban areas where employment rates for Alaska Native women are higher than for Alaska Native men.

Table 8-1. Probit equations estimating individual employment show differences between regional centers and villages

	Individual employment	
	Regional centers	Villages
Intercept	-5.07	-4.54
AGE	0.14 **	0.11 **
AGE2	0.00 **	0.00 **
RMARRY	-0.20	0.06
EDUC	0.44 **	0.41 **
RWOMAN	-0.11	-0.13
BOARDING	-0.12	0.29
SKILLS	0.01	-0.01
HEALTHFITTED	0.07	-0.24
HOMELANG	-0.10	-0.03
LIVEHERE	0.18	0.11
U16KIDS	-0.15 **	0.01
ADULTM	-0.10	0.03
ADULTF	0.22	0.07
NONNATIVES	0.35 *	0.17
ELDERS	-0.12	0.80 *
LONEFEMALE	0.25	0.07
LONEMALE	1.35 **	-0.80 *
ELDERHH	1.37 **	0.43
COUPLEK	0.64 **	-0.33
MULTIGEN	0.60	-0.53
SINGLPAR	0.58	0.26
FAMTIES	0.01	0.09 *
SOCSUP1	0.06 **	-0.02
EMPVRT00	-1.20 *	1.69 *
REMOTEDRY		0.76
OLDWHALING		0.18
EMPPOPHSA		0.11
NATSEXRAT		-0.02
observations	335	289
log likelihood	-155.9525	-164.319
*p≤ 0.10		
**p≤ 0.05		

8.1.2 Comparing the effects of personal resources and communities

Interpreting coefficients from the probit equations allows comparison of the effects of individual and household, family ties and social support and community variables. Because the probit is a non-linear equation, the coefficients do not measure change in the probability of employment per unit change in the independent variables. To clarify the meaning of the coefficients and show the non-linearity of the relationships, the predicted probability of employment is calculated based on a set of values of the independent variables (Liao, 1994). In the examples that follow, the probability of employment for a 'typical' person is the basis for comparison. The 'typical' person has the median value for the variables in each equation.

The examples for regional centers describe how education, social support and employment opportunities in the community affect the probability of employment. For regional centers, the typical person lives in Barrow, is a 39 year old female, high school graduate, in excellent health, lives in an all Native household comprising a couple with children, with close family ties and high levels of social support. The probability that this person is employed is 0.83. The person with the highest probability of employment is 36 year old male, living alone in Kotzebue, with graduate level education and close family ties. This person has a 0.99 probability of employment. The person with the lowest probability of employment is an 18 year old, living in Nome with less than an elementary school education and is rarely in touch with family members. This person has a 0.06 probability of employment.

As shown in **Error! Reference source not found.**, the probability of employment increases with education. The probability of employment for the typical person with less

than an elementary school education is 0.51, compared to 0.83 for the same person with a high school diploma. With a college degree or higher, the probability of employment increases to 0.97.

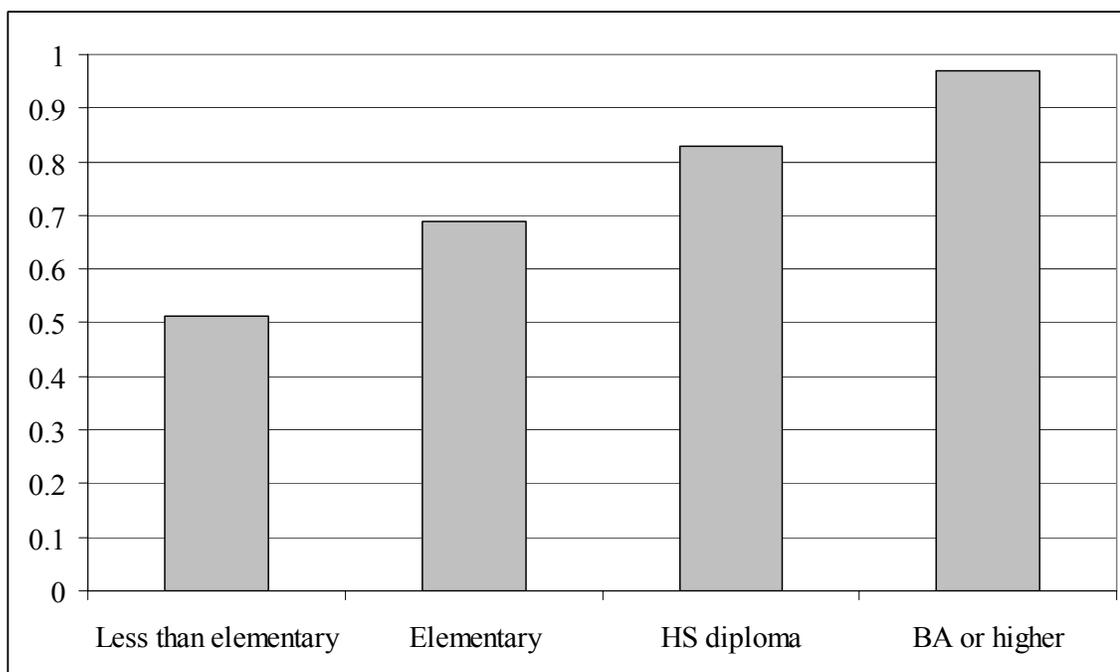


Figure 8-1 The probability of employment increases with education

Most people in regional centers report fairly high levels of social support. The social support index value for the typical person is 31 on a scale of 35. But for some people, lack of social support significantly affects the probability of employment. Figure 8-2 shows the probability of employment for people who report the lowest levels of social support is 0.20. This is much lower than the probability of employment for the typical person and for people who report highest levels of social support. The table shows most people report fairly high levels of social support, but for those with low social support, the probability of employment drops significantly.

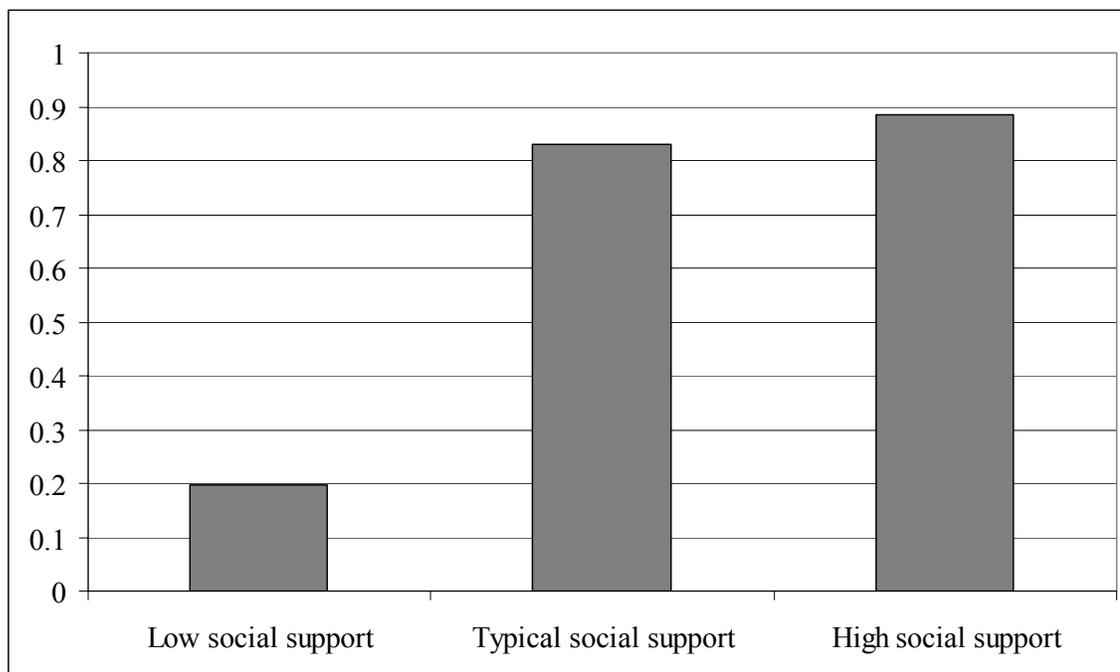


Figure 8-2. Most people report fairly high levels of social support, but for those with little social support, the probability of employment drops significantly.

Error! Reference source not found. shows the probability of employment is lower in Nome, where there are more employment opportunities per Alaska Native share of the working age population, than in Barrow or Kotzebue where there are fewer. Compared to the typical person in Barrow, the probability of employment in Nome is 0.79. For the same person in Kotzebue, the probability of employment is 0.88. Living in Kotzebue instead of Nome increases the probability of employment for the typical person by 0.09.

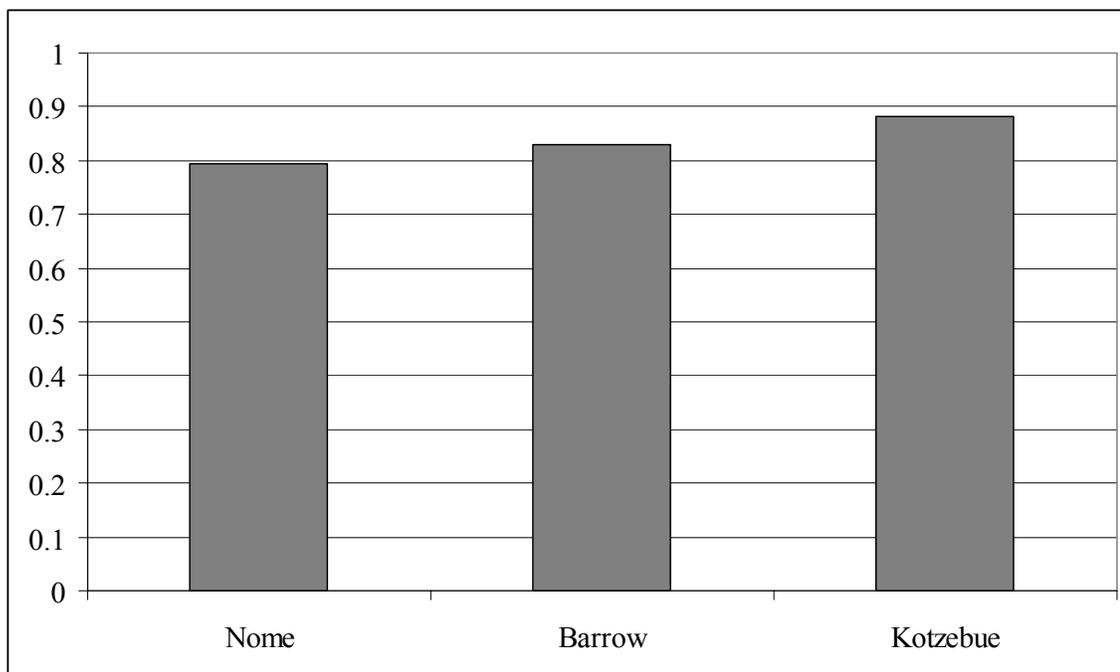


Figure 8-3. The probability of employment is lower in Nome where there are more employment opportunities per Alaska Native share of the working age population than in Barrow or Kotzebue where there are fewer.

The effects of education, social support and community variables combine to affect the probability of employment but they are not additive. Because the probit is a non-linear equation, the magnitudes of the effects of each independent variable are different depending on values of the other independent variables. As shown in **Error! Reference source not found.4**, the effects of education on the probability of employment vary depending on the level of employment opportunities in each community. The effects of moving from less than elementary to a high school education increases the probability of employment more in Nome than in Kotzebue. The community effects are also less for people with higher levels of education than for people with lower levels.

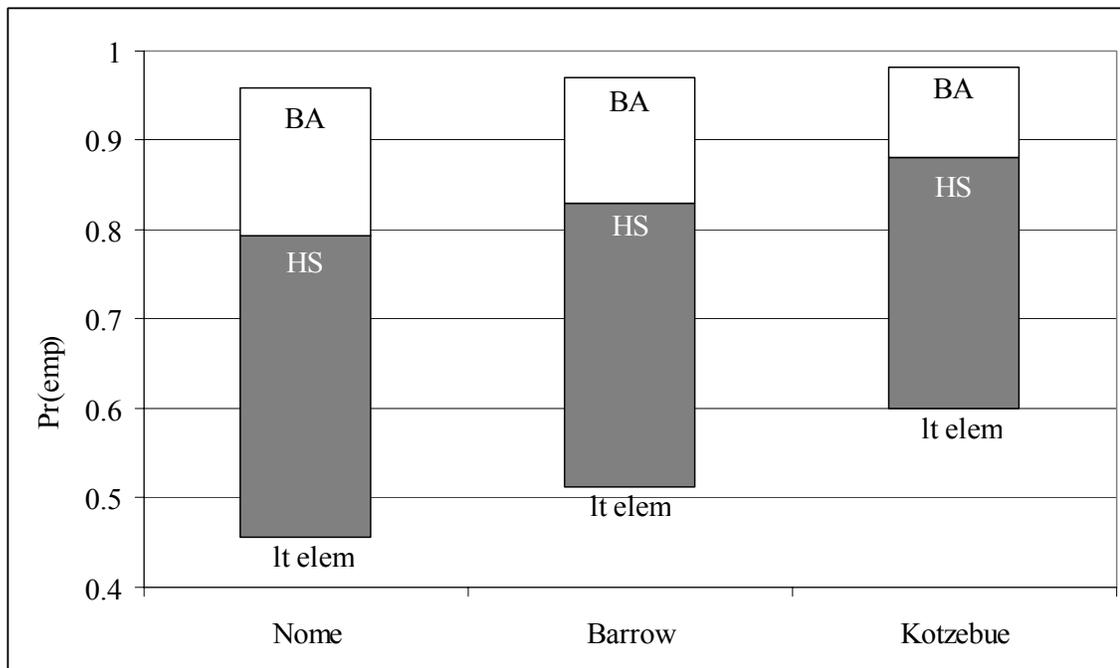


Figure 8-4. The effects of education are different in Nome, Barrow and Kotzebue.

The examples for villages describe how of education, family ties and employment opportunities in the community affect the probability of employment. The ‘typical’ person living in village is a 38 year old female with a high school education, living in a couple with children, all Native household, has close family ties and lives in a community where there are about two working age Alaska Natives for every job. This person has a 0.71 probability of employment. The person with the highest probability of employment is a 36 year old, with a BA or higher education, living in a mixed Native, non-Native household with close ties to extended family and in a village with a large number of employment opportunities relative to the Alaska Native share of the working age population. That person has a 0.99 probability of employment. The person least likely to be employed is an 18 year old lone male with less than an elementary school education who lives in a community with few job opportunities. The probability of employment for that person is 0.004.

Error! Reference source not found.Figure 8-5 shows education increases the probability of employment in villages. A person with less than an elementary level education has a 0.46 probability of employment, compared to a person with a college degree who has nearly a 0.90 probability of employment.

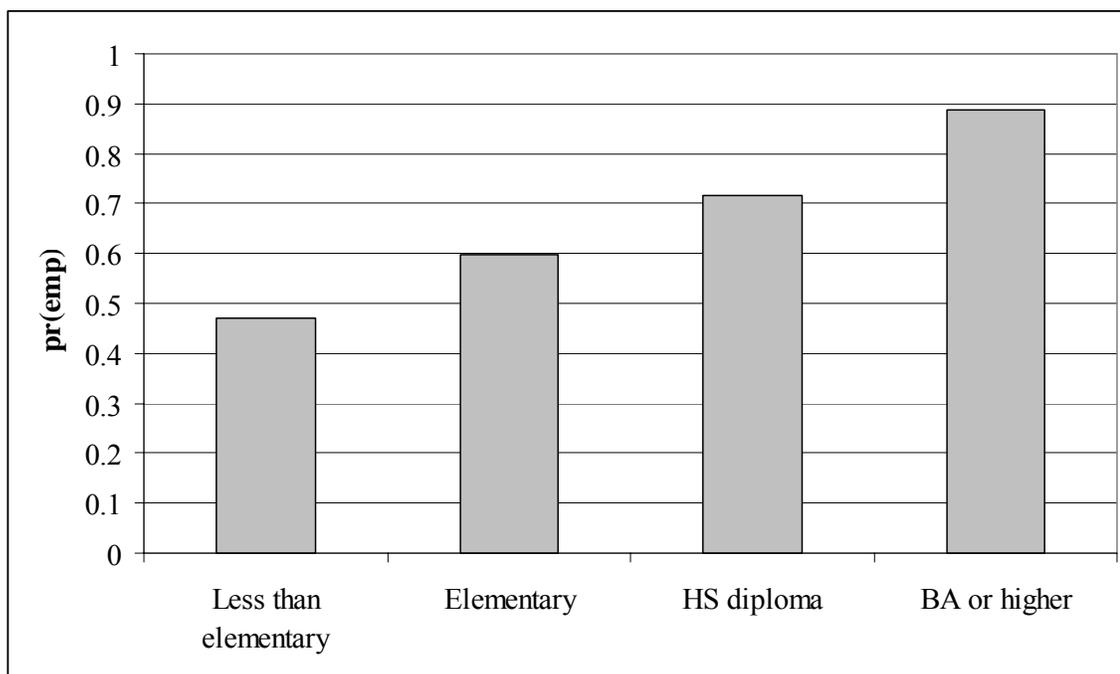


Figure 8-5. People in villages with higher education are more likely to be employed.

Close family ties increase the probability of employment in villages. Figure 8-6 shows the probability of employment for people who are rarely in contact with extended family members is 0.44 compared to 0.71 for the typical person and 0.79 for a person with close family ties.

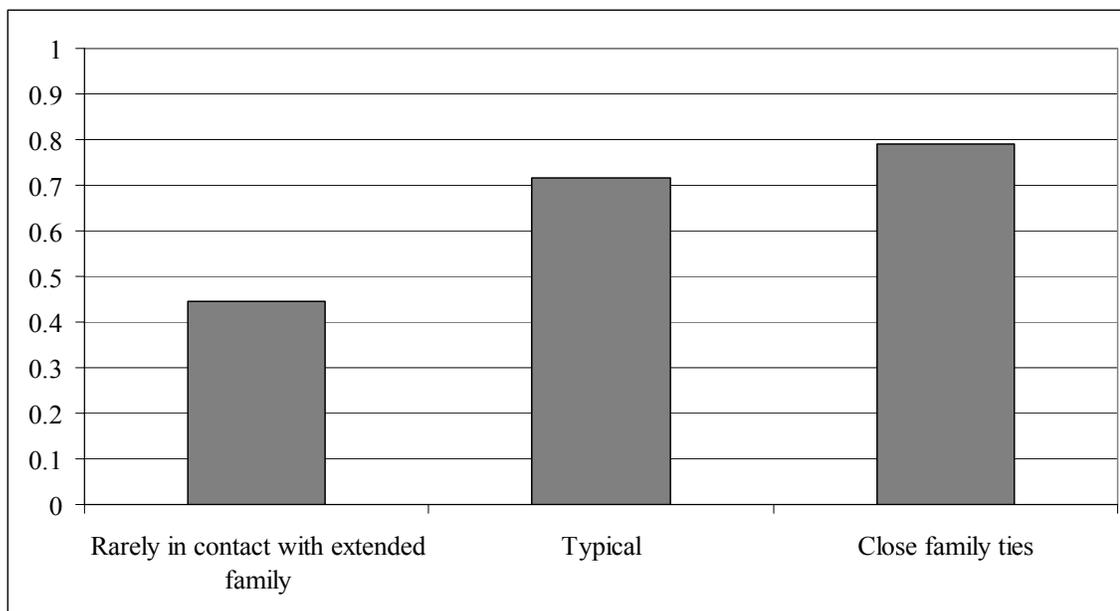


Figure 8-6 Close family ties increase the probability of employment for people who live in villages.

Figure 8-7 compares the probability of employment among villages with low, typical and high employment opportunities per Alaska Native share of the working age population. People who live in communities with fewer employment opportunities relative to the Alaska Native share of the working age population have a 0.60 probability of employment. People who live in communities with more employment opportunities have a higher probability of employment, 0.81 than either people in typical communities or people in communities with few employment opportunities.

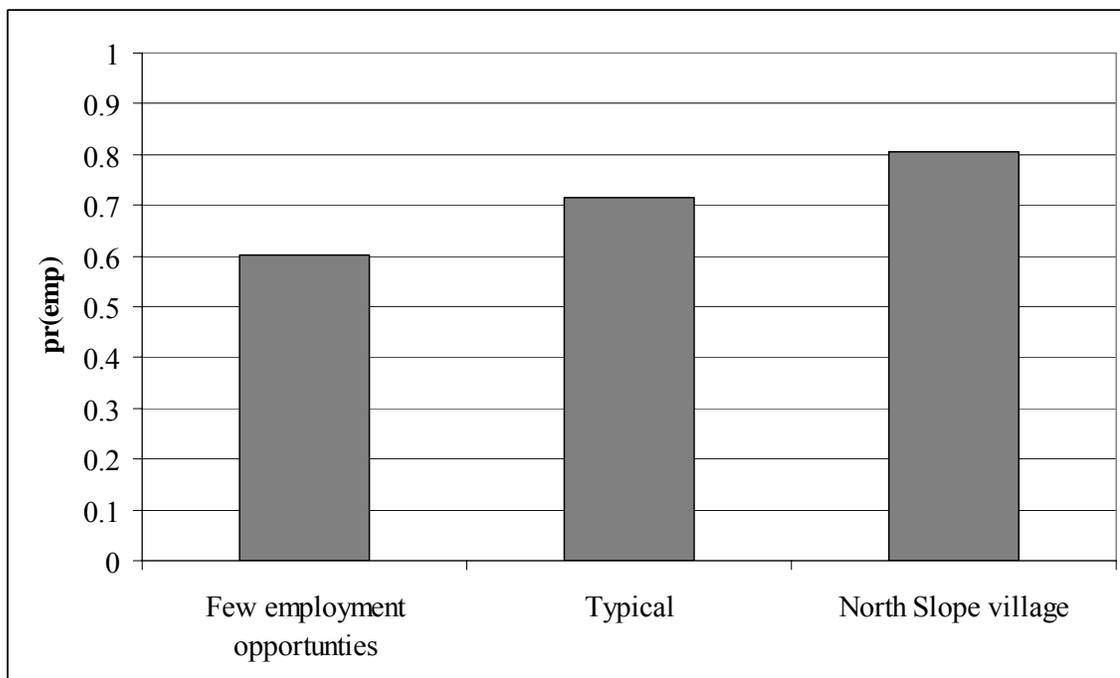


Figure 8-7 People who live in villages with more employment opportunities have a higher probability of employment.

Figure 8-8 shows the effects of education in communities with different levels of employment opportunities on the probability of employment. Living in a North Slope village with more employment opportunities increases the probability of employment more for people with low levels of education more than for people with high levels of education. People with low levels of education in North Slope villages have a higher probability of employment than people with a high school education living where there are fewer employment opportunities. Education changes the probability of employment more for people living in villages with fewer employment opportunities than for people living in village with more employment opportunities.

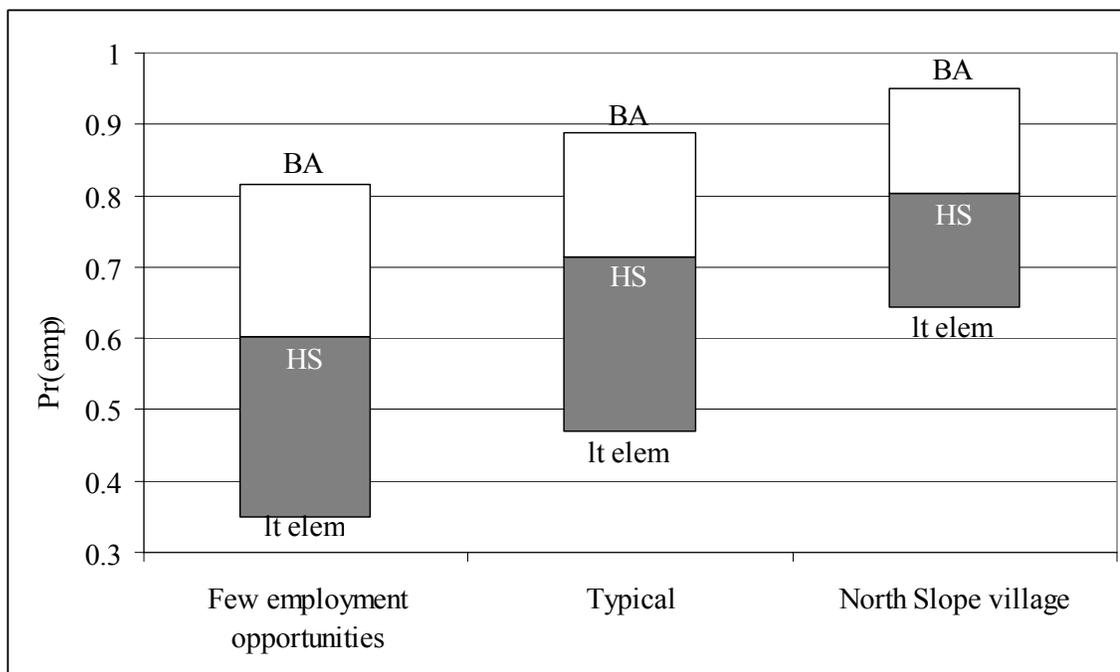


Figure 8-8. The effects of education vary depending on employment opportunities in villages.

8.2 Individual subsistence participation

Table 8-2 presents results from the censored regressions estimating individual subsistence participation. The two columns of coefficients compare men's and women's subsistence participation levels. The count of left-censored observations at the bottom of the table shows 19 of 268 men (7 percent) and 52 of 374 women (14 percent) reported no subsistence activities.

Results in this table reject the null hypothesis that there is no relationship between individual subsistence participation and individual, household, family ties, social support or community variables.

Differences between men and women are the effects of household and community variables. The effect of household composition and type on men's and women's subsistence participation supports hypothesis H12. Individual subsistence participation varies with household type and composition. The number of adult males in the household decreases men's subsistence participation but increases women's subsistence participation. Men who live in lone male households have lower levels of subsistence participation than men in other households. Living alone does not affect women's subsistence participation. This finding for men does not concur with that of Magdanz and Utermohle. However, the difference may be that their measure of subsistence was pounds per capita within each household. Because there is only one person in the household, per capita harvest may be higher at the same time that the number of activities may be lower. Lone males may serve on walrus crews or whaling crews or hunt caribou. They could perform a small number of activities that yield a large harvest in terms of pounds.

For both men and women, closer family ties are associated with higher levels of subsistence participation. This confirms findings of other research about the importance of extended family networks (Magdanz and Utermohle 2003, Usher 1992). Some people work and provide cash for subsistence equipment so others can harvest subsistence foods. These findings support hypothesis H13.

For men and women, subsistence participation is lower in communities with population and employment growth and high homicide, suicide and accidental death rates. Because high population and employment growth and high homicide, suicide and accidental death rates are correlated at the community level, it is not possible to separate out the influence of crime on individual subsistence participation. Nonetheless, this

finding can help direct further research about the possible effects of crime in a community on individuals.

Living in a community with a large number of employment opportunities relative to the Alaska Native share of the working age population lowers women's subsistence participation but does not significantly affect men's participation. Women appear to be working instead of harvesting in communities where there are jobs. Women who live in long inhabited whaling communities also have lower subsistence participation levels. This may be because harvesting whales takes more time than other activities. Women in whaling communities may spend more time doing subsistence but report fewer activities. These findings support hypothesis H15. Subsistence participation varies with community characteristics.

For men and women, subsistence participation levels are lower in remote, dry communities. This is surprising because store bought goods are more expensive in remote communities and subsistence foods are a substitute for expensive store bought goods. This factor also loaded negatively on in-migration. It is possible that communities with high scores (Deering and Nuiqsit) also have high out-migration which could lower subsistence participation.

For men, regression results support hypothesis H10. Living in households where Native language is spoken all the time means higher levels of subsistence participation. Households where Native language is spoken probably indicate households with preference for subsistence food.

Living in households comprising a couple with children was also associated with lower subsistence participation for men. These men are probably working and taking care of young children and do not have time for subsistence.

Men who live in communities with a high Native sex ratio do fewer subsistence activities. This may be because there are not enough women to assist with subsistence harvests.

There is insufficient evidence to support the hypotheses H7, H8, H9, H11 or H14 that individual subsistence participation varies with education, boarding school attendance, health or living in a community one's whole life.

Table 8-2. Results of the censored regression estimating individual subsistence participation levels

	Subsistence participation	
	Men	Women
Intercept	-1.54	-4.86
AGE	0.09	0.19 **
AGE2	0.00 **	0.00 **
RMARRY	1.13 *	1.25 **
EDUC	0.36	0.11
RWOMAN		
BOARDING	0.24	0.10
SKILLS	0.53 **	0.42 **
HEALTHFITTED	0.31	0.12
HOMELANG	0.64 **	-0.01
LIVEHERE	-0.31	-0.31
U16KIDS	0.22	-0.14
ADULTM	-1.06 **	0.49 *
ADULTF	-0.58	0.34
NONNATIVES	0.33	-0.27
ELDERS	-0.07	-0.22
LONEFEMALE		-1.34
LONEMALE	-3.59 **	
ELDERHH	-1.90	-0.33
COUPLEK	-1.82 **	-0.64
MULTIGEN	0.65	-0.19
SINGLPAR	-1.10	-0.76
FAMTIES	0.25 **	0.25 *
SOCSUP1	-0.01	0.04
REGCENTER	-4.42 **	-2.43 **
EMPNRT00	-0.12	-4.07 *
REMOTEDRY	-1.40 *	-1.50 **
OLDWHALING	-0.07	-0.42 **
EMPPOPHSA	-1.02 **	-0.56 **
NATSEXRAT	-0.42 **	-0.14
Scale	3.10	2.70
observations	244	372
left censored observations	18	52
log likelihood	-641.89	-819.87

*p≤ 0.10

**p≤ 0.05

In the censored regression equations, the effect of the independent variables on the subsistence participation is not equal to the coefficient. Because the censored regression equation is non-linear the effects of independent variables are not additive. The relative effects of independent variables are the same but the contribution of each is lower at lowest and highest levels of subsistence participation. Interpreting the coefficients compares effects of different variables on a person's subsistence participation. This section presents estimates of the number of activities each person performs. The estimates start with a 'typical' man and woman, with values for each variable equal to the median for men and women respectively. Estimates use coefficients from the censored equations and hypothetical values for skills learned as a child, marriage, language spoken at home, family ties and community variables to illustrate their importance and combined effects.

The 'typical' man is 39 years old, has a high school education, is unmarried, learned 14 out of 20 traditional skills as a child, speaks Native language at home some of the time, does not live alone, has close family ties and lives in Barrow. This person performs an estimated nine subsistence activities. The man who performs the estimated maximum number of subsistence activities is 30 years old, learned 20 traditional activities as a child, speaks Native language all the time at home, has close family ties and lives in a long inhabited whaling village. The person who performs the estimated minimum number of subsistence activities is a 16 year old male, who learned no traditional skills as a child, never speaks Native language at home, does not have close ties to extended family and lives in a regional center.

Figure 8-9 compares the effects of traditional skills learned as a child on subsistence participation. The estimates show men who were taught more traditional skills as children, perform more subsistence activities as adults.

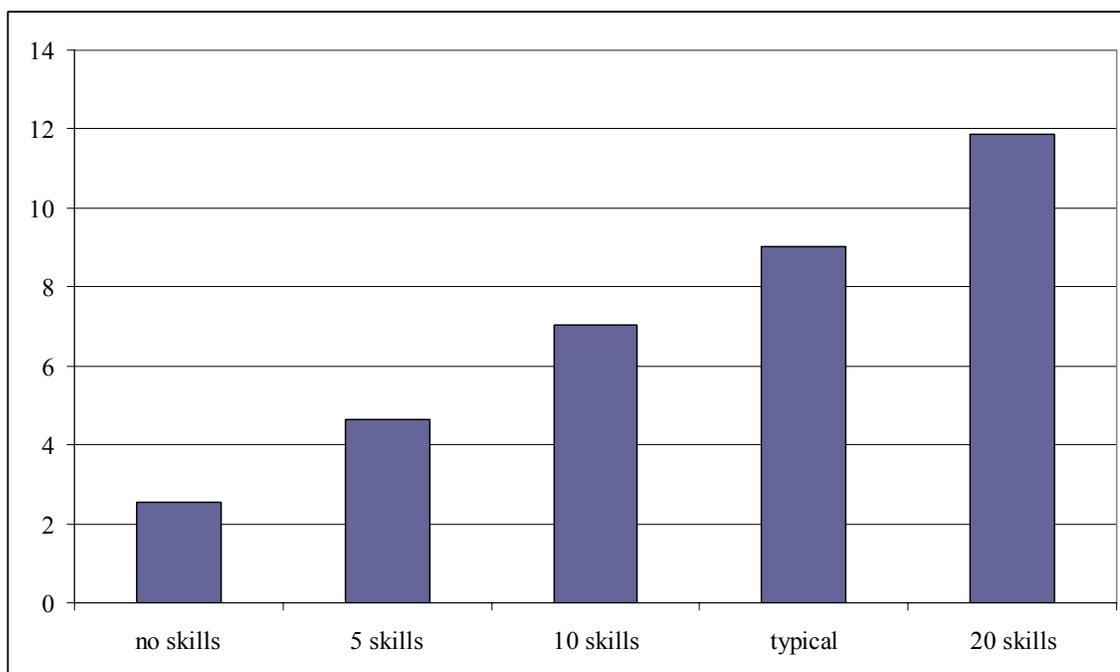


Figure 8-9 Higher number of skills learned as a child mean more subsistence activities for adults

Figure 8-10 shows the amount of time Native language is spoken in the household has a small effect on subsistence participation.

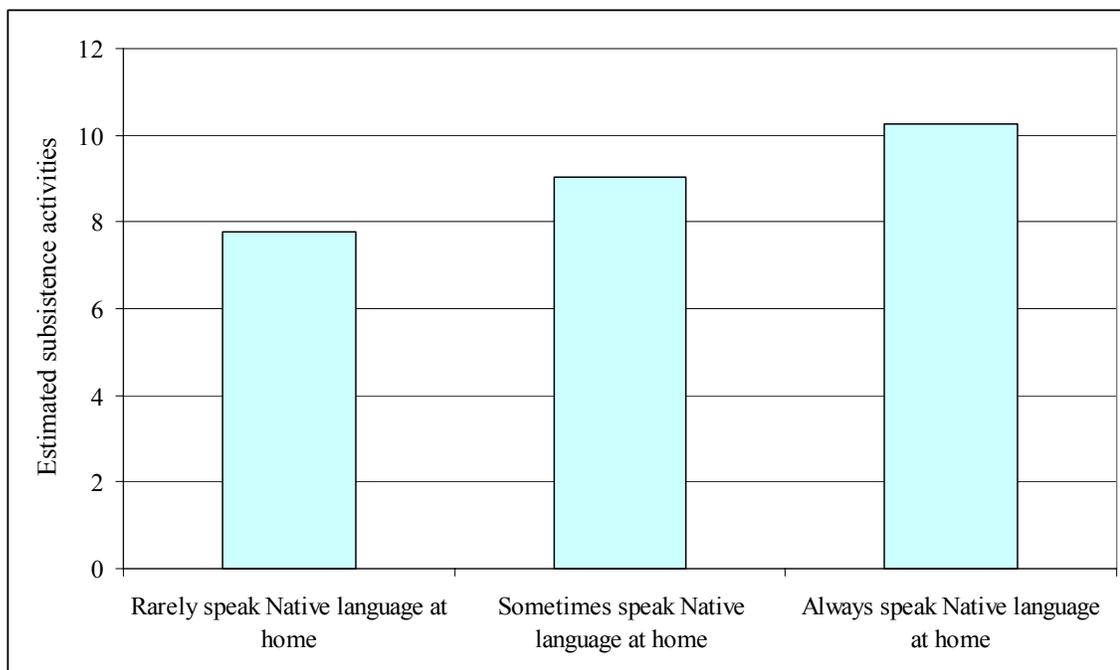


Figure 8-10 Men who live in households where Native language is spoken all the time perform more subsistence activities than do men who live in households where Native language is spoken less often.

Figure 8-11 shows closeness of ties to extended family means higher levels of subsistence participation for men. The typical man reports close family ties, (12 out of a possible 15 on the index) and performs an estimated nine subsistence activities. The typical man, reporting the maximum closeness of family ties, performs an estimated 10 subsistence activities. The typical man who is rarely in touch with extended family members performs about six subsistence activities.

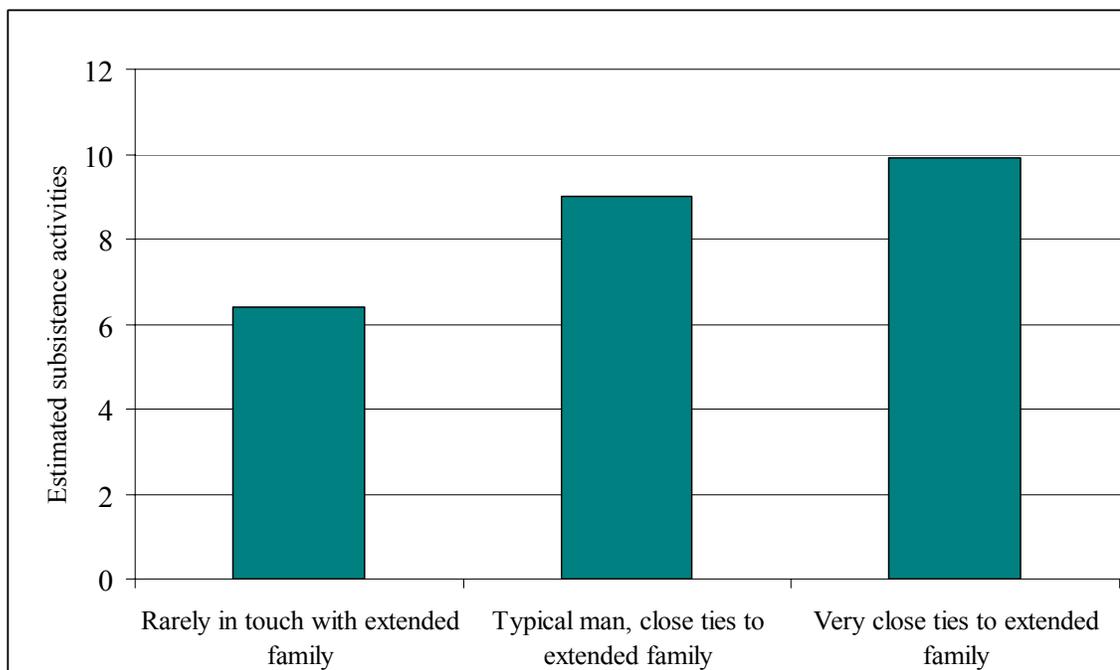


Figure 8-11 Estimated subsistence increases with closeness of ties to extended family.

Figure 8-12 and Figure 8-13 show the effects communities on subsistence participation. The effects of regional center and village are different from the effects of employment and population growth and crime.

Figure 8-12 shows living in a regional center compared to a village affects subsistence participation more for men with a typical set of personal, household and family ties than it does for people with minimum or maximum amounts of resources. Men with maximum resources will perform a large number of subsistence activities no matter where they live. Men with low levels of resources will perform few subsistence activities regardless of where they live.

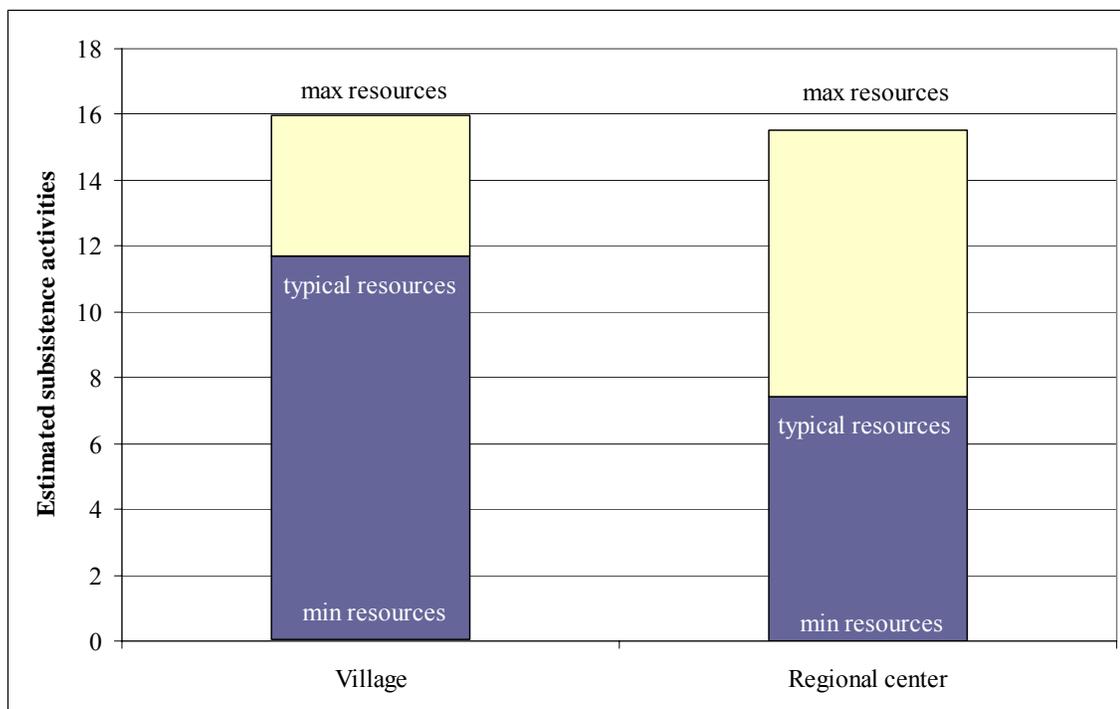


Figure 8-12. Living in a village increases subsistence participation most for a man with a typical level personal, household resources and family ties

The effects of high employment, population growth and crime in a community affect the subsistence participation of all men. Figure 8-13 shows men with all levels of personal, household resources and family ties do more subsistence in communities with lower population and employment growth rates and lower crime rates.

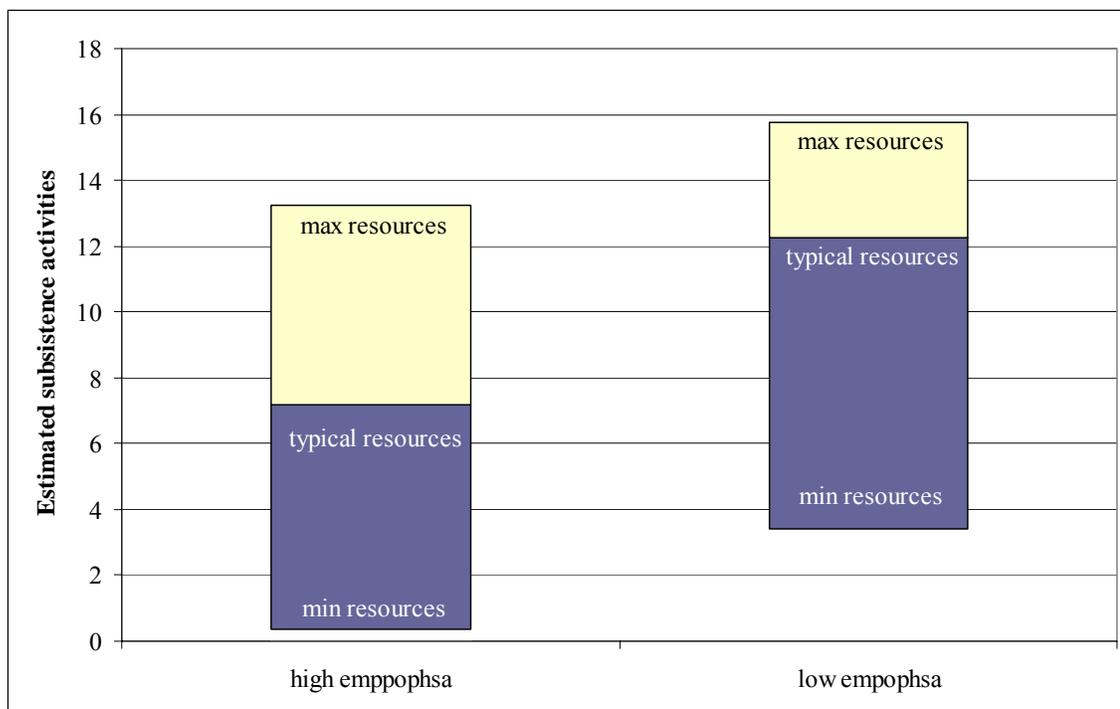


Figure 8-13. Men with high, low and typical levels of resources do more subsistence in communities with low employment, population growth rates and low crime rates.

In the estimates of subsistence participation that follow, the 'typical' woman is 39 years old, unmarried, learned 10 traditional skills as a child, lives in a household with one adult male, has close ties to extended family (13 out of 15 on the index) and lives in Barrow. The expected number of subsistence activities for the typical woman equals three. The woman who performs the maximum number of subsistence activities is 43 years old, lives in a household with three adult males, learned 20 traditional skills as a child, has very ties to extended family. This woman performs 14 activities. The woman who has the lowest estimated level of subsistence participation, zero activities, is 16 years old, learned no traditional skills as a child, lives in a household with no adult males and is rarely in contact with extended family members.

Figure 8-14 shows the number of subsistence activities is higher for women who were taught traditional skills when they were children.

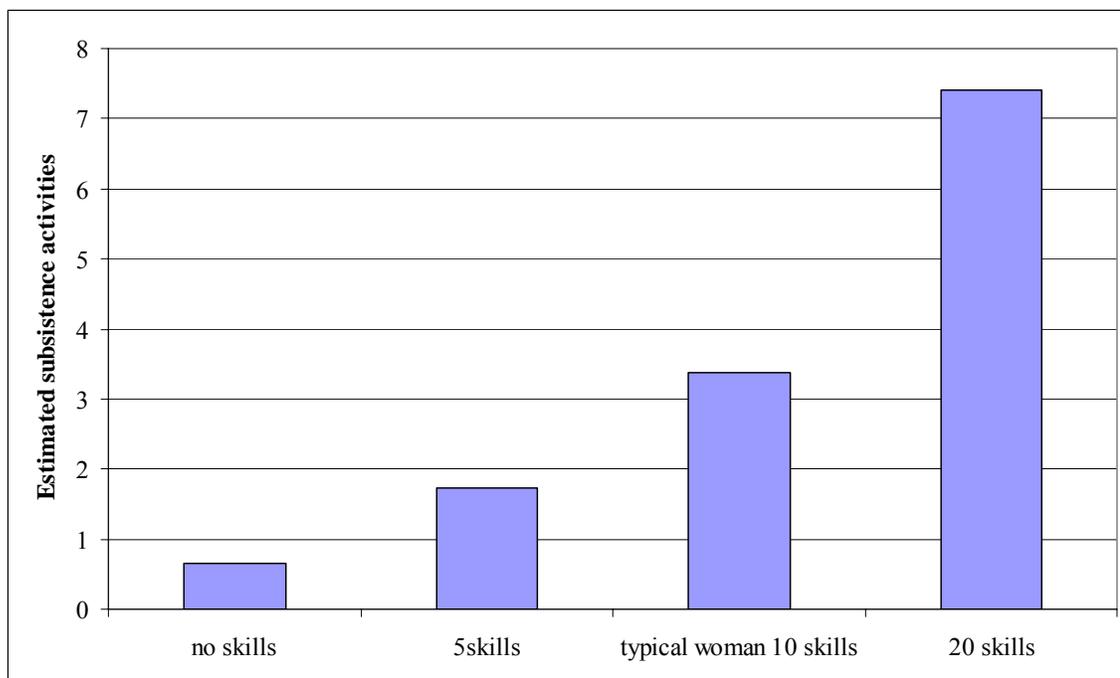


Figure 8-14 Women who were taught more traditional skills as children perform more subsistence activities.

Figure 8-15 shows how community and individual variables combine to affect women's subsistence participation. Community variables affect women's subsistence participation differently depending on the level of personal and household resources a woman has. Personal and household resources are the individual and household variables that are significant in the equation: age, marriage, skills, number of adult males in the household and family ties. This example compares women with minimal, typical and maximum levels of personal resources living in two types of community. The first community has high employment and population growth and high crime rates. The second community has low employment and population growth and low crime rates. The figure shows employment, population growth and crime have the strongest effect on women with high levels of personal, household resources and family ties. These women will perform more subsistence activities in communities with low rates of employment

and population growth and low crime rates. Community characteristics have no effect on women with low levels of individual, household, family ties or social support resources. Their estimated subsistence participation is near zero regardless of where they live.

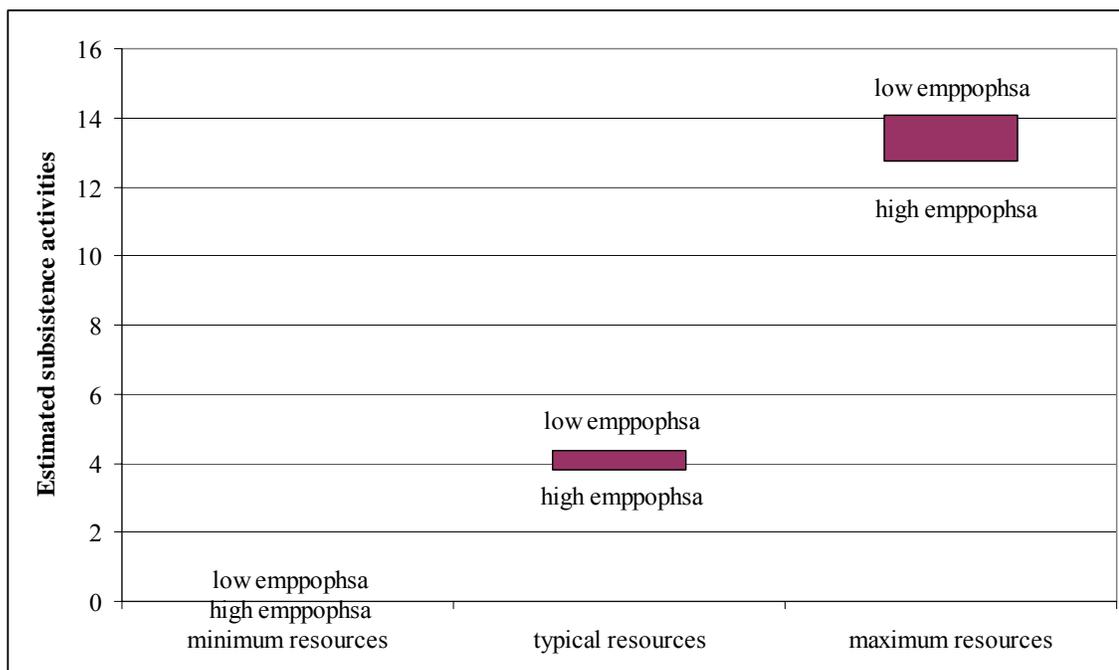


Figure 8-15 Community characteristics of employment and population growth and crimes rates have the largest effect on the subsistence participation of women with high levels of person and household resources.

8.3 Satisfaction

8.4 Domain satisfaction

There is no support for the hypothesis that individual employment and subsistence participation or their interaction, are associated with higher levels of satisfaction in domains related to employment and subsistence. The only association found between individual employment or subsistence and satisfaction is negative. Table 8-3 presents

results from the ordered probit equations estimating individual satisfaction in specific domains. Individual employment is significant in equations estimating satisfaction with opportunities to hunt and fish and satisfaction with the cost of living in the community. For both, higher probability of employment is associated with lower levels of satisfaction. People who have a high probability of employment report low levels of satisfaction with opportunities to hunt and fish because they spend most of their time working. There is no measure of domain satisfaction in which individual subsistence participation is statistically significant.

Table 8-3 and Table 8-4 summarize results in from probit regressions estimating domain satisfaction. The table shows of the individual variables, gender was significant in more equations than any other individual variable. Women are less satisfied than men with their standard of living, job opportunities in their communities and opportunities to hunt and fish and the ability of their household to make ends meet. This provides more explanation for female out-migration from Alaska villages.

Looking at household characteristics, men living alone are less satisfied with their standard of living, job, and the opportunities they have to hunt and fish. People who speak Native language in their households are more satisfied with the combination of activities they do, their standard of living, job opportunities in their communities, opportunities to hunt and fish and the cost of living in their community and the ability of their households to make ends meet. People who have close family ties are more satisfied with the way they combine subsistence activities and jobs, their household income, standard of living and opportunities to hunt and fish. People with more social support have higher levels of satisfaction with the way they combine subsistence activities and

jobs, their standard of living, job opportunities in their community, the quality of life in their community and the ability of their households to make ends meet. The most important community variable for satisfaction is living in long inhabited whaling communities. People who live in long inhabited whaling communities have higher levels of satisfaction with opportunities to hunt and fish and the quality of life in their community. People who live in regional centers report lower levels of satisfaction with their household income and higher levels of satisfaction with job opportunities in their communities.

These findings do not concur with those of subjective well-being researchers. Gender, marriage and age are associated with differences in some domains of satisfaction. The additional finding, individual employment is associated with differences in satisfaction with opportunities to hunt and fish and the cost of living in community link other individual variables, age and education indirectly to satisfaction. The lack of findings in other research for age may be because of model specification. For some satisfaction domains, age has an indirect effect. The gender effect may be specific to Inupiat and Yupiit Eskimo women in this region. Their lower levels of satisfaction with opportunities to hunt and fish is Alaska specific.

Table 8-3 Determinants of individual satisfaction in differs by domains

How satisfied are you with	this combination of activities (hunting, fishing, job)?	your household income?	your standard of living?	this job?
Very satisfied	-3.681	-3.350	-3.244	-4.958
Somewhat satisfied	-1.520	-1.374	-1.140	-2.898
Neither satisfied nor dissatisfied	-0.457	-0.684	-0.375	-2.209
Dissatisfied	0.891	0.624	0.745	-0.819
AGE	0.025	-0.035	-0.064 *	0.044
AGE ²	-0.0001	0.0005	0.0008 **	-0.0002
RMARRY	0.337	0.030	0.124	-0.194
EDUC	0.103	0.163	0.086	0.271 *
RWOMAN	-0.201	-0.016	-0.585 **	-0.354
BOARDING	-0.035	0.031	-0.097	-0.015
HEALTHFITTED	-0.296 **	0.062	0.133	-0.148
HOMELANG	0.172 *	0.084	0.190 **	0.158
LIVEHERE	0.318	0.394 **	0.277	0.383
LONEMALE	-0.073	-0.378	-0.659 *	-1.201 **
LONEFEMALE	0.147	0.460	-0.149	1.171
ELDERHH	0.289	-0.205	-0.185	-0.290
COUPLEK	-0.078	0.565 **	0.238	0.130
MULTIGEN	0.027	-0.322	-0.132	-0.226
SINGLPAR	0.560	0.421	-0.189	0.714 *
FAMTIES	0.104 **	0.088 **	0.101 **	0.087
SOCSUP1	0.032 *	0.014	0.048 **	0.018
PERSROOM	-0.001	-0.170 **	-0.121	-0.027
REGCENTER	0.022	0.346	0.227	-0.010
EMPNRT00	0.264	0.473	0.317	1.673
REMOVEDRY	0.126	0.443	0.307	0.617
OLDWHALING	0.097	-0.024	0.058	0.071
EMPPOPHSA	-0.124	0.001	-0.036	0.010
NATSEXRAT	0.036	-0.066	0.056	-0.132
PJOB	1.443	-0.544	0.123	1.049
PJOB_SUBFIT	-0.213 *	0.012	-0.068	-0.224
SUBFITTED	0.099	-0.009	-0.042	0.102
observations	605	623	623	495
-2 log likelihood	1212.503	1671.508	1581.303	991.932

*p ≤ 0.10

**p ≤ 0.05

Table 8-3 Determinants of individual satisfaction in differs by domains

How satisfied are you with	job opportunities in your community?	opportunities to hunt and fish?	cost of living in your community?	the quality of life in this community?
Very satisfied	-3.690	1.668	-0.767	-1.919
Somewhat satisfied	-1.741	3.531	1.228	0.394
Neither satisfied nor dissatisfied	-0.905	4.382	2.099	1.724
Dissatisfied	0.369	5.511	3.357	3.187
AGE	0.017	0.023	-0.049	-0.014
AGE ²	-0.0002	-0.0003	0.0004	0.0003
RMARRY	-0.147	0.007	-0.488 **	-0.161
EDUC	-0.179	-0.043	-0.201 *	-0.064
RWOMAN	-0.497 **	-0.456 **	0.060	-0.300
BOARDING	-0.080	-0.217	-0.109	-0.214
HEALTHFITTED	0.246 *	0.050	0.129	-0.025
HOMELANG	0.287 **	0.169 *	0.180 **	0.051
LIVEHERE	0.218	-0.026	0.223	0.153
LONEMALE	-0.214	-0.924 **	0.245	-0.173
LONEFEMALE	-0.012	0.549	-0.731	-0.698
ELDERHH	-0.267	-0.262	-0.601	-0.077
COUPLEK	-0.041	0.124	-0.182	0.116
MULTIGEN	-0.408	-0.300	-0.692 **	-0.218
SINGLPAR	0.647 *	0.412	-0.279	0.210
FAMTIES	-0.056	0.090 *	-0.073	0.070
SOCSUP1	0.036 **	0.016	0.012	0.050 **
PERSROOM	-0.081	-0.101	0.014	0.030
REGCENTER	1.569 **	0.863	0.254	0.578
EMPNRT00	-0.189	-3.886 **	0.453	-1.526
REMOTEDRY	0.641 **	-0.002	0.371	0.184
OLDWHALING	-0.071	0.503 **	0.109	0.405 **
EMPPOPHSA	-0.160	-0.255 **	0.036	-0.057
NATSEX RAT	-0.094	-0.054	-0.129	0.045
PJOB	0.502	-2.256 **	-1.400 *	-0.315
PJOB_SUBFIT	-0.135	0.143	0.110	-0.113
SUBFITTED	-0.016	-0.123	-0.063	0.059
observations	615	618	620	621
-2 log likelihood	1812.225	1338.055	1782.307	1470.281

*p ≤ 0.10

**p ≤ 0.05

Table 8-4 reports results from the equation estimating individuals' reports on the ability of their households to make ends meet. Results are presented in a separate table because there are different response categories.

Table 8-4 Determinants of household's ability to make ends meet

<u>Household able to make ends meet</u>	
very easily	-2.893
fairly easily	-0.945
with some difficulty	1.809
AGE	-0.124 **
AGE ²	0.002 **
RMARRY	0.212
EDUC	0.047
RWOMAN	-0.461 **
BOARDING	0.075
HEALTHFITTED	0.415 **
HOMELANG	0.146 *
LIVEHERE	0.029
LONEMALE	-0.483
LONEFEMALE	-0.748
ELDERHH	-0.375
COUPLEK	-0.124
MULTIGEN	-0.207
SINGLPAR	-0.410
FAMTIES	0.062
SOCSUP1	0.029 *
PERSROOM	-0.135 *
REGCENTER	0.632
EMPVRT00	-0.871
REMOTEDRY	0.008
OLDWHALING	-0.156
EMPPOPHSA	0.007
NATSEXRAT	0.052
PJOB	1.193
PJOB_SUBFIT	-0.147
SUBFITTED	0.058
observations	612
-2 log likelihood	1397.375

*p ≤ 0.10

**p ≤ 0.05

Table 8-5 shows results from the ordered probit regression estimating satisfaction with life as a whole. There is no support for the hypothesis that individual employment and subsistence increase satisfaction with life as a whole. The results show that increased probability of employment has the opposite effect. It is associated with lower levels of satisfaction with life as a whole. This may be because having a job means fewer opportunities to perform subsistence activities. Table 8-3 showed that higher probability of employment was associated with lower satisfaction with opportunities to hunt and fish. Researchers on subjective well-being, report that work satisfaction affects life satisfaction (Meyers and Diener 1995). However, because of identification problems it is not possible to empirically test this.

Health, family ties and social support mean more satisfaction with life as a whole.

Of the community variables, living in a long inhabited whaling community is associated with higher levels of satisfaction with life as a whole. Whaling appears to be a social binding force, generating providing more than material benefits (Kruse, 1982).

These results demonstrate that social capital matters for satisfaction. Participating in groups at the level of extended family, informal networks and community increase satisfaction with life as a whole.

Table 8-5 Determinants of satisfaction with life as a whole

	How satisfied are you with your life as a whole
Very satisfied	-3.722
Somewhat satisfied	-1.622
Neither Satisfied nor	-0.343
Dissatisfied	1.231
AGE	0.005
AGE ²	0.000
RMARRY	0.072
EDUC	0.102
RWOMAN	-0.252
BOARDING	0.192
HEALTHFITTED	0.335 **
HOMELANG	-0.013
LIVEHERE	-0.093
LONEMALE	-0.331
LONEFEMALE	0.036
ELDERHH	0.174
COUPLEK	0.265
MULTIGEN	-0.560
SINGLPAR	0.387
FAMTIES	0.130 **
SOCSUP1	0.066 **
PERSROOM	-0.026
REGCENTER	0.093
EMPNRT00	-0.844
REMOTEDRY	0.128
OLDWHALING	0.437 **
EMPPOPHSA	-0.191
NATSEX RAT	-0.013
PJOB	-1.749 **
PJOB_SUBFIT	0.045
SUBFITTED	-0.011
observations	621
-2 log likelihood	1185.042

*p ≤ 0.10

**p ≤ 0.05

Interpreting the coefficients from the ordered probit estimating satisfaction with life as a whole compares the effects of individual variables with the effects of community variables. The 'typical' person is a 39 year old female, in very good health, who speaks Native language at home most of the time, has close family ties (12 out of 15) and high levels of social support (29 out of 35) and lives in Kotzebue.

Figure 8-16 compares the negative effect of the probability of having a job, with the positive effects of family ties and social support. The figure shows even though the probability of employment has a negative effect on satisfaction, the effects of family ties and social support are stronger. In this model, people who are best off in terms of satisfaction, are those don't work but have close family ties and high levels of social support. People who work and have close family ties and high levels of social support are better off than people who don't work and have no family ties or social support.

People who have a high probability of employment probably have less time for hunting and fishing, less time with extended family and friends and in whaling communities, less time to participate in whale harvests.

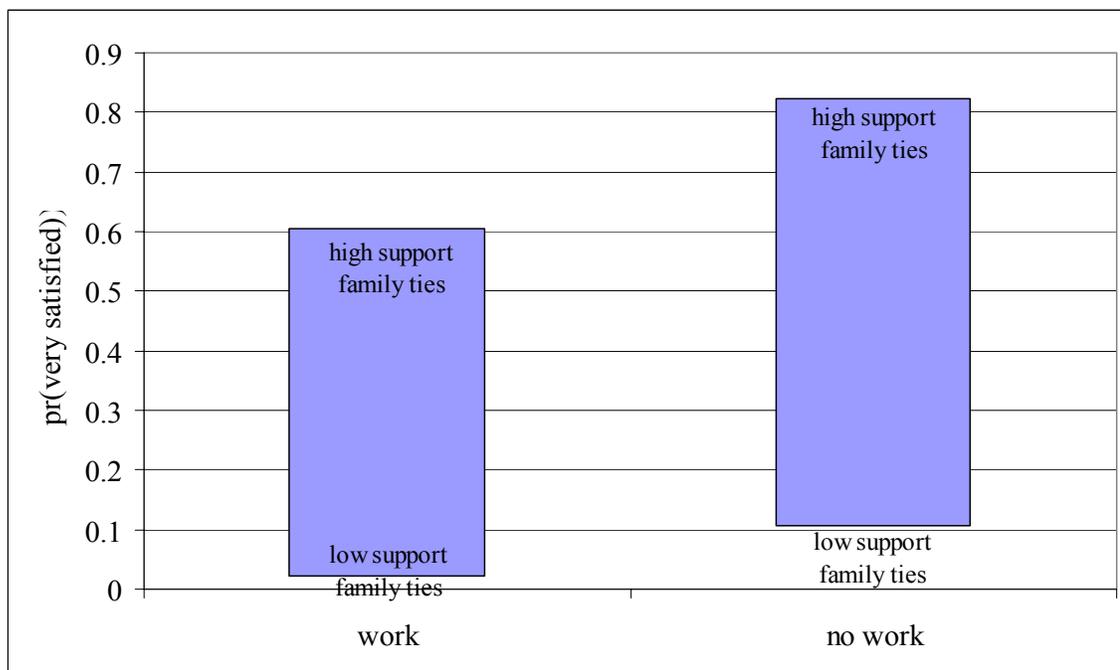


Figure 8-16 The effects of family ties and social support on satisfaction out-weigh the negative effects of employment.

Figure 8-17 show living in a long inhabited whaling community increases the probability of being very satisfied with life as a whole for everyone except those with minimum levels of personal resources.

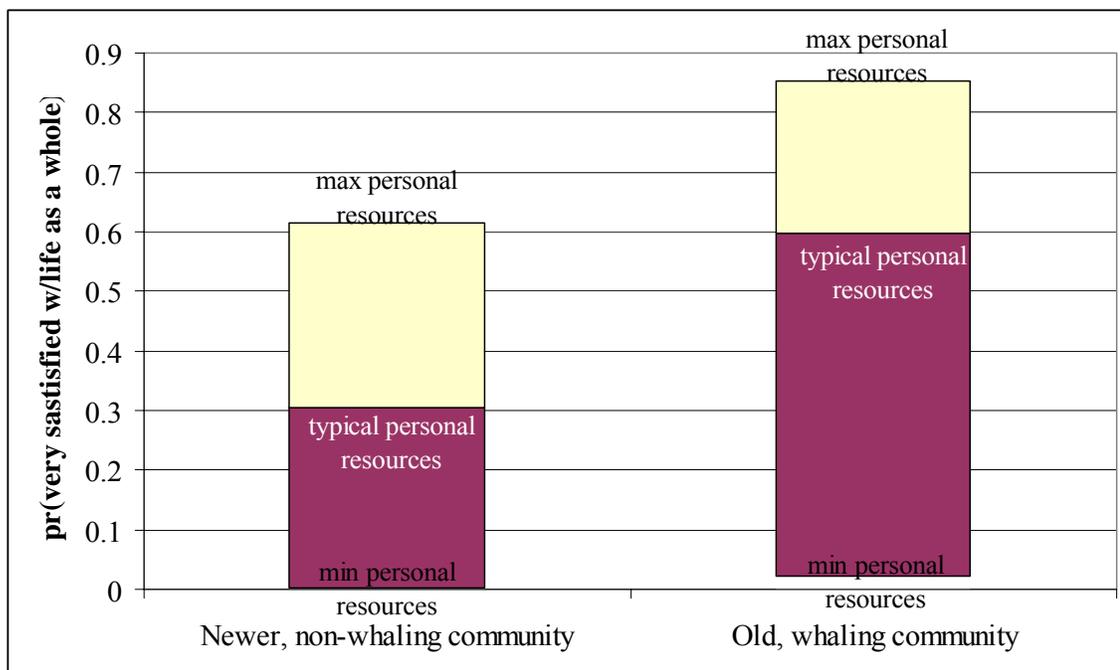


Figure 8-17. People with typical and high levels of personal resources are more likely to be very satisfied with life as whole in old whaling communities than in other communities.

CHAPTER 9 CONCLUSIONS

9.1 Contributions to social theory

This research contributes to social theory by operationalizing the conceptual model of well-being developed by Ringen and Sen. It uses both indirect and direct measures of well-being from Ringen's typology of approaches to measure well-being. It extends Ringen's modeling using results from other research on measuring well-being to include subjective well-being.

It proves part of Ringen's theory. Resources and opportunities are important for choices. Even with the simple model using employment and subsistence arenas, the relationship is not as straightforward as Ringen suggests. This research also confirms Land's (1975) emphasis on the importance of understanding interrelationships among social indicators.

In terms of resources, the results are consistent with Ringen. Resources are important. People with more resources have a higher probability of employment and are estimated to participate in more subsistence activities. Resources also increase satisfaction.

But not all resources are equal. Of the individual resources, education is the strongest predictor of employment. Skills learned as a child is the strongest predictor of subsistence activities. Even with resources people acquire from participating in groups,

such as family ties and social support, without education or skills people are unlikely to work or perform subsistence activities.

The picture is more complicated when resources and opportunities are combined. Opportunities affect people differently depending on their personal resources. Looking at individual employment in regional centers (Figure 8-12) people with high levels of education have a high probability of employment in any of the three regional centers and people who have low levels of resources are unlikely to have a job anywhere. But a person with a high school diploma is more likely to work in Kotzebue than in Nome. In villages (**Error! Reference source not found.**), people with high education have a high probability of working in any village. But people with low levels of education have a much higher probability of working if they live on the North Slope than anywhere else.

Community attributes differ in their effects. Looking at men's subsistence participation, different community attributes affect subsistence participation in different ways. Living in a regional center compared to a village has the strongest effect on the subsistence participation of men with typical levels of personal resources. But employment, population growth and crime affect the subsistence participation of men with maximum, minimum and typical levels of personal resources.

Opportunities in one arena (employment) can be constraints in another (subsistence). Employment opportunities relative to the Alaska Native share of the working age population increase the probability of employment in villages but decrease women's subsistence participation and everyone's satisfaction with opportunities to hunt and fish.

Opportunities come bundled as goods and no-so-goods. The example of employment, population growth and high rates of homicides, suicide and accidental deaths illustrates this.

This research contributes to social capital theory by showing the importance of extended family ties, social support and living in whaling communities are important factors for individual employment, subsistence and satisfaction.

This research contradicts findings of other researchers who report no association between age or gender and subjective well-being (Marshall et al. 2000; Andrews and Withey, 1976). By putting choices between individual characteristics and satisfaction, this research clarifies how age education can be a determinant of satisfaction. It affects satisfaction indirectly, working through choices. It confirms findings of subjective well-being researchers that determinants of domain satisfaction are different from overall satisfaction. It adds to the body of research by showing how gender affects satisfaction in culturally specific areas. In this case, women are less satisfied than men with opportunities to hunt and fish.

9.1.1 Contributions to understanding development in the North Slope, Northwest Arctic and Bering Straits regions.

Frequencies from the Survey of Living Conditions in the Arctic, as well as the regression analysis contribute to the understanding Inupiat and Yupiit Eskimos. This research gives a more realistic, comprehensive picture of life in rural Alaska. It dispels some of the myths of Arctic living. The high levels of social support, family ties and satisfaction reported in the survey dispel the myth that everybody would leave if they

could. The continued high level of subsistence participation and importance of speaking Native language at home dispel the myths that nobody hunts anymore and traditional values no longer apply (Survey of Living Conditions in the Arctic International Team meeting February 2002).

Results can help people outside rural Alaska better understand village life. Outsiders' descriptions of village life do not fit with peoples' reported high levels of family ties, social support and satisfaction. "Some people describe life in villages as hell. I guess we must like the heat" (Ed Ward, Survey of Living Conditions in the Arctic, Alaska Native Management Board Meeting, November 2003).

9.1.2 Implications for development policy

The effects of communities on employment, subsistence and satisfaction do not mean that some people would necessarily be better off migrating. Family ties and social support which increase the probability of employment, subsistence and satisfaction are place specific and would probably go away if a person moved.

The most important factors for jobs, subsistence and satisfaction are not policy variables. Family ties and social support. The closeness of family ties and high levels of social support reported by survey respondents and their importance for employment, subsistence and satisfaction show that there are healthy families and social networks in these communities. The importance skills learned as a child and living in an old whaling community show the importance of continued cultural continuity. The importance of subsistence to Inupiat and Yupiit Eskimos leads to the policy recommendation that they

understand better than outsiders how to preserve subsistence and traditional as a part of life.

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