

EDITED BY BRITTENY M. HOWELL
AND RYAN P. HARROD

ANTHROPOLOGICAL PERSPECTIVES ON AGING



9

The Importance of Traditional Foods and Subsistence Activities for Healthy Aging in Alaska Native Communities

BRITTENY M. HOWELL, RUBY L. FRIED,
AND VANESSA Y. HIRATSUKA

Significant cross-cultural variation exists in how people around the globe define “healthy aging.” This variation can influence, and be influenced by, lifestyle choices, social environments, and health outcomes. In many Indigenous Alaskan communities, important components of healthy aging include access to traditional foods and engagement in subsistence activities. Although many Alaska Native peoples currently reside in cities, the importance of subsistence activities and foods remains crucial and meaningful for healthy aging in both rural and urban locations. Research suggests that Alaska Native Elders define healthy aging into such categories as community engagement, spirituality, physical health, as well as access to traditional foods and activities that converge to strongly influence diet, activity patterns, and health outcomes (Graves and Shavings 2005; Hopkins et al. 2007; Lewis 2011).

Although the term “healthy aging” is used frequently in the gerontological literature, there is no universal definition of this concept (Michel and Sadana 2017). The phrase “successful aging” is often used interchangeably with “healthy aging” in terms of three main components: low probability of disease and disease-related disability, high cognitive and physical functional capacity, and active engagement with life (Rowe and Kahn 1987). However, this definition has been criticized for focusing too heavily on individual lifestyle choices and physical functioning rather than acknowledging cultural expectations of the aging process and complex interactions with the environment and social inequalities that contribute to health

disparities (Katz and Calasanti 2014). Anthropologist Sarah Lamb (2014) argues that this biomedical definition of successful aging is laden with cultural assumptions of individualism influenced by neoliberal attitudes held largely by North Americans while ignoring the biological realities of mortality and human decline at the end of the life span, contributing to a counterproductive aging discourse that blames people for their “failures” to age successfully. Indeed, values of individualism, autonomy, and self-control coalesce to create a culture focused on maintaining youth for as long as possible, resulting in a definition of aging that is characterized as moving away from youth rather than toward an equally important life stage (Gilleard and Higgs 2014, 2015; Foucault 1978).

Instead, an anthropological perspective on aging in Alaska Native communities may consider integrating the concepts of resilience and human adaptability into a more holistic framework for understanding healthy aging. Human adaptability theory frames health outcomes as an indicator of the ability to navigate social, cultural, environmental, and economic conditions (Brewis and Lee 2010; Huss-Ashmore 2000; Ulijaszek 1997). Therefore, a biocultural perspective on human adaptability theory can help anthropologists understand the relationships between biological outcomes and health behaviors as a response to physical and sociocultural environments (Armelagos et al. 1992). For example, Smith-Morris’s work (2004, 2006) among the Pima has shown that obesity on the reservation is linked in complex ways to political, economic, sociocultural, and environmental conditions. This work demonstrates that biological outcomes among some Indigenous populations are often most strongly related to sociocultural and physical environmental stressors rather than genetic differences.

In addition, the gerontological concept of healthy aging, which refers to the retention of social, physical, and mental capacities necessary for the maintenance of well-being through the life course (Iwarsson et al. 2007), also helps us frame the relationship between traditional foods, subsistence activities, and healthy aging in Alaska Native communities. This chapter integrates human adaptability perspectives within a framework of resilience and healthy aging (Boyle and Counts 1988; Lavretsky 2014) by examining traditional diet and subsistence activity patterns among Alaska Native Elders through a biocultural lens. Such a model of human adaptability and healthy aging allows anthropologists to elucidate the important role of adaptive strategies and health behaviors on the continued functioning of

mental, physical, social, and economic systems in Alaska Native communities as the body slows down its processes with age (Hansen-Kyle 2005). In Alaska, Indigenous communities are dealing with rapid economic, social, and environmental changes that require unique adaptive strategies in order to maintain valued lifeways. Here we present several ways that Alaska Native Elders have adapted how they obtain important foods and pass on cultural information to the next generation amid such sociocultural and environmental changes.

Defining “Alaska Native”: Elderhood, Traditional Food, and Subsistence Activities

Alaska has the highest population of Indigenous peoples of any state in the United States, at more than 148,000 individuals, or 19 percent of the general population (U.S. Census Bureau 2019), comprising 11 distinct cultural groups (Alaska Federation of Natives 2020) and collectively referred to as Alaska Native peoples. These groups are distributed geographically across the entirety of the state and consist of Eyak, Tlingit, Haida, and Tsimshian (southeast); Inupiaq and St. Lawrence Yupik (north and northwest); Yup'ik and Cup'ik (southwest); Athabascan (interior and southcentral); Alutiiq (Sugpiaq); and Unangax peoples (Aleutian Islands). The foods, subsistence activities, and cultural practices vary widely across these multiple cultural groups in the largest state in the United States. However, there is reason to suggest that some commonalities exist in the ways that Indigenous peoples of the Circumpolar North view healthy aging, resilience, and adaptability (Akearok et al. 2019; Howell and Peterson 2020). These commonalities include recognition and respect for the interconnectedness of ecology, seeking harmony in interpersonal relationships, spiritual growth through spending time on the land, and reflection on multigenerational knowledge transmission.

The concept of “Elderhood” is generally not defined strictly by chronological age in Circumpolar Indigenous communities, but instead includes broader components of aging such as physical growth, senescence, increasing responsibility for their actions as individuals and as community members, and willingness to transmit accumulated wisdom to the younger generation (Collings 2000, 2001). Among many Alaska Native peoples, Elderhood is generally an honor that community members bestow upon a person as a result of the knowledge they have gained throughout their lives and demonstrate through their actions (Lewis 2010). Therefore, research on

Circumpolar Indigenous aging often includes perspectives from Elders in their forties and fifties, as well as individuals over 60 years old.

The term “traditional food” used in this chapter refers to all culturally accepted food within a particular population that is available from local natural resources (Kuhnlein and Receveur 1996). Alaska Native traditional foods include locally hunted, harvested, fished, and gathered items such as game meat (moose, caribou, etc.), marine mammals (seal, whale, etc.), wild birds and their eggs, berries, greens, and seafood (Redwood et al. 2019). The phrase “subsistence activities” is defined here as any activity related to traditional food procurement or processing such as berry picking, fishing, hunting, and trapping as well as butchering, cutting, smoking fish or meat, and working animal skins and hides (Kuhnlein and Receveur 1996; Redwood et al. 2019; Wheeler and Thornton 2005). In this chapter, we interrogate how cultural, physical, and psychological health benefits of subsistence activities and consumption of traditional foods for Alaska Native Elders may be situated within a framework of human adaptability, resilience, and healthy aging.

Health Impacts of Traditional Foods and Activities among Alaska Native Elders

Traditional diets and subsistence activities of Alaska Native peoples vary due to ecological availability of resources in the large geographic expanse of Alaska. Such variation contributes to our understanding of cross-cultural diversity in population biologies (Ice 2005). In general, locally acquired foods in Alaska are nutrient-dense with high levels of protein, iron, omega-3 fatty acids, vitamins, and antioxidants coupled with low levels of carbohydrates. Traditional foods contain nutrients that are beneficial for healthy aging, such as higher vitamins A, C, D, and B12, calcium, and total dietary fiber (Bersamin et al. 2007). Consumption of greater amounts of traditional foods has been correlated with lower lipids, blood pressure, glucose, and adiposity among Alaska Native peoples (Bersamin et al. 2008; Ryman et al. 2015). Researchers have also explored the role of tundra greens, fish, and marine animals as important components of the subsistence diet, which may result in a high intake of polyunsaturated fatty acids and have a positive impact on glucose tolerance and insulin sensitivity (Aslibekyan et al. 2014). Human adaptability theory suggests that genetic variance observed in Indigenous Arctic populations may have evolved in response to a

need to conserve body stores of nutrients due to environmental limitations on its availability in the traditional diet.

Historical and anthropological accounts of Alaska Native peoples include observations of low rates of obesity, diabetes, and cardiovascular disease, with more recent research indicating that both traditional diet and the processes of food harvesting, storage, and preparation contribute to positive health effects (Bjerregaard et al. 2004; O'Brien et al. 2017). For example, Redwood and colleagues (2008) report that subsistence activities such as fishing, picking berries or greens, and cutting and smoking fish or meat were common sources of physical activity for Alaska Native peoples. Participation in subsistence activity was also found to vary by sex and geographic region, with individuals in southwest Alaska reporting more subsistence activities compared to individuals in southeast and southcentral Alaska (an area that includes the state's largest urban center). Such findings have also been reported among Indigenous peoples in Greenland, where non-urban adults engage in more subsistence activities like fishing and hunting than their city-dwelling counterparts (Dahl-Petersen, Jørgensen, and Bjerregaard 2011).

In Alaska, subsistence activities as a form of exercise are also higher among men than women, but do not differ by age (Redwood et al. 2008). Work among Canadian Inuit Elders demonstrates similar gendered patterns, and that Elders exhibit moderate to high levels of physical activity despite high rates of overweight and obesity (Hopping et al. 2010). Ethnographic work among Elders also indicates that engaging in subsistence activities as a form of exercise is viewed to be a personal responsibility that helps maintain healthy aging as well as fight hegemonic discourses of aging as a process of increasing frailty and deterioration (Brooks-Cleator and Lewis 2020).

Despite the aforementioned health benefits of traditional foods and subsistence activities, public health surveillance and ethnographic research have shown a decline in traditional food consumption and subsistence activities among Alaska Native peoples accompanying the shift toward a more market-based diet (McGrath-Hanna et al. 2003). In a ten-year follow-up of an Alaska Native cohort in southcentral Alaska, Redwood and colleagues (2019) found that there was a significant decline in the mean number of traditional foods eaten as well as reduced consumption of multiple traditional foods. Nevertheless, traditional foods continue to play an important role in the health of Elders. In a large study of Alaska Native peoples in three

regions of Alaska, over 92 percent of the study population reported eating at least one traditional food in the past year, with the most common being fish, moose, and *agutaaq* (a mixture of berries, fat, and dried fish) (Redwood et al. 2008). In general, the proportion of the Alaska Native population eating a traditional diet differs by age and area of residence. For example, researchers have examined red blood cell stable isotope ratios from two Yup'ik villages in southwest Alaska comparing a group of Elder participants to adolescent participants and found differences consistent with increased intake of marine subsistence in Elders, and of market foods in younger participants (O'Brien et al. 2017; Wilkinson, Yai, and O'Brien 2007). Additionally, individuals residing in rural areas have a higher proportion of their diet consisting of traditional foods than those in urban areas (Ballew et al. 2004, 2006).

The health impacts of a lifelong diet of traditional foods on chronic disease risk are not well studied. However, some research has demonstrated possible protective effects of traditional foods rich in omega-3 fatty acids and lean protein in salmon, seal oil, moose, caribou, seal, and walrus, including reduced weight gain as well as improved glucose tolerance and lipid profiles (Ebbesson et al. 2005; Makhoul et al. 2010, 2011). Traditional diets may be low in fiber and high in fat, and when such diets are coupled with exposure to carcinogens derived from diet or the environment, there may be an increased risk of developing precancerous colon polyps (Ocvirk et al. 2020). Additionally, Beaulieu-Jones and colleagues (2015) describe an inverse association of marine food intake with systolic and diastolic blood pressure. However, obtaining traditional foods and engaging in subsistence activities remain an important part of how Elders define healthy aging, which plays an integral role in their health behaviors and biological outcomes.

Conceptualizing Healthy Aging in Alaska Native Communities

Research among Elders demonstrates that these traditional foods and subsistence activities are not just important for physical health, but also play a significant role in the broader cultural definition of healthy aging. Indeed, research shows that healthy aging is defined differently by older adults and biomedical professionals who tend to disagree on the importance of various physiological, psychological, societal, and personal aspects of aging (Hansen-Kyle 2005). In Alaska, older adults define healthy aging in terms of having a positive attitude, a sense of community, and a purpose in life

rather than focusing on physical health parameters from a medical model (Howell, Seater, and McLinden 2020; Peterson, Baumgartner, and Austin 2020). The ways that people define and think about healthy aging have a profound effect on their adaptability, resilience, health behaviors, and resulting biological and health outcomes (Torres 2003).

Lewis (2010, 2011, 2013a, 2013b, 2014) has produced much of the literature on how rural Elders define healthy aging. This body of work demonstrates that Elders define healthy aging in holistic terms, encompassing elements of emotional well-being, community engagement, spirituality, and physical health; however, much of the successful aging literature tends to focus on physical health from a biomedical lens (Lewis 2011). Traditional foods and engagement in subsistence activities crosscut these important aspects of healthy aging, as Elders report that these activities increase emotional and physical health, community engagement, and encompass spiritual components. For example, one rural Elder states:

In urban communities, food isn't traditional, rural has more traditional food, which is like our medicine. Living off of the land helps people age well; food connects who we are as Native peoples. Living off the land is putting your body to use. Keeping up your health and mental balance. Don't have these opportunities in the cities. Cities have more dictated ways of living. There are no Western stresses in villages. Your body becomes weak and lazy in urban cities; there is no access to traditional food. (Lewis 2010, 390)

Ethnographic research by Hopkins et al. (2007) in rural southwestern Alaska also corroborates that Alaska Native women define healthy aging in terms of engaging in subsistence activities, consuming traditional foods, and respecting their Elders. Participants in this qualitative study stated that subsistence activities, such as berry picking and fish processing, are important sources of physical activity. Consumption of these food items is also known to confer health benefits “and make the body strong” (46), especially when compared to *kassaq* (“white people”) market foods. Participants in the Norton Sound region also indicated that subsistence activities are a way to survive and provide for community members, as well as to preserve their culture (Brooks-Cleator and Lewis 2020). Indigenous Elders throughout Alaska view being able to successfully participate in subsistence activities and to teach these activities to others, also called generativity, as a defining feature of healthy aging.

The Role of Generativity

Ethnographic research shows that important components of generativity for Elders are demonstrated through the lens of food and subsistence activities. Anthropologist Robert Rubenstein (2015) defines “generativity” as having an interest in guiding and teaching the next generation in terms of four main elements: people, groups, things, and activities (see also Agunbiade, this volume, for a discussion on generativity). This framework fits well with the holistic nature of Alaska Native healthy aging, since Elders often describe generativity in terms of teaching individuals and groups of younger people about the important aspects of life in Alaska Native communities, which often revolve around the procurement, processing, and consumption of traditional foods. Lewis’s (2014) research demonstrates that Elders view the dissemination of traditional knowledge as an important aspect of social and community engagement, which has a profound effect on Elders’ ability to age well. His research among individuals aged 50 years and younger has also shown that many Alaska Native peoples view the inability to age well as primarily due to decreases in access to subsistence foods and activities in urban and rural locations alike (Lewis 2013a).

Lewis’s research demonstrates the importance of healthy aging perspectives and optimism in rural Alaska Native communities. Elders expressed hope in the face of Westernizing influences, such as the internet and video games, that they will be able to preserve and transmit their traditional subsistence culture to the next generation (Lewis 2013b). For example, one Elder stated that he thinks “young people would begin to understand their grandparents’ way of life. And follow the pathway of getting your food and learn the better food values for themselves. I think this would do them well” (Lewis 2014, 278). Rural Elders view themselves as being well positioned to help shape the health of younger Alaska Native peoples by passing on and strengthening their traditional cultures and values in the face of rapid cultural change.

Alaska Native peoples indicate that intergenerational transmission of subsistence activities and cultural knowledge also helps them manage stressful experiences and increase resilience by providing coping strategies and a sense of hopeful optimism for the future generation (Rivkin et al. 2019; Wexler et al. 2014). Ethnographic work among the Inupiaq in northern Alaska corroborates that transmission of food harvesting customs, knowledge, and

skills to others results in Elders feeling valued, which greatly improves their quality of life and valuable functioning (Smith et al. 2009).

Although much of the ethnographic work on healthy aging among Elders has been conducted in the interior, southwest, northern, and south-central regions of the state, research in southeast Alaska also indicates the important role of traditional foods and subsistence activities for Alaska Native peoples. For example, Lunda and Green's (2020) study on teaching traditional harvesting practices to children shows that Elders view their role as teachers as an important component of cultural knowledge transmission and identity formation in the next generation. One respondent indicated, "Subsistence is a huge part of our culture, our identity. Everything we have comes from our land. Being able to understand our surroundings is important in understanding who we are" (99). Human adaptability and healthy aging frameworks help us connect how culture, resilience, identity, and behavioral practices affect biological outcomes, because Indigenous adults engaged in teaching subsistence activities report such positive health outcomes as improved diet, increased exercise, and subjective well-being (Burnette, Clark, and Rodning 2018).

Employing Adaptive Strategies for Obtaining Traditional Foods

Recognizing the importance of traditional foods for physical, mental, and spiritual well-being, Alaska Native older adults employ multiple adaptive strategies to obtain these foods despite occasional yet significant barriers, such as living in an urban area, physical limitations, lack of transportation, and increased vulnerability to food insecurity (Fogel-Chance 1993; Howell and Peterson 2020; Skinner et al. 2013). Adaptive strategies include, but are not limited to, engaging in urban food harvesting, food-sharing networks, and traditions of trade and barter; attending potlatches and cultural events; contributing to hunting, gathering, processing, and food storage; and participating in institutional efforts related to food sovereignty and traditional food access.

Although much of the anthropological literature on Elders focuses on rural residents, many of these subsistence foods and activities also inform definitions of healthy aging among Elders living in urban locations. Elders in urban areas may have different access to subsistence foods compared to their counterparts living in rural Alaska, so there may also be meaningful differences in their modes of adaptation. Urban Alaskan communities

contrast in many ways from rural communities including greater access to general and specialized medical care that is often unavailable elsewhere in the state, given the presence of the Alaska Native Medical Center and other higher-capacity medical facilities. Howell and Peterson (2020) report that moving to an urban area can be viewed as a chain reaction that leads to weaker ties with family members and decreased access to traditional foods. Indeed, traditional food access is more limited for most residents of urban Alaska, as evidenced by the significantly lower harvest (Alaska Department of Fish & Game 2015) and consumption of these foods (Nobmann and Lanier 2001; Walch et al. 2019) compared to patterns in rural areas.

However, engaging in urban harvesting and food-sharing networks are two adaptive strategies that allow traditional food access among Elders living in urban Alaska. Picking berries is a harvesting activity that can be done within and just outside of city limits. In addition, dip-netting and other fishing activities can be accessed in the southcentral and southeast regions by car or boat. While these activities can be physically rigorous, older adults can contribute directly or by helping process and store the foods that their family and friends may acquire. Such multigenerational efforts commonly occur in rural communities as well, where Elders characterize experiences of harvesting and processing foods as “working together for the future” (Inuit Circumpolar Council-Alaska 2015). It is also a common practice for individuals living in rural areas to send traditional foods to their family members living in cities (Fogel-Chance 1993; Fried 2019; Walch et al. 2019). For example, one Elder living in Anchorage revealed getting her “fish, caribou, moose, ptarmigan, you know, a lot of berries: salmonberries, blueberries, raspberries” from her family members who live in rural areas, “like my cousin’s husband works as a foreman in a crab plant and so he can get us crab where we couldn’t otherwise afford it” (Howell 2017). Her family in the northwest gets her seal oil and her family in interior Alaska sends her watermelon berries in exchange for fresh fruit from the markets in Anchorage that they cannot obtain in rural Alaska. “It’s a bartering system,” she reports (150–151). While specific data on the participation of Elders in rural-to-urban food sharing is lacking, it can be assumed that Elders living in Anchorage and other urban centers who receive traditional foods have acquired them in this manner of sharing (Lee 2002).

Looking beyond the urban-rural differences, the value of sharing with Elders in one’s community is common among Indigenous populations in the Circumpolar North (Berkes and Jolly 2002; Griffin 2020; Ready 2018).

The Inuit Circumpolar Council's recent publication on Food Sovereignty and Self Governance (2020), which includes many interviews with Elders, reports that sharing and cooperation is apparent in nearly every element of dialogue, and that these values are foundational to Inuit culture. Furthermore, food sharing, especially within families, has been identified as one of the most important ways of adapting to food shortages (Skinner et al. 2013). In a particularly salient demonstration of the importance of sharing, a man from Kivalina, Alaska, spoke about harvesting caribou and sharing with his older parents:

They can't hunt, they get too old, [so] they're always excited. It's a good feeling to know that my parents are waiting for that [caribou] meat. It's a really good feeling when you give it to them. (Griffin 2020, 338)

From a Canadian Elder's perspective, Collings (2001, 136) also presented the view that one of the best aspects of being an Elder "must be that when they get food brought to them by the younger generation because granny likes it when we bring her food, country food." These accounts, along with millennia of traditional practices and culture, demonstrate the importance of food sharing for continued access to traditional foods among Indigenous Elders in Alaska and the Circumpolar North.

Elders' access to traditional foods can also be achieved through participation at cultural and community events, as well as through organization-based efforts. In 2014, the Traditional Foods Nourishment Act was passed, which allowed traditional foods to be served in facilities including hospitals and eldercare facilities. Following this, the Alaska Native Medical Center has included traditional foods in their cafeteria and to current patients, including berries, salmon, halibut, and reindeer (Rogers 2015; AN-THC 2016; Hillman 2018). In addition, the Hunter Support Program is one example of a formal initiative that provides fish and game to Elders living at *Utuuqanaat Inaat* ("A Place for Elders," a long-term care facility), as well as other community social events (Maniilaq Association 2020). While these are examples of formalized programs, many other Alaska Native villages, community-level entities, and individuals provide traditional foods to Elders consistent with the Alaska Native cultural tradition of sharing foods with community members, and Elders in particular (see, for example, Fienup-Riordan 2000).

While serving as a cornerstone of cultural values, Elder involvement in traditional food sharing is not limited to receiving food from younger

family and community members. In fact, it was found that Elders often serve as focal points for the collection and sharing of traditional foods, as demonstrated by the fact that households with Elders provided more meals to other households compared to households without (Ready 2018). The expert knowledge of traditional food harvesting, processing, storage, and preparation is also often held among Elders who are commonly deferred to by other family and community members (Berkes and Jolly 2002; Collings 2011). Traditional knowledge gained over a lifetime can also be applied in response to changes to food availability. For example, traditional knowledge of how to diversify hunting and gathering activities, as well as how to distribute and store traditional foods in times of scarcity, can be used to overcome altered migration and seasonal patterns of harvest species due to climate change (Berkes and Jolly 2002; Griffin 2020). Guo and colleagues (2015) also found that older respondents experienced lower levels of food insecurity compared to younger respondents when they were in charge of food preparation, supporting the idea that knowledge and willingness to contribute in this way can buffer Elders from food shortages.

Food sovereignty is an increasingly important issue among Alaska Native and Indigenous Circumpolar communities (Griffin 2020; Inuit Circumpolar Council-Alaska 2020). Contributing knowledge in service to the maintenance of traditional activities and food harvesting is not necessarily limited to an Elder's family, community, or even geographic region. Equitable co-management and the ability of communities and Tribal governments to determine restrictions on season and amounts of species harvested is seen by many as foundational for increased and enduring access to traditional foods and ways of life. Elders are often involved in efforts to establish and promote food sovereignty through Tribal governments, providing traditional knowledge to Western scientific studies, and through participation in other regulatory and advocacy groups and organizations. Perhaps one of the most prominent examples is the involvement of many Elders across multiple communities in the Inuit Circumpolar Council's Inuit Food Security Project (2015, 2020).

This multi-year, Inuit-led project was conducted across Alaska and the Inuvialuit Settlement Region of Canada, and addressed multiple aspects of traditional food security including food sovereignty, access, knowledge sources, stability, health and wellness, as well as decision-making power and management. Traditional Indigenous knowledge holders were not only involved and interviewed for the project, but they were also among the

leaders of the project, which ultimately led to a Traditional Food Security Conceptual Framework and recommendations to strengthen traditional food security (Inuit Circumpolar Council-Alaska 2015). On a community level, many Elders are also involved in Hunters and Trappers Committees (e.g., Aklavik and Inuvik HTC) that work with other wildlife management bodies, including the State of Alaska. This participation in regional efforts and institutions is an example of an adaptive response to protecting, maintaining, and expanding access to traditional foods that are also evident in Indigenous populations across the Arctic (e.g., Berkes and Jolly 2002).

Discussion

As the Circumpolar North continues to experience rapid and extreme climate change, there are accompanying changes such as thinning of sea ice, thawing of permafrost, and changes in migration patterns of subsistence animals, which have immediate impacts on traditional subsistence activities. Elders advise subsistence hunters and policy makers on adaptive strategies to monitor climate change impacts and maintain subsistence activities (Berner et al. 2016; Inuit Circumpolar Council-Alaska 2015, 2020; Wheeler and Thornton 2005) as well as lead and support resilient responses to disruptive climate-mediated impacts on subsistence food and activities. Elders also draw upon past social and environmental changes; have lived experience in developing and enacting past adaptations; and use these ideas and experiences to address present vulnerabilities in a resilient framework such that subsistence practices continue to support and strengthen social and cultural ideologies of Alaska Native peoples (Wilson 2014).

Anthropologists utilizing biocultural approaches to human adaptability and healthy aging are able to situate Elders' adaptations to a changing socio-cultural and physical environment within a perspective of the variation in health that is expressed across and within populations (Leonard 2018; Pike and Williams 2006). Human adaptability theory elucidates the pathways through which sociocultural and environmental conditions affect population biologies and health outcomes (Brewis and Lee 2010; Dufour 2006). In this chapter, we have reviewed the literature on the physical health benefits of traditional foods and subsistence activities as well as demonstrated the ways these activities serve as the conduit through which Indigenous identities are forged and maintained in Alaska Native communities.

Elders contribute to important engagement with, and knowledge trans-

mission of, local food procurement in their communities. This central role of Elders serves the dual effect of increasing their healthy aging outcomes and improving the health of the people around them. While traditional foods and subsistence activities incur positive health benefits for older adults, these activities are also integral to the concept of Elderhood and generativity.

Indigenous peoples across the state of Alaska define healthy aging in terms of their continued community engagement, spirituality, and physical health, as well as their access to traditional foods and activities. The anthropological lens allows us to view traditional foods and subsistence activities as the pathways through which the sociocultural and physical environment comes to affect diet, activity patterns, and health outcomes for Elders. This chapter has also demonstrated the resilience of Elders as they face rapidly changing cultural, economic, and physical environments. Despite challenges, Alaska Native Elders continue to define healthy aging in terms of continued performance of subsistence activities and consumption of traditional foods.

Acknowledgments

The authors wish to thank Sofiya Shreyer for her suggestions and feedback on an earlier version of this chapter.

References

- Akearok, Gwen H., Katie Cueva, Jon Petter A. Stoor, Christina V. L. Larsen, Elizabeth Rink, Nicole Kanayurak, Anastasia Emelyanova, and Vanessa Y. Hiratsuka. 2019. "Exploring the Term 'Resilience' in Arctic Health and Well-Being Using a Sharing Circle as a Community-Centered Approach: Insights from a Conference Workshop." *Social Sciences* 8(2): 45.
- Alaska Department of Fish & Game. 2015. "Subsistence in Alaska: A Year 2014 Update." Accessed November 10, 2020. https://www.adfg.alaska.gov/static/home/subsistence/pdfs/subsistence_update_2014.pdf.
- Alaska Federation of Natives. 2020. "Alaska Native Peoples." Accessed October 19, 2020. <https://www.nativefederation.org/alaska-native-peoples/>.
- Alaska Native Tribal Health Consortium. 2016. "ANMC Serves Healing, Traditional Foods to Our People." Accessed November 4, 2020. <https://anthc.org/news/anmc-serves-healing-traditional-foods-to-our-people/>.
- Armelagos, George J., Thomas Leatherman, Mary Ryan, and Lynn Sibley. 1992. "Biocultural Synthesis in Medical Anthropology." *Medical Anthropology* 14(1): 35–52. <http://www.informaworld.com/10.1080/01459740.1992.9966065>.
- Aslibekyan, Stella, Howard W. Wiener, Peter J. Havel, Kimber L. Stanhope, Diane M. O'Brien, Scarlett E. Hopkins, Devin M. Absher, Hemant K. Tiwari, and Bert B. Boyer. 2014. "DNA

- Methylation Patterns Are Associated with n-3 Fatty Acid Intake in Yup'ik People." *Journal of Nutrition* 144(4): 425–430.
- Ballew, Carol, Angela Ross Tzilkowski, Kari Hamrick, and Elizabeth D. Nobmann. 2006. "The Contribution of Subsistence Foods to the Total Diet of Alaska Natives in 13 Rural Communities." *Ecology of Food and Nutrition* 45(1): 1–26. <https://doi.org/10.1080/03670240500408302>.
- Ballew, Carol, Angela Ross, Rebecca S. Wells, and Vanessa Hiratsuka. 2004. "Final Report on the Alaska Traditional Diet Survey." Alaska Native Epidemiology Center. Accessed November 20, 2020. http://anthctoday.org/epicenter/publications/Reports_Pubs/traditional_diet.pdf.
- Beaulieu-Jones, Brendin R., Diane M. O'Brien, Scarlett E. Hopkins, Jason H. Moore, Bert B. Boyer, and Diane Gilbert-Diamond. 2015. "Sex, Adiposity, and Hypertension Status Modify the Inverse Effect of Marine Food Intake on Blood Pressure in Alaska Native (Yup'ik) People." *Journal of Nutrition* 145(5): 931–938.
- Berkes, Fikret, and Dyanna Jolly. 2002. "Adapting to Climate Change: Social-Ecological Resilience in a Canadian Western Arctic Community." *Conservation Ecology* 5(2).
- Berner, James, Michael Brubaker, Boris Revitch, Eva Kreummel, Moses Tcheripanoff, and Jake Bell. 2016. "Adaptation in Arctic Circumpolar Communities: Food and Water Security in a Changing Climate." *International Journal of Circumpolar Health* 75(1): 33820.
- Bersamin, Andrea, Bret R. Luick, Irena B. King, Judith S. Stern, and Sheri Zidenberg-Cherr. 2008. "Westernizing Diets Influence Fat Intake, Red Blood Cell Fatty Acid Composition, and Health in Remote Alaskan Native Communities in the Center for Alaska Native Health Study." *Journal of the American Dietetic Association* 108(2): 266–273.
- Bersamin, Andrea, Sheri Zidenberg-Cherr, Judith S. Stern, and Bret R. Luick. 2007. "Nutrient Intakes Are Associated with Adherence to a Traditional Diet among Yupik Eskimos Living in Remote Alaska Native Communities: The CANHR Study." *International Journal of Circumpolar Health* 66(1): 62–70.
- Bjerregaard, Peter, T. Kue Young, Eric Dewailly, and Sven O. E. Ebbesson. 2004. "Review Article: Indigenous Health in the Arctic: An Overview of the Circumpolar Inuit Population." *Scandinavian Journal of Public Health* 32(5): 390–395. <https://doi.org/10.1080/14034940410028398>.
- Boyle, J. S., and M. M. Counts. 1988. "Toward Healthy Aging: A Theory for Community Health Nursing." *Public Health Nursing* 5(1): 45–51. <https://doi.org/10.1111/j.1525-1446.1988.tb00559.x>.
- Brewis, Alexandra, and Sarah Lee. 2010. "Children's Work, Earnings, and Nutrition in Urban Mexican Shantytowns." *American Journal of Human Biology* 22(1): 60–68. <https://doi.org/10.1002/ajhb.20954>.
- Brooks-Cleator, Lauren A., and Jordan P. Lewis. 2020. "Alaska Native Elders' Perspectives on Physical Activity and Successful Aging." *Canadian Journal on Aging/La Revue canadienne du vieillissement* 39(2): 294–304.
- Burnette, Catherine E., Caro B. Clark, and Christopher B. Rodning. 2018. "Living Off the Land: How Subsistence Promotes Well-Being and Resilience among Indigenous Peoples of the Southeastern United States." *Social Service Review* 92(3): 369–400.
- Collings, Peter. 2000. "Aging and Life Course Development in an Inuit Community." *Arctic Anthropology* 37(2): 111–125.
- . 2001. "If You Got Everything, It's Good Enough: Perspectives on Successful Aging

- in a Canadian Inuit Community.” *Journal of Cross-Cultural Gerontology* 16(2): 127–155. <https://doi.org/10.1023/A:1010698200870>.
- . 2011. “Economic Strategies, Community, and Food Networks in Ulukhaktok, Northwest Territories, Canada.” *Arctic*: 207–219.
- Dahl-Petersen, Inger K., Marit E. Jørgensen, and Peter Bjerregaard. 2011. “Physical Activity Patterns in Greenland: A Country in Transition.” *Scandinavian Journal of Public Health* 39(7): 678–686. <https://doi.org/10.1177/1403494811420486>.
- Dufour, Darna L. 2006. “Biocultural Approaches in Human Biology.” *American Journal of Human Biology* 18(1): 1–9. <https://doi.org/10.1002/ajhb.20463>.
- Ebbesson, Sven O. E., Patricia M. Risica, Lars O. E. Ebbesson, John M. Kennish, and M. Elizabeth Tejero. 2005. “Omega-3 Fatty Acids Improve Glucose Tolerance and Components of the Metabolic Syndrome in Alaskan Eskimos: The Alaska Siberia Project.” *International Journal of Circumpolar Health* 64(4): 396–408.
- Fienup-Riordan, Ann. 2000. *Hunting Tradition in a Changing World: Yup'ik Lives in Alaska Today*. Piscataway, NJ: Rutgers University Press.
- Fogel-Chance, Nancy. 1993. “Living in Both Worlds: Modernity and Tradition among North Slope Iñupiaq Women in Anchorage.” *Arctic Anthropology*: 94–108.
- Foucault, Michel. 1978. *The Will to Knowledge, The History of Sexuality*, Volume 1. London: Penguin.
- Fried, Ruby Laurel. 2019. “Biological Memories: Examining Early Indicators of Intergenerational Health among Alaska Native Women and Children Living in Anchorage, Alaska.” Northwestern University.
- Gilleard, Chris, and Paul Higgs. 2014. *Ageing, Corporeality and Embodiment*. New York: Anthem Press.
- . 2015. “Aging, Ambodiment, and the Somatic Turn.” *Age, Culture, Humanities: An Interdisciplinary Journal* 2: 17–33.
- Graves, K., and L. Shavings. 2005. “Our View of Dignified Aging: Listening to the Voices of Our Elders.” *Journal of Native Aging and Health* 1(1): 29–40.
- Griffin, P. Joshua. 2020. “Pacing Climate Precarity: Food, Care and Sovereignty in Iñupiaq Alaska.” *Medical Anthropology* 39(4): 333–347.
- Guo, Yang, Lea Berrang-Ford, James Ford, Marie-Pierre Lardeau, Victoria Edge, Kaitlin Paterson, IHACC Research Team, and Sherilee L. Harper. 2015. “Seasonal Prevalence and Determinants of Food Insecurity in Iqaluit, Nunavut.” *International Journal of Circumpolar Health* 74(1): 27284.
- Hansen-Kyle, Linda. 2005. “A Concept Analysis of Healthy Aging.” *Nursing Forum* 40(2): 45–57. <https://doi.org/10.1111/j.1744-6198.2005.00009.x>.
- Hillman, Anne. 2018. “To Feed Elders, Traditional Foods Take Untraditional Route.” *Alaska Public Media*, February 28, 2018, <https://www.alaskapublic.org/2018/02/28/to-feed-elders-traditional-foods-take-untraditional-route/>.
- Hopkins, Scarlett E., Pat Kwachka, Cécile Lardon, and Gerald V. Mohatt. 2007. “Keeping Busy: A Yup'ik/Cup'ik Perspective on Health and Aging.” *International Journal of Circumpolar Health* 66(1): 42–50. <http://www.ncbi.nlm.nih.gov/pubmed/17451133>.
- Hopping, B. N., E. Erber, E. Mead, C. Roache, and S. Sharma. 2010. “High Levels of Physical Activity and Obesity Co-Exist Amongst Inuit Adults in Arctic Canada.” *Journal of Human Nutrition and Dietetics* 23: 110–114. <https://doi.org/10.1111/j.1365-277X.2010.01096.x>.
- Hopping, B. N., E. Mead, E. Erber, C. Sheehy, C. Roache, and S. Sharma. 2010. “Dietary

- Adequacy of Inuit in the Canadian Arctic." *Journal of Human Nutrition and Dietetics* 23(s1): 27–34.
- Howell, B. M., M. Seater, and D. McLinden. 2020. "Using Concept Mapping Methods to Define 'Healthy Aging' in Anchorage, Alaska." *Journal of Applied Gerontology* 35(2): 113–131.
- Howell, B. M., and J. R. Peterson. 2020. "'With Age Comes Wisdom': A Qualitative Review of Elder Perspectives on Healthy Aging in the Circumpolar North." *Journal of Cross-Cultural Gerontology* 35(2): 113–131.
- Howell, Britteny M. 2017. "Healthy Aging in the North: Sociocultural Influences on Diet and Physical Activity among Older Adults in Anchorage, Alaska." University of Kentucky.
- Huss-Ashmore, Rebecca. 2000. "Theory in Human Biology: Evolution, Ecology, Adaptability, and Variation." In *Human Biology: An Evolutionary and Biocultural Perspective*, edited by B. Bogin S. Stinson, R. Huss-Ashmore, and D. O'Rourke, 1–25. New York: Wiley-Liss.
- Ice, Gillian H. 2005. "Biological Anthropology and Aging." *Journal of Cross Cultural Gerontology* 20(2): 87–90. <https://doi.org/10.1007/s10823-005-9084-6>.
- Inuit Circumpolar Council-Alaska. 2015. "Alaskan Inuit Food Security Conceptual Framework: How to Assess the Arctic from an Inuit Perspective." *Summary Report and Recommendations Report. Anchorage, Alaska*.
- . 2020. "Food Sovereignty and Self-Governancy: Inuit Role in Managing Arctic Marine Resources." Accessed November 16, 2020. https://secureservercdn.net/104.238.71.250/hh3.0e7.myftpupload.com/wp-content/uploads/20200914-FSSG-Report_LR-1.pdf.
- Iwarsson, Susanne, Hans-Werner Wahl, Carita Nygren, Frank Oswald, Andrew Sixsmith, Judith Sixsmith, Zsuzsa Széman, and Signe Tomsone. 2007. "Importance of the Home Environment for Healthy Aging: Conceptual and Methodological Background of the European ENABLE-AGE Project." *The Gerontologist* 47(1): 78–84.
- Katz, Stephen, and Toni Calasanti. 2014. "Critical Perspectives on Successful Aging: Does It 'Appeal More Than It Illuminates'?" *The Gerontologist* 55(1): 26–33. <https://doi.org/10.1093/geront/gnu027>.
- Kuhnlein, Harriet V., and Olivier Receveur. 1996. "Dietary Change and Traditional Food Systems of Indigenous Peoples." *Annual Review of Nutrition* 16: 417–442.
- Lamb, Sarah. 2014. "Permanent Personhood or Meaningful Decline? Toward a Critical Anthropology of Successful Aging." *Journal of Aging Studies* 29: 41–52.
- Lavretsky, Helen. 2014. *Resilience and Aging: Research and Practice*. Baltimore: Johns Hopkins University Press.
- Lee, Molly. 2002. "The Cooler Ring: Urban Alaska Native Women and the Subsistence Debate." *Arctic Anthropology* 39(1): 3–9.
- Leonard, William R. 2018. "Centennial Perspective on Human Adaptability." *American Journal of Physical Anthropology* 165(4): 813–833.
- Lewis, Jordan P. 2010. "Successful Aging through the Eyes of Alaska Natives: Exploring Generational Differences among Alaska Natives." *Journal of Cross-Cultural Gerontology* 25(4): 385–396. <https://doi.org/10.1007/s10823-010-9124-8>.
- . 2011. "Successful Aging through the Eyes of Alaska Native Elders: What It Means to Be an Elder in Bristol Bay, AK." *The Gerontologist* 51(4): 540–549. <https://doi.org/10.1093/geront/gnr006>.
- . 2013a. "The Future of Successful Aging in Alaska." *International Journal of Circumpolar Health* 72(1): 21186. <https://doi.org/10.3402/ijch.v72i0.21186>.

- . 2013b. “The Importance of Optimism in Maintaining Healthy Aging in Rural Alaska.” *Qualitative Health Research* 23(11): 1521–1527. <https://doi.org/10.1177/1049732313508013>.
- . 2014. “The Role of Social Engagement in the Definition of Successful Ageing among Alaska Native Elders in Bristol Bay, Alaska.” *Psychology & Developing Societies* 26(2): 263–290. <https://doi.org/10.1177/0971333614549143>.
- Lunda, A., and C. Green. 2020. “Harvesting Good Medicine: Internalizing and Crystallizing Core Cultural Values in Young Children.” *Ecopsychology* 12(2): 91–100. <https://doi.org/10.1089/eco.2019.0066>.
- Makhoul, Zeina, Alan R. Kristal, Roman Gulati, Bret Luick, Andrea Bersamin, Bert Boyer, and Gerald V. Mohatt. 2010. “Associations of Very High Intakes of Eicosapentaenoic and Docosahexaenoic Acids with Biomarkers of Chronic Disease Risk among Yup'ik Eskimos.” *American Journal of Clinical Nutrition* 91(3): 777–785.
- Makhoul, Zeina, Alan R. Kristal, Roman Gulati, Bret Luick, Andrea Bersamin, Diane O'Brien, Scarlett E. Hopkins, Charles B. Stephensen, Kimber L. Stanhope, and Peter J. Havel. 2011. “Associations of Obesity with Triglycerides and C-Reactive Protein Are Attenuated in Adults with High Red Blood Cell Eicosapentaenoic and Docosahexaenoic Acids.” *European Journal of Clinical Nutrition* 65(7): 808–817.
- Manilaq Association. 2020. “The Siglauq.” Accessed December 1, 2020. <https://www.manilaq.org/siglauq/>.
- McGrath-Hanna, Nancy K., Dana M. Greene, Ronald J. Tavernier, and Abel Bult-Ito. 2003. “Diet and Mental Health in the Arctic: Is Diet an Important Risk Factor for Mental Health in Circumpolar Peoples?—A Review.” *International Journal of Circumpolar Health* 62(3): 228–241.
- Michel, Jean-Pierre, and Ritu Sadana. 2017. “‘Healthy Aging’ Concepts and Measures.” *Journal of the American Medical Directors Association* 18: 6.
- Nobmann, Elizabeth D., and A. P. Lanier. 2001. “Dietary Intake among Alaska Native Women Resident of Anchorage, Alaska.” *International Journal of Circumpolar Health* 60(2): 123–137.
- O'Brien, Diane M., Kenneth E. Thummel, Lisa R. Bulkow, Zhican Wang, Brittany Corbin, Joseph Klejka, Scarlett E. Hopkins, Bert B. Boyer, Thomas W. Hennessy, and Rosalyn Singleton. 2017. “Declines in Traditional Marine Food Intake and Vitamin D Levels from the 1960s to Present in Young Alaska Native Women.” *Public Health Nutrition* 20(10): 1738–1745. <https://doi.org/10.1017/S1368980016001853>.
- Ocvirk, Soeren, Annette S. Wilson, Joram M. Pasma, Jia V. Li, Kathryn R. Koller, Gretchen M. Day, Christie A. Flanagan, Jill Evon Otto, Pam E. Sacco, and Frank D. Sacco. 2020. “A Prospective Cohort Analysis of Gut Microbial Co-metabolism in Alaska Native and Rural African People at High and Low Risk of Colorectal Cancer.” *American Journal of Clinical Nutrition* 111(2): 406–419.
- Peterson, J. R., D. A. Baumgartner, and S. L. Austin. 2020. “Healthy Ageing in the Far North: Perspectives and Prescriptions.” *International Journal of Circumpolar Health* 79(1): 1735036. <https://doi.org/10.1080/22423982.2020.1735036>.
- Pike, Ivy L., and Sharon R. Williams. 2006. “Incorporating Psychosocial Health into Biocultural Models: Preliminary Findings from Turkana Women of Kenya.” *American Journal of Human Biology* 18(6): 729–740. <https://doi.org/10.1002/ajhb.20548>.
- Ready, Elspeth. 2018. “Sharing-Based Social Capital Associated with Harvest Production and Wealth in the Canadian Arctic.” *PloS One* 13(3): e0193759.

- Redwood, Diana G., Gretchen M. Day, Julie A. Beans, Vanessa Y. Hiratsuka, Sarah H. Nash, Barbara V. Howard, Jason G. Umans, and Kathryn R. Koller. 2019. "Alaska Native Traditional Food and Harvesting Activity Patterns over 10 Years of Follow-Up." *Current Developments in Nutrition* 3(11). <https://doi.org/10.1093/cdn/nzz114>.
- Redwood, Diana G., Elizabeth D. Ferucci, Mary C. Schumacher, Jennifer S. Johnson, Anne P. Lanier, Laurie J. Helzer, Lillian Tom-Orme, Maureen A. Murtaugh, and Martha L. Slattery. 2008. "Traditional Foods and Physical Activity Patterns and Associations with Cultural Factors in a Diverse Alaska Native Population." *International Journal of Circumpolar Health* 67(4): 335–348. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2925499/pdf/nihms225797.pdf>.
- Rivkin, I., E.D.S. Lopez, J. E. Trimble, S. Johnson, E. Orr, and T. Quaintance. 2019. "Cultural Values, Coping, and Hope in Yup'ik Communities Facing Rapid Cultural Change." *Journal of Community Psychology* 47(3): 611–627. <https://doi.org/10.1002/jcop.22141>.
- Rogers, Jillian. 2015. "Traditional Foods on Menu for Kotzebue Elders." *The Arctic Sounder: Voice of the Arctic Inupiat*, March 13, 2015, http://www.thearcticsounder.com/article/1511traditional_foods_on_menu_for_kotzebue_elders.
- Rowe, J. W., and R. L. Kahn. 1987. "Human Aging: Usual and Successful." *Science* 237: 143–149.
- Rubinstein, Robert L., Laura M. Girling, Kate De Medeiros, Michael Brazda, and Susan Hannum. 2015. "Extending the Framework of Generativity Theory through Research: A Qualitative Study." *The Gerontologist* 55(4): 548–559.
- Ryman, T. K., B. B. Boyer, S. Hopkins, J. Philip, S.A.A. Beresford, B. Thompson, P. J. Heagerty, J. J. Pomeroy, K. E. Thummel, and M. A. Austin. 2015. "Associations between Diet and Cardiometabolic Risk among Yup'ik Alaska Native People Using Food Frequency Questionnaire Dietary Patterns." *Nutrition, Metabolism and Cardiovascular Diseases* 25(12): 1140–1145.
- Skinner, Kelly, Rhona M. Hanning, Ellen Desjardins, and Leonard J. S. Tsuji. 2013. "Giving Voice to Food Insecurity in a Remote Indigenous Community in Subarctic Ontario, Canada: Traditional Ways, Ways to Cope, Ways Forward." *BMC Public Health* 13(1): 427.
- Smith, Janell, Penelope Easton, Brian Saylor, Dennis Wiedman, and Jim LaBelle. 2009. "Harvested Food Customs and Their Influences on Valuable Functioning of Alaska Native Elders." *Alaska Journal of Anthropology* 7(1): 101–121.
- Smith-Morris, Carolyn. 2006. "Community Participation in Tribal Diabetes Programs." *American Indian Culture and Research Journal* 30(2): 85–110.
- Smith-Morris, Carolyn M. 2004. "Reducing Diabetes in Indian Country: Lessons from the Three Domains Influencing Pima Diabetes." *Human Organization* 63(1): 34–46.
- Torres, Sandra. 2003. "A Preliminary Empirical Test of a Culturally-Relevant Theoretical Framework for the Study of Successful Aging." *Journal of Cross Cultural Gerontology* 18(1): 79–100.
- U.S. Census Bureau. 2019. "QuickFacts: Alaska." Accessed October 19, 2020. <https://www.census.gov/quickfacts/AK>.
- Ulijaszek, Stanley J. 1997. "Human Adaptation and Adaptability." In *Human Adaptability: Past, Present, and Future*, edited by S. J. Ulijaszek and A. R. Huss-Ashmore, 7–16. Oxford: Oxford University Press.
- Walch, Amanda, Philip Loring, Rhonda Johnson, Melissa Tholl, and Andrea Bersamin. 2019. "Traditional Food Practices, Attitudes, and Beliefs in Urban Alaska Native Women Receiving WIC Assistance." *Journal of Nutrition Education and Behavior* 51(3): 318–325.

- Wexler, L., L. Joule, J. Garoutte, J. Mazziotti, and K. Hopper. 2014. "Being Responsible, Respectful, Trying to Keep the Tradition Alive': Cultural Resilience and Growing Up in an Alaska Native Community." *Transcult Psychiatry* 51(5): 693–712. <https://doi.org/10.1177/1363461513495085>.
- Wheeler, Polly, and Tom Thornton. 2005. "Subsistence Research in Alaska: A Thirty Year Retrospective." *Alaska Journal of Anthropology* 3(1): 69–103.
- Wilkinson, Michael J., Youlim Yai, and Diane M. O'Brien. 2007. "Age-Related Variation in Red Blood Cell Stable Isotope Ratios (Delta13C and Delta15N) from Two Yupik Villages in Southwest Alaska: A Pilot Study." *International Journal of Circumpolar Health* 66(1): 31–41.
- Wilson, Nicole J. 2014. "The Politics of Adaptation: Subsistence Livelihoods and Vulnerability to Climate Change in the Koyukon Athabascan Village of Ruby, Alaska." *Human Ecology* 42(1): 87–101.

proof