

Chapter 5

Peoples of the Arctic: Characteristics of Human Populations Relevant to Pollution Issues

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5.1. Introduction

This chapter provides an introduction to the inhabitants of the Arctic (Figure 5-1). While there is insufficient space to explore the extent of information that exists in the written literature or in the oral traditions of indigenous cultures, the information given here is intended to help understand how contaminants may affect Arctic residents, and to encourage further investigation of these effects. The impacts that both contaminants and, more insidiously, the fear of contaminants have on, in particular, indigenous peoples and cultures demonstrate the need for effective communication and for preventing contamination that may lead to adverse effects on Arctic peoples.

The primary focus of this chapter is on the indigenous peoples of the Arctic (Figure 5-2). This is for two reasons. First, indigenous peoples have been living as part of the Arctic ecosystem for millennia, and in most areas, continue to do so. As consumers of local resources, they are in some ways the end recipients of the types of pollution that are transported long distances, as described throughout this report. Many of the effects of environmental contamination are likely to be most pronounced among indigenous peoples.

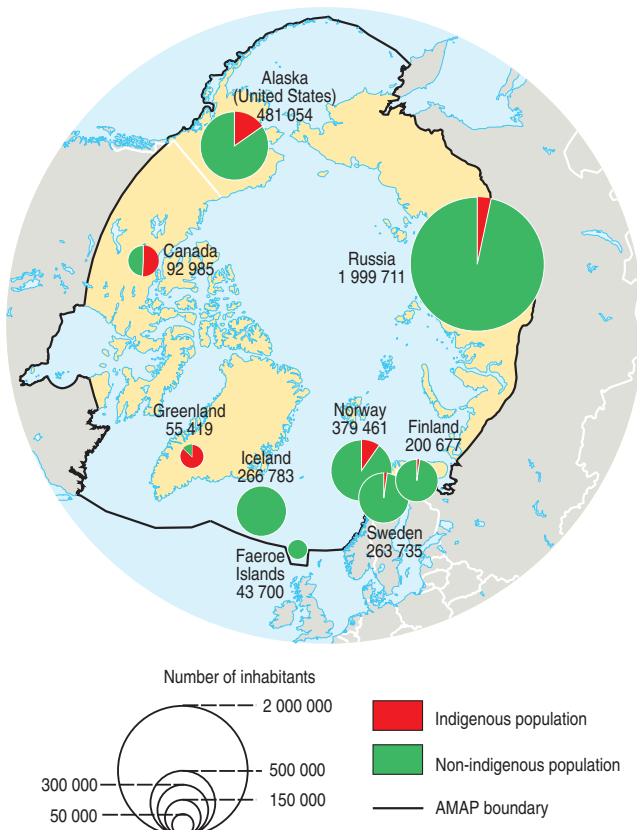


Figure 5-1. Total and indigenous populations of the Arctic, by Arctic area of each country (the data from Russia are for the indigenous minority population).



Figure 5-2. Locations of Arctic indigenous peoples.

Second, the cultures and traditions of Arctic indigenous peoples are found nowhere else. Most of these groups continue their patterns of resource use, maintain their cultural traditions, and fight for their rights to continue to do so. Their connection to the Arctic environment is unique and multifaceted. This relationship is everywhere affected, and in some cases at risk of disappearing, due to dislocation of people and traditional activities. In other cases, the very existence of some indigenous groups is at risk. Some have become extinct, even within the twentieth century. Arctic indigenous peoples are the most fragile elements of human society in the Arctic and the most susceptible to environmental change. As such, they deserve special attention to their ways of life, living conditions, and prospects for the future.

In addition, of course, large numbers of immigrants have moved to the region. In the Nordic countries and Russia, this has taken place over several centuries. In North America, only in the past century have a significant number of new arrivals taken up permanent residence. While most of these immigrants have come from European cultures, other peoples are moving to the North as well, increasing the ethnic, racial, and cultural diversity of the Arctic population.

Throughout the Arctic, the non-indigenous population is growing, and in many areas is larger than the indigenous population. Although some mutual assimilation and acculturation take place, cultural, social, economic, and other differences remain between the two groups, and their activities, diets, and other routes of exposure to contaminants may vary as well. Some members of the general populations depend upon the Arctic environment, and are sensitive to environmental change. Their concerns must be considered along with those of indigenous peoples.

Iceland and the Faeroe Islands occupy an ambiguous place in the dichotomy between indigenous and non-indigenous. The settlers who arrived before year 1000 found no inhabitants, and their descendants continue to live in the islands, with distinct languages and cultures. Their societies are susceptible to environmental change in their lands and seas. Both, therefore, receive special attention in this chapter.

This chapter first describes the peoples of the Arctic, starting in Alaska and moving east around the pole. This is done country-by-country, with the exception that the Saami are considered as a group prior to the sections on the four coun-

tries in which they live. This allows for a concise discussion of one group which lives in a relatively compact area. Next, the chapter makes brief observations concerning the future of indigenous peoples, and the role of indigenous peoples in understanding environmental change. These sections are intended to provide an introduction to related issues of importance for and about indigenous peoples in the Arctic. The chapter concludes with a summary discussion of similarities and differences in the ways of life of Arctic peoples.

5.2. United States: Alaska

5.2.1. Geography

Alaska is the northwestern-most of the United States, and the only state that extends into the Arctic. The territory was purchased from Russia in 1867, and in 1959 became the 49th state admitted to the union.

As elsewhere in the Arctic, there is no precise definition of Arctic Alaska. The US definition (United States 1984) includes all territory north of the Arctic Circle, plus territory north and west of the Porcupine, Yukon, and Kuskokwim Rivers, as well as the Aleutian chain, and all contiguous seas. The US definition of Arctic Alaska covers approximately 700 000 km².

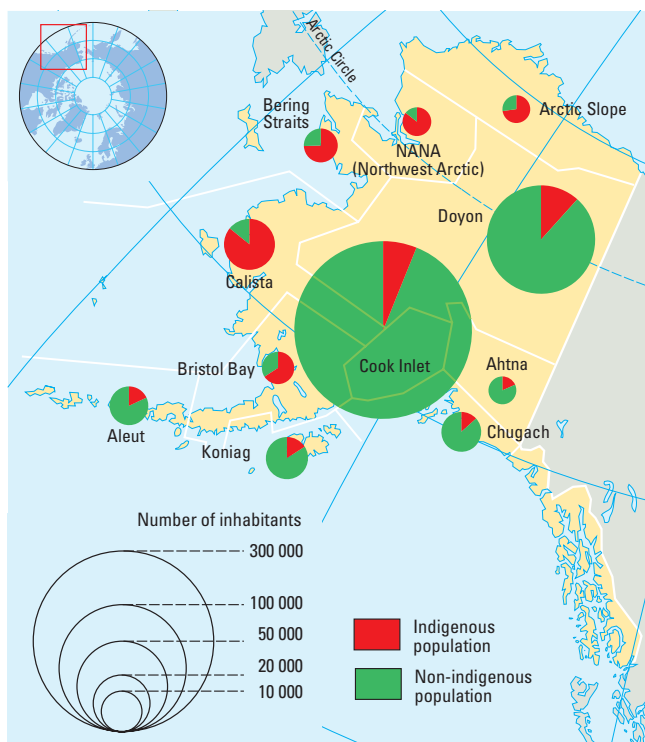


Figure 5-3. Total and indigenous populations of Arctic Alaska, by Native Regional Corporation region (US Department of Commerce 1993a).

The AMAP region as considered in this report is broader, including the entire state of Alaska with the exception of the southeastern 'panhandle.' This definition covers approximately 1 400 000 km². Throughout this section, the AMAP regional definition will be used.

5.2.2. Population

According to the 1990 Census, 481 054 people lived in Arctic Alaska that year (US Department of Commerce 1993a) (Figure 5-3). Due largely to in-migration, the state's population in all regions has been rising rapidly for decades.

In rural Alaska, there are several distinct regions, each with a regional center. There are several delineations of the regions,

according to regional government, regional Native Corporation, health care organization, administrative and organizational structure, and statistical areas. While these are consistent on a large scale, there are several variations that prevent simple comparisons among statistics for different subjects.

5.2.2.1. Indigenous peoples

The indigenous peoples of Arctic Alaska are the Inuit (Eskimo), Aleut, Athabascan, and Eyak. The Inuit and Aleut languages are part of the same language family. The Inuit include Alutiik, Central Yup'ik, Inupiat, and Siberian Yupik. The Athabascan (related to the Gwichin and Dene in Canada), also include many sub-groups.

The 1990 US Census counted 85 698 indigenous persons in Alaska (US Department of Commerce 1993a), and Butler (1994a) gives a 1995 estimate of 99 179. Of the 1990 total, approximately 73 235 lived in the Arctic. The indigenous population has a greater proportion of persons under 20 years of age than the US population as a whole (Figure 5-4), and a greater proportion of persons under 20 and over 60 than the overall Alaska population, which is heavily influenced by in- and out-migration of working age persons.

Politically, the status of indigenous peoples in Alaska differs from that of Native Americans in the contiguous 48 states, although issues of tribal sovereignty are far from settled in Alaska. The Alaska Native Claims Settlement Act of 1971 (ANCSA) extinguished aboriginal claims and established regional and village native corporations to protect indigenous interests and to encourage economic, social, and political integration of indigenous peoples. The extent to which this has occurred is heavily debated, and most observers agree that the goals of ANCSA have not been fully realized (e.g., Berger 1985, Alaska Natives Commission 1994).

Other issues, such as subsistence rights, are also prominent. The Alaska State Constitution forbids racial discrimination, preventing the State of Alaska from favoring indigenous interests in subsistence and other areas. Certain federal environmental laws, such as the Marine Mammal Protection Act and the Endangered Species Act, contain exemptions for Alaskan indigenous peoples to preserve traditional hunting practices. Authority to manage subsistence resources is divided between the state and federal governments, and remains a contentious and unsettled issue (Huntington 1992, Alaska Natives Commission 1994).

In addition, the ownership of land in Alaska is complex. Different federal, state, local, and private entities owning or managing adjacent and interwoven lands often have different regulations and practices regarding land use. This arrangement further confuses the issues of subsistence hunting and traditional land use. The situation offshore is similar. Two federal agencies split management responsibility for marine mammals, and additional state and federal agencies manage fishing and mineral development in near-shore and outer-continental-shelf regions (Huntington 1992).

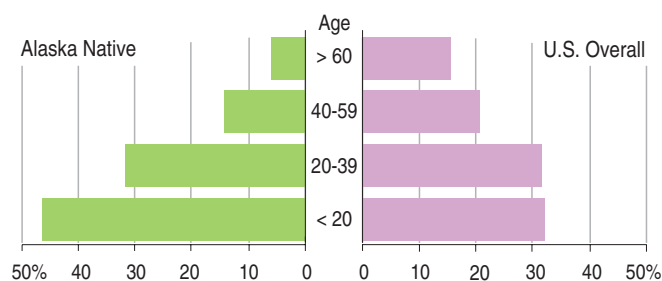


Figure 5-4. Age structure of Alaska indigenous, Alaska total, and United States total populations, 1980 (compiled from Middaugh *et al.* 1991).

Migrations from region to region, or from villages to regional and urban centers such as Nome and Anchorage, are common, but have not blurred regional identities and boundaries. The descriptions given below are for the traditional areas inhabited by each group, which remain the basis for group identity and traditional activity. Nonetheless, it must be understood that present-day social, cultural, and economic patterns are a complex system of adaptations to a wide variety of modern influences (e.g., Berger 1985, Kruse 1986, Carey 1992).

For indigenous peoples of Alaska, changes are occurring in all aspects of life. The end point of these changes is unknown, and the pace of change varies from region to region, from village to village, from family to family, and even within families. The relative degrees of cultural retention, change, adaptation, or assimilation cannot be rated on a simple scale. Traditional customs and activities are a common tie, and a source of identity.

Aleut

The Aleuts inhabit the islands of the Aleutian chain, including the Kommandorskye Islands of Russia, the Pribilof Islands of the Bering Sea, and the Alaska Peninsula on the North American mainland. Primarily a sea-going people, the Aleut depend upon fish, marine mammals, and birds for their diet. A small percentage of the diet is derived from plants. Military activity during and after the Second World War caused large-scale relocations of Aleut villages, at least temporarily, and have influenced the economy of the region. Commercial fishing is the primary economic activity of the Aleutian chain, with processing and harbor facilities at Unalaska (Dutch Harbor) and, more recently, St. Paul.

Alutiiq

The Alutiiq, or Sugpiaq, live in southwestern and southcentral Alaska, on the Alaska Peninsula, Kodiak Island, the southern Kenai Peninsula, and the areas surrounding Prince William Sound. Linguistically, they are related to the Central Yupik, and they share cultural attributes with both the Yupik and the Aleuts (Pullar 1996). Alutiiq communities are coastal, and have high dependence upon fish (mainly salmon) and terrestrial mammals (mainly caribou), in addition to birds, plants, and marine mammals. Commercial fishing is the primary economic activity for this area (Fall and Morris 1987).

Athabaskan

The Athabascans inhabit the boreal forests of interior Alaska, and parts of the Yukon Territory and the Northwest Territories of Canada. There are several linguistic sub-groups within the Athabaskan region. These are the Ahtna, the Gwichin, the Ingalik, the Han, the Holikachuk, the Koyukon, the Tanacross, the Tanaina, the Tanana, the Upper Kuskokwim, and the Upper Tanana (Krauss 1982). Traditional activities include salmon fishing, caribou and moose hunting, and trapping (VanStone 1974, Nelson 1983). Birds, other terrestrial mammals, and some plants are also taken for subsistence hunting, and coastal communities hunt marine mammals such as the beluga whale. Traditional bartering with Iñupiat and Yupik neighbors brought coastal foods such as seal oil and other marine products into the interior (Huntington 1966, Huntington 1993).

Central Yup'ik

The Central Yup'ik, also known as Yup'ik and including the Cup'ik, inhabit the coast and tundra of the Yukon-Kuskokwim Delta in southwest Alaska. They are the most numerous of Alaska's Inuit groups. The Central Yup'ik language is, along with Siberian Yupik, one of the few indigenous lan-

guages in Alaska that remains the primary language for most children in the region. The subsistence activities of the region center on fish, with marine and terrestrial mammals, birds and bird eggs, and plants also playing a significant role. The customs and activities of the Central Yup'ik, often overlooked by researchers and readers more familiar with the Iñupiat (Fienup-Riordan 1990, 1994), remain strong in the villages of southwest Alaska, and include many traditions and beliefs concerning hunting and sharing.

Eyak

The Eyak, linguistic relatives of the Athabascans, live on the southern coast of Alaska, in the Cordova area to the east of Prince William Sound. Though the Eyak are Alaska's least numerous indigenous group, and only one elder still speaks the language, many Eyak are actively reviving their culture (Campbell 1996).

Iñupiat

The Iñupiat live in the coastal and tundra regions of Alaska north of Norton Sound in the Bering Sea. Although linguistically related to the Siberian Yupik and Central Yup'ik, the Iñupiat are more closely related to the Inuvialuit and Inuit of Canada and the Kalallit of Greenland. Coastal Iñupiat depend upon marine mammals, caribou, birds, and fish, while inland Iñupiat concentrate on caribou, fish, and birds. In all cases, plants amount to no more than a few percent of the diet. Traditional trade and bartering extended hundreds of miles, and was centered on annual trade fairs in places near modern Kotzebue (northwest Alaska) and Nuiqsut (on the Colville River delta in the central North Slope) (Spencer 1959). The extent of this trade, like many other customs, remains strong today, as subsistence products are shared among villages across the region.

Siberian Yupik

The Siberian Yupik in Alaska inhabit St. Lawrence Island in the Bering Sea, and are sometimes referred to as St. Lawrence Island Yupik. They are the same group as the Yupik of the Chukotka, Russia, mainland, sharing language, customs, and kinship ties across the international border. St. Lawrence Island has in the past supported reindeer herds, but today the major subsistence resources are all marine, primarily walrus and bowhead whale, as well as fish, shellfish, seals, and birds. Some plants are gathered as well, but as with all Arctic regions of Alaska, plants are a minor component of the overall diet. Traditional customs remain strong on St. Lawrence Island, and the renewed ties to Chukotka have revived customary trade as well as intermarriage.

5.2.2.2. Non-indigenous residents

While indigenous residents outnumber the immigrant population in some rural areas, the majority of Alaskans today are non-indigenous. These residents are more likely to live in urban areas, of which Anchorage and Fairbanks are the most populous. Most non-indigenous residents are new arrivals to the state, although a few families have lived in the area for several generations. Hunting and fishing are popular with many non-indigenous residents, but the patterns and extent of use are rarely as extensive as they are for indigenous persons. In terms of exposure to environmental contaminants, the risks faced by non-indigenous residents will be no greater than those faced by Natives, and in most cases smaller. Therefore, the following section concentrates primarily on describing the activities and lifestyles of the indigenous peoples.

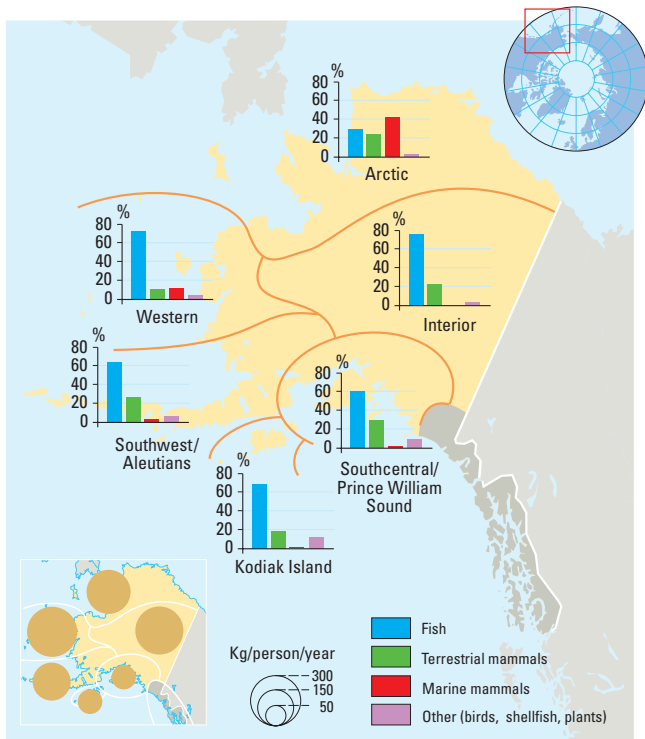


Figure 5-5. Total and composition of subsistence production for small and mid-sized communities in selected areas of Alaska (Robert J. Wolfe, Alaska Department of Fish and Game, Division of Subsistence, Juneau, Alaska).

5.2.3. Hunting, fishing, and gathering

For indigenous peoples in Alaska, subsistence (the hunting, fishing, and gathering of local foods for consumption, sharing, and trade or barter) is a deeply-rooted source of identity, through both the harvesting activities themselves, and the consumption and distribution of foods and other products from the harvest. Figure 5-5 shows the composition of subsistence production for regions of Alaska.

Table 5-1 shows, as an example, the size of the harvest in Barrow, and the percentage of participating households for each resource. Clearly, harvesting local foods is a common and vital part of local life in rural Alaska.

Despite widespread technological and social changes, subsistence remains a critical part of modern village life in Alaska (Burch 1985, Barker 1993). Current debates over rights to

Table 5-1. Composition of, and participation in, annual subsistence production for Iñupiat households in Barrow, Alaska, 3-year average (1987-89), usable amounts of major species. (Stephen R. Braund & Associates and Institute of Social and Economic Research 1993).

Resource	Household mean, kg	Per capita mean, kg	% of Iñupiat households participating
Marine mammals	304	74	76
Bowhead whale	216	55	75
Walrus	47	10	29
Bearded seals	22	5	46
Ringed and spotted seals	13	3	27
Polar bear	6	1	7
Terrestrial mammals	145	30	77
Caribou	138	29	77
Moose	7	1	7
Fish	65	13	60
Whitefish	50	10	54
Other freshwater fish	9	2	33
Salmon	4	1	16
Other coastal fish	2	<1	23
Birds	18	4	65
Geese	11	2	40
Eiders	6	1	52
Ptarmigan	<1	<1	26
Total	532	121	87

and priorities for subsistence hunting and fishing reach into the heart of indigenous politics, economy, and society. The political and legal questions surrounding this debate are far from resolved in Alaska, and so the long-term dimensions of access to and regulation of subsistence activities are unclear.

While land ownership is a relatively new concept, the ability to use resources as they are needed is the traditional and primary basis for traditional resource use. Harvest areas used by any particular village may consist of several thousand square kilometers of sea and land. Land use regulations may affect several villages in a region, including some that are hundreds of kilometers distant.

While production is a crucial and often-studied aspect of subsistence, sharing is perhaps the most valued aspect of subsistence. Sharing touches upon all members of a community, and represents a way of establishing, strengthening, and maintaining ties to family and community, and among communities (Bodenhorn 1989, Wenzel 1994). For certain species, custom dictates how the animal is to be shared. This may depend upon whether it is the first taken in a given season, or if it is the first taken by that hunter. Disruptions to subsistence that threaten sharing are seen as most damaging to indigenous society as a whole. Such disruption may include presence of contaminants in foods, or even the fear of contaminants, since hunters may be reluctant to give tainted meat away.

It is critical to note that, at either the individual or community level, subsistence harvest production levels do not relate directly to consumption levels. Individual hunters, or households with active hunters, usually produce food for a number of people who cannot or do not hunt for themselves. Andrews (1989) describes individual household productions in the Central Yup'ik village of Nunapitchuk in excess of 5000 kg of edible foods per year, most of which is then shared. In addition, the focus of individual harvests may vary considerably within a village, depending upon available harvesting tools (e.g., whether the individual has access to a boat).

Village averages can be similarly misleading, since high production of a particular resource by a village may indicate trade with other villages for other resources. For example, beluga whale harvests in Point Lay on the North Slope are high, but the beluga is shared throughout the region, and may be exchanged for bowhead whale, which are not hunted in Point Lay (G. Upicksoun pers. comm.). Such trade also explains the presence of marine products in inland villages, since furs and caribou may be traded for seal and whale. Thus, consumption does not neatly follow production, and calculations of contaminants risk based upon local production do not adequately account for the volume of trade and sharing that distribute subsistence products over a wide area.

Fish

For rural Alaska as a whole, fish are 59% by weight of the total subsistence harvest; for certain regions, fish comprise over three-quarters of the harvest (Wolfe n.d.). Except for the northernmost region of Alaska, fish are the majority of the subsistence harvest by weight (see Figure 5-5). Salmon are the most important species, but whitefish, burbot, and trout species are significant as well. Several species of shellfish are also important to subsistence harvests, including clams and crab.

Fish are typically caught by net, both in the ocean and in rivers and lakes. Salmon fishing depends upon the timing of the salmon runs, but fishing for resident species occurs at various times of the year. Fishing for tomcod or smelt may take place any time of the year. Fishing for many species, and primarily for salmon, is done near established fish camps. Families and extended families may spend up to several months at fish camp, living in tents or wooden cabins.

Fish are preserved through three primary means: drying in open air, smoking, and freezing. In some areas, fish are also fermented, salted, or canned. They are eaten either as they were preserved, or in coastal areas they may be dipped in seal oil. Eggs are usually eaten, as are heads.

Marine mammals

For coastal communities in Arctic Alaska, marine mammals are a critical and highly valued resource. They are also the reason that many communities are located on coastal points, since migrating marine mammals pass within close range. In northern and northwestern Alaska, marine mammals account for 42% of the subsistence harvest, or 99 kg per person per year (Wolfe n.d.). In these regions, the primary species taken are bowhead whales, beluga whales, walrus, bearded seals, ringed seals, polar bear, and other species of seals. In southwestern Alaska and the Aleutian chain (southern Bering Sea), the marine mammal harvest is lower, but has great cultural significance. In these regions, the primary species taken are walrus, harbour seal, bearded seal, sea lion, and fur seal.

Hunting of large marine mammals is usually a cooperative effort due to the size of the animals and the difficulty of the hunting conditions. Smaller species, such as seals, polar bear, and sometimes beluga whale, are hunted by individuals or by a single boat. The hunting methods vary greatly by season and by village. For hunting bowhead whales, camps are established on the sea ice or on shore near open water. Whaling crews may spend more than one month at these camps, living in tents on the ice or in small cabins on land. Marine mammal hunting for other species is sometimes done from shore-based camps away from the village.

Marine mammal foods are frozen, dried, or fermented for storage. These can be eaten as they are stored, or cooked by boiling or frying. Seal oil is rendered and is eaten with other foods as a condiment. Polar bear and walrus meat are cooked to avoid trichinosis, and polar bear livers are avoided due to toxic levels of vitamin A. Blubber and internal organs are regularly eaten, as is the skin and blubber from whales (*mak-tak* or *mangtak*).

In all regions, sharing of marine mammals is frequently associated with rituals of division of the catch, giving to elders, and, in the case of large species such as bowhead and walrus, festivals celebrating a successful hunt. For coastal communities, marine mammals are a vital cultural resource, as well as a significant contribution to the local diet.

Terrestrial mammals

For both coastal and inland communities, terrestrial mammals form a significant part of the subsistence harvest. Caribou are the primary species hunted, although moose, Dall sheep, muskox, brown and black bear, and a variety of smaller mammals are also taken. Reindeer herding, introduced in the early 20th century, continues in some areas of Alaska. At present, caribou populations throughout the Arctic region are high, as are harvest levels. Due to their migrations, caribou are hunted throughout the year in different communities, depending upon their local availability. Moose, sheep, muskox, and smaller mammals are available more consistently, although local preferences and government hunting regulations may restrict harvests.

Trapping of terrestrial mammals is common in Arctic Alaska. Trapped species include wolf, fox, marten, otter, mink, beaver, porcupine, lynx, hare, and parka squirrel. Furs are used for clothing and handicrafts, and many of these species are also eaten.

Terrestrial mammals are preserved by freezing and by drying, as well as occasionally by fermentation. They are usu-

ally eaten as they were preserved, or cooked by boiling, roasting, or frying. Fat and internal organs are also valued foods.

As with marine mammals, there are a number of cultural and religious associations with terrestrial mammals and their use. These include taking of moose by Athabascan Indians for funeral potlatches, and the giving of a hunter's first caribou to an elder.

Birds

Although birds comprise only a few percent of the annual subsistence harvest, they are significant in the seasonal hunting cycle. Several species of geese, ducks and other seabirds, swans, cranes, owls, and ptarmigan are hunted. In many areas, birds are the first animals to return in spring, and thus are the first source of fresh meat available to hunters after the winter.

Birds are preserved by freezing, drying, or by fermenting. They are eaten cooked, boiled, or in soups.

Plants

Gathering of plants provides another dietary supplement to the overall subsistence harvest in Alaska, adding nutrients to the diet. Many species of berries, roots, and greens are harvested, some for medicinal purposes. For obvious reasons, this harvest is highly seasonal, though plants may be stored frozen or in seal oil and eaten throughout the year. Berries are often combined with fat into *agutuk* (spelled variously), or 'Eskimo Ice Cream'. Despite the relatively small quantities, plants, like birds, play a large role in the seasonal round. In some regions, berry camps are set up during the fall season. The majority of plant gathering is done by women and children (Jones 1983).

5.2.4. Diet

The indigenous Alaskan diet relies heavily upon indigenous foods. Documentation of consumption quantities is not available beyond a few specific cases. Instead, an overview of dietary practices and trends can be gathered from available publications and experienced researchers (e.g., Nobmann 1989, Nobmann *et al.* 1992). While a number of 'western' foods are consumed with great frequency, mean daily intake of fish, for example, is 109 g, more than six times the American average of 17 g (Nobmann *et al.* 1992). The diet was also found to be nutritious, based upon calculations of the nutrient values for indigenous foods (Nobmann 1993).

Seasonal variations are apparent, including a greater consumption of fish in summer and of marine mammal products in winter. Shifts in consumption patterns between 1956-61 (Heller and Scott 1967) and the present (Nobmann *et al.* 1992) indicate increases in intake of certain nutrients and declines in others. Overall, the diet is nutritious, in addition to the spiritual and cultural well-being that it brings, and the indigenous foods remain important sources of vitamins, minerals, and energy. While several factors have led to changes in diet among indigenous peoples, a shift in diet away from indigenous foods is likely to be detrimental to overall indigenous health, including physical, social and spiritual health.

5.2.5. Employment

With the exception of the North Slope Borough (essentially the same as the Arctic Slope region) and some fishing communities in south and southwest Alaska, local economies in rural Alaska depend heavily on state and federal government funds. For its revenue, the North Slope Borough's government taxes the property of the oil production facilities in and around Prudhoe Bay. Commercial fishing, primarily for her- and salmon, provides seasonal income for many com-

Table 5-2. Employment statistics for indigenous persons over age 16 in Arctic Alaska, by Native Regional Corporation region (U.S. Department of Commerce 1993a).

Region	% of persons over age 16 in labor force	% of labor force unemployed	% of employed persons working ≥ 35 hours/week	% of employed persons in		
				government	manufacturing	forestry/fisheries
Ahtna	48.7	54.4	53.0	39.8	—	—
Aleut	53.2	10.7	66.5	32.9	7.2	18.4
Arctic Slope	68.4	23.2	75.8	67.5	1.6	0.7
Bering Straits	51.0	24.6	51.0	53.6	1.1	1.4
Bristol Bay	41.9	18.3	49.1	62.0	1.0	2.7
Calista	48.9	22.4	47.1	64.4	1.3	1.3
Chugach	53.0	16.2	67.2	29.7	10.0	12.7
Cook Inlet	60.1	20.5	74.4	27.0	7.0	2.2
Doyon	55.4	30.0	57.8	44.0	2.7	1.0
Koniag	58.6	14.6	61.5	34.9	6.5	12.7
NANA (Northwest Arctic)	51.6	27.5	67.0	49.8	0.8	0.2

munities south of the Bering Strait. Mining for gold, lead and zinc, and jade also provide employment. The majority of jobs, however, are in the service and public (government) sectors of the economy (see Table 5-2).

Employment opportunities in rural Alaska are limited. State of Alaska unemployment statistics are likely to underestimate the actual figures, since 'discouraged' workers (i.e., those who have not sought employment in the four weeks prior to the survey) are not included in the statistics (Fried 1994a, North Slope Borough 1995). Also, underemployment is common, since many jobs are seasonal or temporary (North Slope Borough 1995). In some cases, this may reflect a preference, since it allows more time for subsistence activities. Nonetheless, 21.4% of rural Alaskans have income below the US poverty line, compared with 9.0% of the whole Alaska population (Fried 1994b).

Raising the levels of rural employment, especially as rural populations grow, is a critical problem for Alaska (Blatchford 1994). While ties to subsistence activities and village life may lessen the attraction of moving to urban areas, the economic pressure to seek work and better living conditions may cause substantial migrations from rural to urban Alaska.

5.2.6. Housing

Rural Alaska has a chronic housing shortage. The economic conditions described above, the high cost of building materials (Alaska Housing Finance Corporation 1994), and the rate of population growth combine to keep supply well below demand. Median occupancy rates in some regions exceed one person per room (US Department of Commerce 1993b, 1993c).

Much existing housing is inadequate in terms of size, quality of construction and insulation, and plumbing. In the Arctic regions of Alaska, fewer than half the villages have prevalent flush-toilet systems. In northern, northwestern, and southwestern Alaska (Arctic Slope, NANA (Northwest Arctic), Bering Straits, and Calista regions), nearly three-quarters of villages are without consistent flush-toilet systems (Olofson 1993). In most of these cases, running water is also unavailable in the home. Treated water is usually supplied centrally in each village, although residents frequently prefer water taken directly from nearby creeks, lakes, or melted from ice.

Sewage disposal is a significant problem for many villages. Topographic relief may be slight, and drinking water supplies may not be easily kept separate during seasonal changes in water level. In addition, villages located along rivers may discharge untreated sewage into waters that flow past villages farther downstream. Lack of sanitation, plus the lack of readily-available clean water in the home for such routine practices as hand washing, contributes to the spread of diseases such as hepatitis A and giardia within rural communities (State of Alaska 1991).

5.2.7. Education

In recent decades, village residents have had access to schooling through high school without leaving their community. This has increased high school graduation rates. In the Arctic areas, 52-75% of indigenous residents are high school graduates, and 2-6.5% have university degrees (Table 5-3) (US Department of Commerce 1993a). Younger age groups have higher high school graduation rates (North Slope Borough 1995). Rural community colleges (i.e., introductory courses at the university level) exist in each regional center, although in some cases the emphasis has turned toward vocational training rather than academic education (Nuqittatq-tuat Atautchikun 1995).

Table 5-3. Education attainments for indigenous persons over age 25 in Arctic Alaska, by percent, by Native Regional Corporation region (U.S. Department of Commerce 1993a).

Region	High school graduates	Attained Bachelor's degree
Ahtna	53.4	2.5
Aleut	54.5	2.5
Arctic Slope	54.6	2.7
Bering Straits	52.7	2.2
Bristol Bay	57.7	3.8
Calista	52.2	2.7
Chugach	65.6	1.9
Cook Inlet	75.6	6.5
Doyon	63.9	4.2
Koniag	63.1	4.6
NANA (Northwest Arctic)	55.4	2.2

5.2.8. Language

While indigenous languages have suffered greatly due to the prevalence of English and former school policies which banned their use, they are still widely spoken in many regions of Arctic Alaska. Table 5-4 shows results of the 1990 Census questions concerning use of non-English languages as well as

Table 5-4. Language abilities among indigenous persons over age 5 in Arctic Alaska, by percent, by Native Regional Corporation region (U.S. Department of Commerce 1993a).

Region	Speak a non-English language	Don't speak English well
Ahtna	31.4	12.3
Aleut	13.2	4.0
Arctic Slope	72.6	17.3
Bering Straits	49.2	12.3
Bristol Bay	43.1	18.8
Calista	76.2	37.0
Chugach	24.0	5.9
Cook Inlet	17.1	4.4
Doyon	21.5	7.6
Koniag	11.8	2.4
NANA (Northwest Arctic)	48.0	17.5

self-perceived fluency in English. Efforts to preserve and promote indigenous languages are under way in schools and in the communities as a whole. These programs are relatively new, and their long-term effect remains to be seen.

5.2.9. Mortality and morbidity

The leading causes of death in Alaska are cancer (135 deaths per 100 000 population), heart disease (118.5 per 100 000), unintentional injuries (51 per 100 000), and suicide (23 per 100 000) (Alaska Bureau of Vital Statistics 1995). Boedeker and Davidson (1994) report that heart disease is the leading cause of death of indigenous Alaskans, when age-adjusted to the US population. They also report that age-adjusted indigenous mortality for most types of cancer is higher than the rates for the US population overall. Patterns of disease are changing, reflecting numerous factors, including increased life expectancy, decreases in physical activity, and changes in smoking, diet, nutrition, health care delivery, and diagnostic capabilities in the state (G. Egeland pers. comm.).

Most available studies and figures do not separate data into regions or indigenous groups, so most data presented in this section are for all indigenous peoples of Alaska. Overall death rates for indigenous peoples have been declining for some time (Boedeker and Butler 1993). Life expectancy for an indigenous newborn in 1950 was 46.84 years; in 1980-84, it was 66.60 years (Middaugh *et al.* 1991). In particular, deaths from injuries, accidents, water/drowning, and homicide declined significantly between 1980 and 1990. Injury deaths still remain far higher in Alaska than in the US as a whole. In Alaska, 16% of all deaths were from injuries, compared with 4% nationwide (State of Alaska 1994). Many other causes of death appear to be declining slightly.

Heart disease deaths appear to be increasing among indigenous Alaskans and decreasing among non-indigenous residents of the state. In 1950, among men aged 45-64 years, the heart disease and atherosclerosis death rate was 185 per 100 000 for indigenous men, and 558 per 100 000 for non-indigenous men. In 1980-89, the indigenous rate had increased to 243 per 100 000, and the non-indigenous rate had decreased to 222 per 100 000 (Alaska Department of Health and Social Services, Section of Epidemiology, unpubl. data).

In the indigenous population, diabetes, breast cancer, suicide, chronic obstructive pulmonary disease, lung cancer, and neoplasms are increasing with some statistical significance (Boedeker and Butler 1993, Butler 1994b). Increased prevalence of non-insulin-dependent diabetes mellitus and impaired glucose tolerance appears to be associated with decreased consumption of seal oil and fish (Adler *et al.* 1994).

Incidence of specific cancers among indigenous peoples varies from that of the general US population, and is most similar to that of Inuit in Canada and Greenland. Compared with the overall US population, indigenous Alaskans have higher incidence of cancer in the nasopharynx, esophagus, stomach, liver, gallbladder, cervix, and kidney, and lower incidence in the prostate, breast, uterus, bladder, and leukemia/lymphoma (Lanier 1993, Lanier *et al.* 1994). From 1984-88, the overall age-adjusted cancer incidence rate for indigenous persons is comparable to that of the general US population. Separated by sex, the overall incidence rate for indigenous males is lower than that of the US population; for indigenous females, the rate is higher. The overall rate for Inuit is lower for both sexes (Lanier *et al.* 1994).

Mortality from cancer is higher in the Alaska Area Native Health Service region than for any other population served by the Indian Health Service (Valway 1991). Among indigenous females, cancer is the leading cause of mortality (Mid-

daugh *et al.* 1991). The excess of mortality, which is greater than the excess of incidence, may be due to late diagnosis, less than optimal treatment available in rural Alaska, higher incidence of less-treatable cancers, or other factors (Lanier 1993, Lanier *et al.* 1994). Lanier (1993) also reports that one-third of new cancers and cancer deaths are tobacco related.

Morbidity statistics also show sharp differences between indigenous peoples and the general US population. The leading disease-related cause of hospitalization in Indian Health Service facilities in Alaska in 1993 was pneumonia (following deliveries, injuries, and complications during pregnancy). Pneumonia was second to malignant neoplasms as a disease-related cause of the actual number of days spent in hospital (Boedeker and Davidson 1994). Davidson *et al.* (1989, 1993) report that among Yupik in the Yukon-Kuskokwim Delta and Iñupiat in the NANA (Northwest Arctic) region, incidence by age group of invasive pneumococcal disease is up to 60 times the corresponding rate for the US population as a whole. Although case-fatality rates appear unusually low for the disease, the incidence rates 'appear to be the highest reported for any population worldwide' (1989). Davidson *et al.* (1993) also report that vaccine treatment is effective and can be administered among remote populations.

Some disease-causing factors are more prevalent among indigenous Alaskans than the general US population. Although low in total numbers, botulism also reaches its highest incidence worldwide among indigenous Alaskans, complicated by use of plastic bags and containers for storing and aging foods (Segal 1992).

Smoking is more common among Alaskans than in the US population at large (Owen *et al.* 1996), and appears to be increasing (Murphy *et al.* 1996). In 1991, 31.4% of indigenous Alaskans and Native Americans smoked, compared with 25.7% of all Americans (Bartecchi *et al.* 1994). The State of Alaska (1991) reports that 25.9% of Alaska adults smoke, and 38.6% of indigenous adults smoke. Lanier *et al.* (1994) report a prevalence of 50% for current indigenous adult smokers, as well as a high and early use of chewing tobacco, leading to other forms of tobacco use. A recent study analyzing deaths in 1992-94 found that nearly 20% of deaths in Alaska were attributable to smoking (Schumacher 1996).

Alcohol abuse is also a significant behavioral risk factor in Alaska, especially for indigenous Alaskans (State of Alaska 1991, 1994, Bashshur and Quick 1990).

5.2.10. Health care

The current health care system in rural Alaska is provided by tribal organizations contracted by the Indian Health Service of the US Public Health Service (PHS), which is responsible for providing health care to indigenous Americans throughout the USA. In rural Alaska, there are no alternatives, and so non-indigenous residents are also allowed to use these facilities. Health care is provided in cooperation with regional nonprofit organizations. These administer programs, hire local health aides, and provide support for patients in their communities in the form of interpretations and health instruction, as well as for patients in Anchorage or Fairbanks who are undergoing medical treatments unavailable in the communities or regional centers.

The facilities available in rural Alaska are below the national averages, especially in human resources for health education and primary health care (Aleutian-Pribilof Islands Association Health Department n.d.). A report to the governor and the legislature of Alaska concluded, 'By nearly all measures, the health status of indigenous Alaskans is significantly lower than other Alaskans. The health needs of indi-

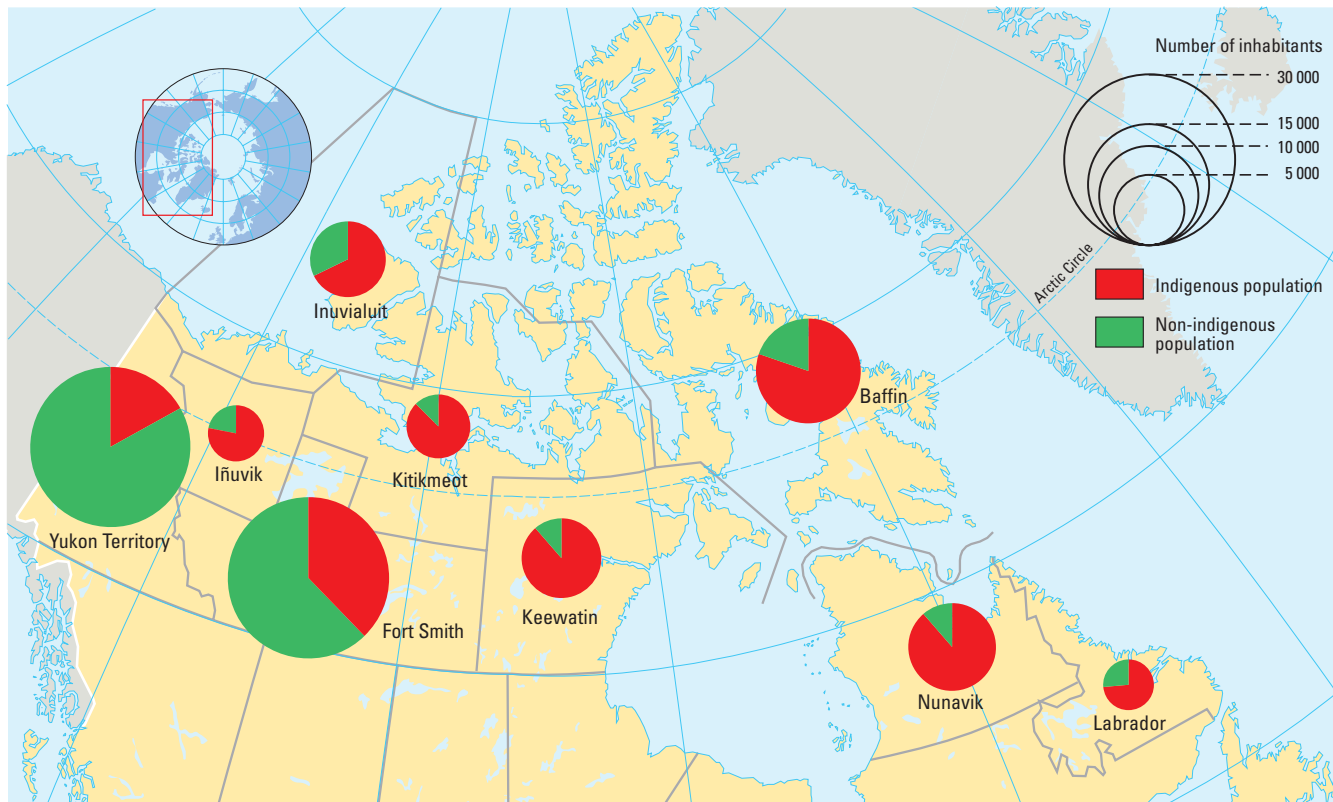


Figure 5-6. Total and indigenous populations of Arctic Canada (Statistics Canada 1995).

genous Alaskans far outstrip the resources available through the Alaska Area Native Health Service (PHS) and its tribal contractors. Many villages do not have basic water and sanitation services which are essential to the control of disease' (Alaska State Legislature 1993).

5.3. Canada

5.3.1. Geography

The Canadian Arctic as covered in this section, consists of the Yukon and Northwest Territories, plus the Inuit areas of northern Quebec and Labrador. This area comprises some 40% of the land area of Canada, or roughly 4 million km².

For statistical and other purposes, the Canadian Arctic can be divided into three sections: the Inuit area of the Northwest Territories, Quebec and Labrador, the Dene/Métis area of the Northwest Territories, and the Yukon Territory. The Inuit area includes six regions: Labrador in Newfoundland;

Nunavik or Northern Quebec in Quebec; and Baffin, Keewatin, Kitikmeot, and the Inuvialuit Settlement Area of the Northwest Territories. Baffin, Keewatin, and Kitikmeot comprise the soon-to-be-created territory of Nunavut. Dene and Métis communities are located in the Fort Smith and Inuvik regions of the western Northwest Territories, within the northern extent of the treeline. The Yukon Territory includes 14 First Nations, and is treated as one region. Where significant, this section will note the main differences between conditions and patterns in each area.

5.3.2. Population

According to the 1991 Census, the Canadian Arctic had 92 985 residents, of whom 47 351 were indigenous (Figure 5-6).

5.3.2.1. Indigenous peoples

Three groups of indigenous peoples are recognized in the Canadian Constitution: the Inuit, the Métis, and the Indians, who in the Arctic include the Dene and the Yukon First Nations. This section will describe the Inuit of Labrador, Quebec, and the Northwest Territories; the Dene and Métis of the Northwest Territories; and the 14 First Nations of the Yukon Territory. The primary basis for these distinctions is the alliances formed in the land-claim process, which has been going on for over twenty years in northern Canada. These alliances tend to follow cultural, ethnic, and geographic boundaries, which form appropriate distinctions for the considerations in the following sections. In Labrador, there are also two Innu communities within the range of the Inuit communities, but these are not included in this discussion.

As seen in other indigenous populations throughout the country, the indigenous population of the Arctic is predominantly young. This is especially true of the Inuit population (Figure 5-7).

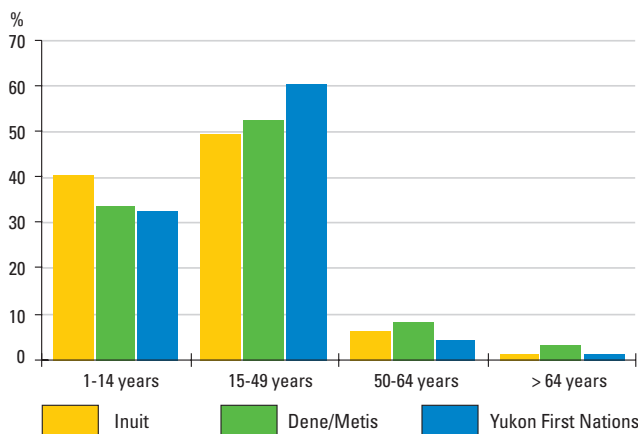


Figure 5-7. Age structure of the indigenous population of Arctic Canada, by ethnicity (Statistics Canada 1994, 1995).

The Inuit

The most northerly of the indigenous peoples of Canada are the Inuit, widely known as hunters of marine mammals, and still dependent on a wide range of indigenous foods from marine, terrestrial, and freshwater habitats. Inuit share a common language, with regional dialects.

In the six Inuit regions, there are 54 Inuit communities, the populations of which are between 41.9% and 98.9% indigenous. In all regions, the community which has the lowest percentage of Inuit is the community which is the administrative and commercial hub of the region and which therefore has the largest number of government and business employees posted there. This is an indirect indicator of the greater extent to which non-Inuit are employed in these activities.

Dene and Métis

There are 25 Dene and Métis communities in the western Northwest Territories. These communities are located within the Fort Smith Region and portions of the Inuvik Region. Non-indigenous residents compose 57.8% of the population of these communities. The indigenous residents total 12 780, including Dene and Métis as well as a small number of Inuit. The indigenous population of these communities, like other indigenous communities in Canada, is significantly younger than the general Canadian population.

The Dene cultural-linguistic groups in these two regions include the Chipewyan, Dogrib, Slavey, and Tetlit Gwich'in. The 9244 Dene counted in the 1991 Census make up 28.9% of the area's population.

The northern expansion of the fur trade during the 18th century, into what is now the Northwest Territories, led to the arrival of Cree-French Métis people. Many of the Métis voyageurs, who originally acted as guides during this period, stayed and allied themselves with local Dene groups. Currently, the Métis comprise approximately one-tenth of the total population of the Northwest Territories (Outcrop 1990). According to the 1991 Census, Métis comprised 11.7% of the region's population, or 3536 persons. This figure may be inaccurately low. The Métis Nation indicates that there are closer to 7000 Métis currently in the Northwest Territories (Bill Carpenter pers. comm.).

Yukon First Nations

There are fourteen First Nations within the Yukon, each with its designated historic and current harvesting territories. These fourteen individual First Nations are represented on a territorial basis by the Council for Yukon First Nations. The fourteen First Nations include eight linguistic and cultural areas within the Yukon. These are the Gwich'in, Han, Northern Tutchone, Upper Tanana, Southern Tutchone, Tagish, Tlingit, and Kaska.

5.3.2.2. Non-indigenous residents

Nearly half of the residents of the Canadian Arctic today are non-indigenous, and some have lived in the area for generations. These residents are more likely to live in the territorial and regional centers, such as Yellowknife, Whitehorse, and Iqaluit. Hunting and fishing are popular with many non-indigenous residents, but the patterns and extent of use are rarely as extensive as they are for indigenous peoples of the region. In terms of exposure to environmental contaminants, the risks faced by non-indigenous residents will be no higher than those faced by indigenous residents, and in most cases will be lower. Therefore, as with the section on Alaska, the following section concentrates primarily on describing the activities and lifestyles of the indigenous residents.

5.3.3. Hunting, fishing, and gathering

A wide range of plant and animal species are used in the Canadian Arctic. Figure 5-8 shows harvest levels of the resource categories used in each Inuit region and the Yukon Territory. Community-specific patterns vary according to custom and local availability of resources. While there is little detailed information on the harvesting activities of Dene and Métis, these regions have patterns of resource use distinct from those of Inuit and the Yukon First Nations. The most significant difference is the absence of marine mammals in the harvest of the Yukon and Dene/Métis regions, and the correspondingly higher reliance on terrestrial mammals and fish.

Within resource categories there are also distinct regional patterns. For example, seal make up three-quarters of the marine mammal harvest in the Baffin region, while in the Inuvialuit and Keewatin regions, beluga whale make up over half the marine mammal harvest. Terrestrial mammal harvests in the Inuit region are almost exclusively caribou, while in the Yukon, moose account for half the total in this category.

Land-use practices are based on the use of different traditional areas by family and extended family groups according to the season and the type of renewable resource harvested. Access to these areas was and is regulated by custom. In parts of the Baffin region, for example, it is customary for people who wish to enter an area traditionally used by another family to ask permission of that family prior to traveling in that area.

Harvesting practices are adapted to local and regional conditions. Contemporary technologies have been adapted to traditional ones, and innovations continue to be made. Guns are used for hunting, nets for fishing, and manufactured metal rakes for berry picking; but harpoons and spears are also used, and most people pick berries by hand without implements. Long-standing practices are often employed with the assistance of new technologies and materials. In the eastern Arctic, for example, one method of seal hunting involves approaching the seal on the ice using a blind made of cloth fabric rather than skins.

The harvest is shared among individuals on the basis of kinship and other ties. Sharing, gift-giving and exchange are all elements of the indigenous economy. In recent years, efforts have been made in some areas to promote inter-settlement trade in the north, in recognition of both long-standing exchange networks and the need to support local economies. Other attempts have been made, principally by Inuit, to commercialize specialty northern foods, such as Arctic char, outside of the Arctic.

Reliance on renewable resources is strong in the Canadian Arctic and subarctic. In 1989, total indigenous harvest levels in the Northwest Territories were estimated at about 5 million kilograms, exclusive of commercial fishing catches

Table 5-5. Harvesting and land-based activities by indigenous adults in Arctic Canada, by ethnicity (Statistics Canada 1994, 1995).

	Inuit	Dene/Métis	Yukon First Nations
Number of adults	16187	8355	2800
<i>Activity</i>			
Purchased fishing and hunting equipment in past 12 months	6295	2260	955
Lived on the land for some time in past 12 months	10295	3020	975
for 1-2 weeks	3305	955	125
3-4 weeks	2815	440	125
5-20 weeks	3250	760	175
>20 weeks	225	265	0
unspecified	290	75	15

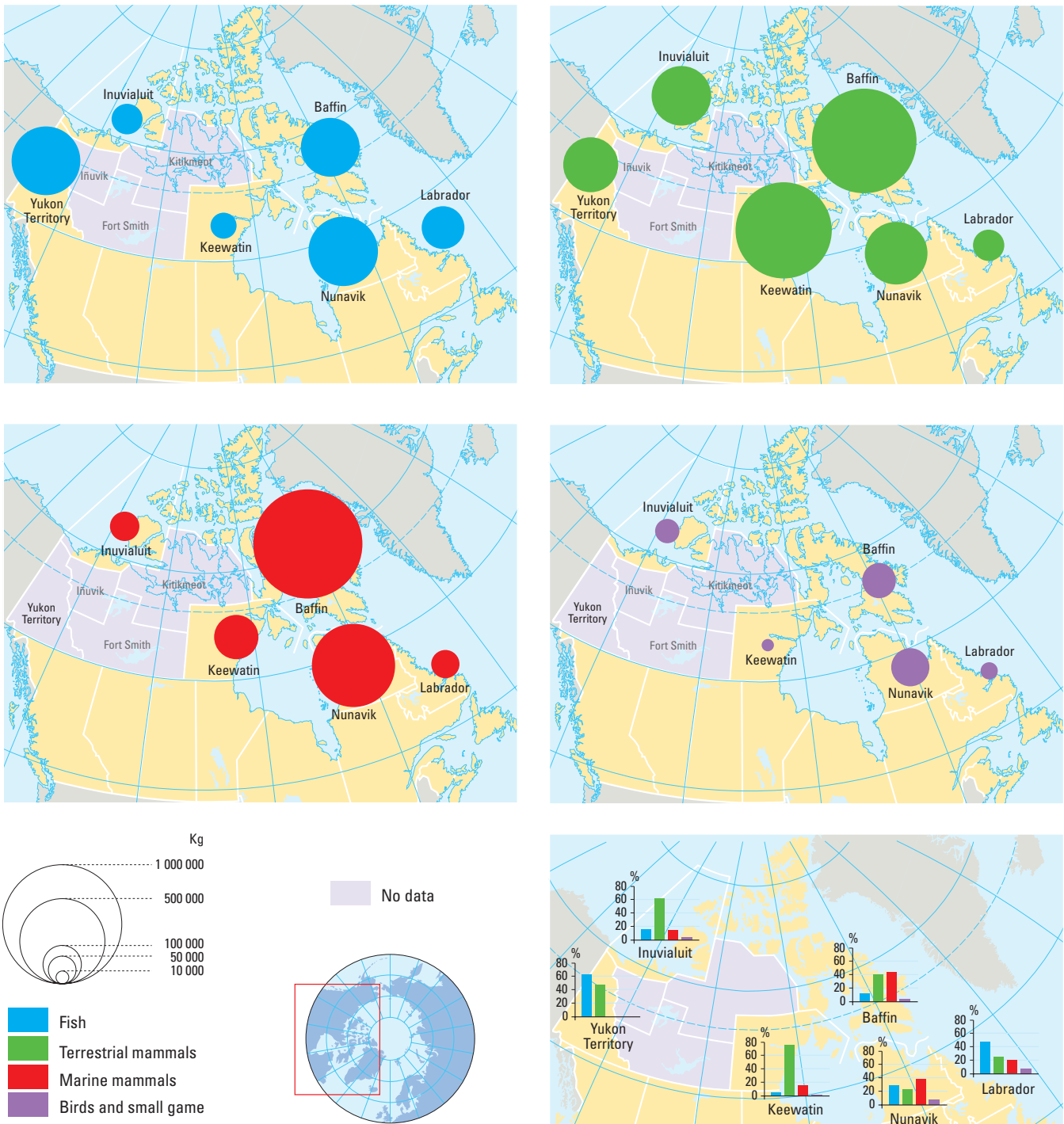


Figure 5-8. Annual indigenous subsistence production in Arctic Canada, by category, in total kg and percent of harvest (Usher 1986, Usher and Staples 1988, James Bay and Northern Quebec Native Harvesting Research Committee 1988, Weihs and Okalik 1989, Gamble 1987, Fabijan 1991).

(Usher and Wenzel 1989, Weihs *et al.* 1993). This is an average production of 232 kilograms per person per year.

Local harvest production represents a substantial contribution to the region's economy. The Inuvialuit, Dene and Métis harvest alone contributes the equivalent of over CDN\$ 3 million, or CDN\$ 1074 per capita (Weihs *et al.* 1993). Other regions of the Canadian Arctic produce even more than this.

Such extensive harvesting activities require participants to spend considerable time out on the land, and to make substantial investments in fishing and hunting equipment (Table 5.5). The results of these activities are similarly widespread, as many people obtain indigenous food either from their own activities or those of their family and friends (Statistics Canada 1995). These practices are similar across all regions.

5.3.4. Diet

Numerous studies in recent years have examined dietary patterns and trends in indigenous communities in the Canadian Arctic. These studies show a consistent pattern of widespread reliance on indigenous foods. Although store-bought foods are also common, nutrient analyses of indigenous foods show that these foods contribute significant portions of daily nutritional intakes (Kuhnlein *et al.* 1994, 1995a, 1995b, 1995c, 1996, Chan *et al.* 1995, Kuhnlein 1995, Morrison *et al.* 1995).

The consumption of indigenous foods is of significant benefit for three primary reasons: indigenous food is more nutritious than foods imported from southern Canada, which

generally have higher levels of sugar and saturated fats; cash resources are limited and indigenous food production is a more economical investment than the purchase of store-bought foods; and the sharing of indigenous foods is critical to the reinforcement of the social relationships which are central to the subsistence harvesting economy and to indigenous cultures.

Indigenous dietary patterns, like harvesting patterns, vary widely from individual to individual, community to community, region to region, and season to season (Wenzel 1991, Kuhnlein *et al.* 1995a, 1995c, 1996). Many foods are preserved by drying, smoking, freezing, pickling or fermenting, and immersion in oil, and so may be consumed in other seasons than those in which they were originally harvested. The following examples from the Inuit, Dene/Métis, and Yukon areas give an idea of the compositions and variations of indigenous diets.

In a dietary study of Inuit in Aklavik, Northwest Territories, for the period from autumn 1990 to summer 1991, Wein observed that caribou, beluga whale, hare, muskrat, whitefish, cisco, burbot, inconnu, Arctic char, ducks, geese, cloudberries, cranberries and blueberries were commonly used: over 50% of the households consumed these foods (Freeman *et al.* 1992). Wein used frequency of consumption rather than mass consumed to determine relative importance, and found that caribou was the single most frequently eaten species, and that the order of importance went from mammals down to fish, birds, and berries. Other plant foods, such as roots of *Hedysarum alpinum*, stems and leaves of *Rumex arcticus*, and willow buds (*Salix* spp.) were eaten much less frequently than berries (Freeman *et al.* 1992).

Wein also observed seasonal patterns in food utilization by people living in Aklavik. Berry picking and drying of caribou meat and fish take place in August; duck and geese hunting in September; caribou, Dall sheep, and moose hunting in August and September; and ice fishing after freeze-up in October. In November, trapping of fur-bearers begins and continues through the winter. Fishing with nets continues in January and February. Before ice break-up in April, muskrat are trapped for their pelts and are also eaten. Waterfowl return as the ice begins to open up in May and are used for food until they begin to nest. Fishing resumes after ice break-up. Spring is the time for gathering roots. Summer is whaling time and people travel out on the Yukon coast to hunt beluga. Willow tops, bird eggs, and wild rhubarb are sometimes gathered.

Among the Dene and Métis, food sample collections and dietary interviews were conducted for a dietary study in the communities of Fort Good Hope and Colville Lake from July to August 1988 (Kuhnlein 1991). For women in Fort Good Hope, the indigenous foods consumed in greatest quantity were moose in summer, barrenland caribou in winter, and duck in spring. Other important summer foods were inconnu, whitefish, cisco, and blueberries. In winter, the other important foods were moose, rabbit, whitefish, and loche. In spring, woodland caribou was the most important food. The men of Fort Good Hope had similar patterns of consumption for both the summer and winter seasons. In summer they ate mostly moose, inconnu, cisco, and whitefish, and in winter, barrenland caribou, moose, rabbit, whitefish, loche, and beaver.

Colville Lake women reported eating large quantities of whitefish, barrenland caribou, and ducks in summer. In spring they reported consuming high amounts of trout, barrenland caribou, duck, and loche. For women in the outpost camps, the most important foods were trout, rabbit, caribou, moose, and whitefish. Similar patterns of consumption

were found among Colville Lake men. Men in the outpost camps consumed less trout while barrenland caribou was consumed in the greatest quantities. Moose, whitefish, woodland caribou, and rabbit were also important (Kuhnlein 1991).

While individuals in Colville Lake and the outpost camps were found to consume much greater quantities of indigenous food than those in Fort Good Hope, other patterns of use were similar at all three research sites. In Fort Good Hope, Colville Lake, and the outpost camps, men were found to consume more indigenous food than women, and older adults (41-60 years) consumed more than younger adults (20-40 years) (Kuhnlein 1991).

The overall diet of the respondents included not only indigenous foods, but a significant amount of store-bought foods. The most frequently noted store-bought foods were: beverages (drink powders, sugar, evaporated milk, colas, whiteners), fats (lard, butter, margarine), bread items and potatoes, processed meats, and eggs. Frozen market meats used most often were pork chops and hamburger. Eggs were used often. Fruits and vegetables were used infrequently (Kuhnlein 1991).

A similar study of food consumption patterns and the use of indigenous food was carried out in the Dene/Métis community of Fort Smith, Northwest Territories and the predominantly indigenous community of Fort Chipewyan, Alberta, 240 km south of Fort Smith (Wein *et al.* 1991).

At the household level, the overall frequency of use of indigenous food was 319 occasions per year. Animal foods predominated with a heavy reliance on large mammals, especially moose and caribou, and fish, especially whitefish. Except for berries, plant foods were rarely used. Small mammals and birds were used occasionally.

Although young people were found to consume less indigenous food than their elders, other socioeconomic indicators such as employment status or education had no impact on the use of indigenous food. The factors most likely to influence the frequency of use of indigenous foods were the presence of a hunter, trapper, or fisherman in the household; age; and gender, as males consumed more indigenous food than females.

The study concluded that among the households surveyed, indigenous food was consumed 6 times per week. Individual consumption averaged 0.5 kg per week and individual indigenous food consumption occurred 4.2 times per week. On average, animal foods from the land constituted one-third of the total indigenous food consumed by individuals of all three generation groups studied.

An extensive study of the frequency of use of indigenous foods in four Yukon communities, carried out by Wein and Freeman (1995), provides a comprehensive picture of indigenous food use by Yukon First Nations. Study communities included Haines Junction, Old Crow, Teslin, and Whitehorse.

The study sample was composed of 40 randomly selected households in each of the four communities. A food frequency questionnaire based specifically on Yukon First Nations foods was developed for the study, with the assistance of eight elders and other leaders. The questionnaire listed over 70 species of animals, birds, fish, berries, and plants. Respondents were also asked to name species not on the original list. The respondents were asked to report the frequency of consumption by species and season, from fall 1991 to summer 1992.

In addition, 24-hour diet recall interviews were carried out on four separate days, one in each season, over the year from fall 1992 to summer 1993. About 80 species were used as food by the 122 households participating in the study. Of these, some were used by 'a very few households.'

All 122 households used at least one species of mammal and of fish, while virtually all (121) households used moose and salmon, berries, and other plant foods. Over 50 households used caribou, hare, ground squirrel, beaver, ducks, grouse, chinook salmon, sockeye salmon, coho salmon, whitefish, lake trout, Arctic grayling, low bush cranberries, crowberries, blueberries, and Labrador tea. The mean frequency of consumption of all traditional food species combined was about 409 times annually, or more than once daily. Mammals accounted for about half, fish about one-fifth, berries about one-fifth, other plants one-tenth, and birds one-twentieth (Wein and Freeman 1995).

5.3.5. Employment

Wage employment is generally scarce in indigenous communities and unemployment rates are believed to be higher than the 1991 census data shown in Table 5-6 would indicate, perhaps as a result of the structure of this question in this census. The high percentage of community residents not in the workforce is characteristic of northern indigenous communities. This pattern is primarily a result of the lack of employment opportunities in these communities.

Table 5-6. Employment status of indigenous persons in Arctic Canada, by ethnicity (Statistics Canada 1995).

	Inuit	Dene/Métis	Yukon First Nations
Employed	7490 (46%)	3715(48%)	no data
Unemployed	2310(14%)	1325(17%)	no data
Not in labor force	7595(47%)	3045(39%)	no data
Report other, unpaid activities	5795(35%)	2075(27%)	835(31%)

Although most residents seek out wage employment when it is available within their community, the limited availability of employment for most residents means that it is sporadic and short-term. At the same time, the number of residents who continue to engage in harvesting activities remains high. For those who are only marginally employed, wage employment provides the cash required to engage in harvesting activities. Those with full-time employment, however, also continue to engage in harvesting activities even though they may have to adjust the pattern of their harvesting activities in keeping with the demands of wage employment.

The distribution of employment by sector in the Inuit communities is an indicator of the distribution overall in the Canadian Arctic. In 1994, government was the largest single employer within these communities, providing 31.6% of all jobs. Education and health services provided an additional 12.7%. The private sector generated 39% of all jobs in the transportation and communications, retail and wholesale, construction, and accommodation sectors. Resource-related sectors such as agriculture, logging, and fishing accounted for only 2% of jobs, while the mining sector provided 6% of the employment in these communities (Statistics Canada 1995).

Table 5-7. Total income for indigenous and all adults in Arctic Canada, by income bracket, by ethnicity and place of residence, 1990 (Canadian dollars) (Statistics Canada 1994, 1995)

Total income (all sources)	Indigenous Adults			All adults		
	Inuit	Dene/Métis	Yukon First Nations	NW Territories	Yukon Territory	Canada
<\$10000	58%	53%	50%	32%	23%	28%
\$10000-19999	19%	20%	29%	18%	20%	24%
\$20000-39999	16%	18%	19%	24%	31%	31%
>\$40000	6%	9%	2%	27%	25%	17%

Table 5-7 shows the distribution of indigenous and all adults by income level. These indicate that income levels for indigenous persons are much lower than the territorial and national averages. Many indigenous households are below the Canadian poverty line.

5.3.6. Housing

In most communities, housing is limited and the supply is below the demand. The average number of occupants per dwelling ranged from 2.9 in the Yukon Territory to 5.3 in the Baffin region. The average persons-per-room ranged from 0.5 in the Yukon to over 1 in the Baffin region, and as high as 1.7 in the Dene/Métis community of Snare Lake. Although the housing situation in the Yukon is considerably better than for other regions of the Canadian Arctic, these figures are still higher than the Canadian average of 0.4 persons per room. It is thus no surprise that many people are on waiting lists for housing.

Although census data indicate that most houses have indoor bathroom facilities, other sources reveal that in many communities residents bag their human wastes which are collected by truck and disposed of in a surface dump or lake (the so-called 'honey-bucket' system) (Outcrop 1990). While the bathroom may be indoors, the sewage disposal system may not be, and the census question may have misled respondents. Southern-style municipal water and sewage treatment systems have been introduced in some communities, but elsewhere, facilities are basic. Drinking water is often obtained from surface waters such as rivers and lakes by the truck load (in winter, ice is used) and delivered to holding tanks in the houses. Many residents obtain their own water from surface sources (Statistics Canada 1994, 1995).

5.3.7. Education

Table 5-8 shows the educational attainments of indigenous residents of Arctic Canada. Nationwide, additional Arctic Canada indigenous persons have graduated from university, but at the time of the census were living, working, or traveling outside the Arctic.

Table 5-8. Highest education level attained by indigenous persons aged 15-49 in Arctic Canada, by ethnicity (Statistics Canada 1994, 1995).

Education Level	Inuit	Dene/Métis	Yukon First Nations
No formal schooling	470	35	0
1-8 years	5240	1680	15
Secondary level	4640	1945	1175
Some post-secondary	1595	585	430
Certificate/Diploma	1895	840	555
University degree	0	5	0

The small number of university graduates may reflect the fact that there are no universities in the Canadian Arctic. Four times as many Inuit have obtained non-university post-secondary educational certificates (excluding trades certification) as have graduated from university. Job training programs and community college programs offered by Arctic College, Yukon College, or southern colleges are alternatives to university programs.

5.3.8. Language

Indigenous languages remain widely used in the Canadian Arctic. Among Inuit, the 1991 Census reported that of 21 355 Inuit in the Northwest Territories, 13 495 reported

Inuktitut as their home language, and 4325 reported knowledge of neither French nor English. In the Dene/Métis and Yukon regions, the patterns are similar.

5.3.9. Mortality and morbidity

Life expectancies for the combined indigenous and non-indigenous population in the Yukon and Northwest Territories are below the Canadian average. Male life expectancy is 71.9 years in the north, and 74.6 years nationwide. Female life expectancy is 75.9 years in the north, and 80.9 years nationwide. The northern figures have been rising more quickly, however. The life expectancy of Inuit in 1941-42 was 29 years, and had more than doubled by 1978-82, when it reached 66 years (Young 1994).

Infant mortality rates are also higher in the north, but improving rapidly. In the Northwest Territories, for the period 1961-66, the rate was 144 per 1000, compared with 26 per 1000 for Canadians as a whole. In 1981-85, the rate for Northwest Territories Inuit was 28 per 1000, compared with 9 per 1000 for all of Canada (Young 1994).

Cancer patterns in the Canadian Arctic differ from those for the country as a whole. For females in the Northwest Territories, breast cancers occur at two thirds the national rate. This has been attributed to differences in breast feeding practices and in diet. Cervical and ovarian cancer, however, were more common among women in the Northwest Territories than for women in Canada as a whole. For males in the Northwest Territories, lung cancer was more common (30% of cancers) than in men nationwide (19%), but prostate cancer was less common (6% compared with 14%). These differences have been largely attributed to the patterns for Inuit and Dene rather than to the patterns for non-indigenous Arctic residents (Freitag *et al.* 1990).

One of the benefits of the continued reliance of an indigenous-food diet appears to be a reduced risk of certain other health problems. Indigenous groups in the Canadian Arctic have among the lowest age-standardized prevalence of diabetes in the country. Diabetes is one of the more prominent health risks associated with acculturation.

One of the more serious threats to human health among indigenous communities is the extremely high prevalence of smoking (Statistics Canada 1995). A 1987 study of smoking behavior among students in the Northwest Territories found 'exceedingly high' rates among indigenous youths. By age 19, 63% of Indian youths were current smokers as compared with only 43% of non-indigenous youths (Young 1994).

Given the current level of smoking among indigenous adults, and the apparent trend in smoking among young people, smoking is and will continue to be a major health risk in these communities. Smoking is believed to be the most likely explanation for the apparent increase in lung cancer among Inuit in the Northwest Territories between 1980-84 (Freitag *et al.* 1990). Smoking must also be considered as a potentially confounding variable in health studies related to contaminant exposures among Inuit and Dene.

5.3.10. Health care

The improvements in health among Inuit are attributable in part to better medical health care. In the 1950s, nursing stations were created by the federal government in many communities, providing the first regular access to western-style medical care for most Inuit. These nursing stations are now managed by the territorial and provincial governments, sometimes in cooperation with Inuit agencies created under land claims or public governmental agreements.

Hospital facilities are centralized in major cities; people frequently travel from northern communities to Edmonton, Winnipeg, Ottawa, Montreal, and Yellowknife for medical treatment. Traveling clinics make regular visits to communities to provide specialized health care services which are not locally or regionally available.

5.4. Denmark: Greenland

5.4.1. Geography

The Greenlandic name for Greenland is Kalaallit Nunaat, 'Land of the Greenlanders.' Covering nearly 2.2 million km², Greenland is the world's largest island, and is one of the three countries (with Denmark and the Faeroe Islands) within the Kingdom of Denmark. Two of the 179 members of the Danish Parliament come from Greenland.

Internally, Greenland is governed by the Home Rule, a parliamentary democracy with 31 seats and headed by a premier. The Home Rule can assume responsibility for all matters except foreign and security policy, the monetary system, mineral and hydrocarbon exploration and exploitation, and some aspects of the judicial system. In 1992, the Home Rule assumed the last of its potential fields, the health care system.

5.4.2. Population

Kalaallit (plural of Kalaalleq) is the collective name of Greenland's indigenous peoples, who are Inuit and belong to three groups, the Kitaamiut (the West Greenlanders), the Tunumiut (the East Greenlanders), and the Inughuit (or 'Polar Eskimos' in North Greenland). There are approximately four Tunumiut and fifty Kitaamiut to each Inughuit (Fægteborg 1995-96).

On January 1, 1994, the total population of Greenland was 55 419. Of these, 48 029 were born in Greenland and 7390 were born elsewhere, most in Denmark. The indigenous population had 23 538 females and 24 491 males. The non-indigenous population had 2257 females and 5133 males. The distribution and composition of Greenland's population as of January 1, 1994 is shown in Figure 5-9.

The country is divided into 18 municipalities. Fifteen are in West Greenland, one in North Greenland, and two in East Greenland. None of the municipalities is landlocked. Each municipality consists of an administrative town and a number of villages and small settlements.

Of the 48 029 native-born Greenlanders, 38 186 lived in the towns and 9587 lived in the villages. The remaining 256 persons lived at radio and weather stations and other such outposts. The Danish population primarily lived in the towns, with only 224 living in the villages.

In 1994, Nuuk, the capital and largest city of Greenland, had 12 935 inhabitants. Nuuk also has the largest number of non-indigenous inhabitants.

5.4.3. Hunting, fishing, and gathering

Approximately 20% of the population is directly or indirectly dependent on hunting activities. The majority of these live in the five hunting municipalities. Both professional and nonprofessional hunters and fishermen must obtain a game license. Professional hunters and fishermen are those whose primary occupation is hunting and fishing. Workers unemployed more than 125 days per year, senior citizens, and institutions where hunting is a primary element of the educational or economic program, can also obtain professional game licenses.

The most important resources for the hunters are ringed seal and harp seal, but a wide variety of other species are

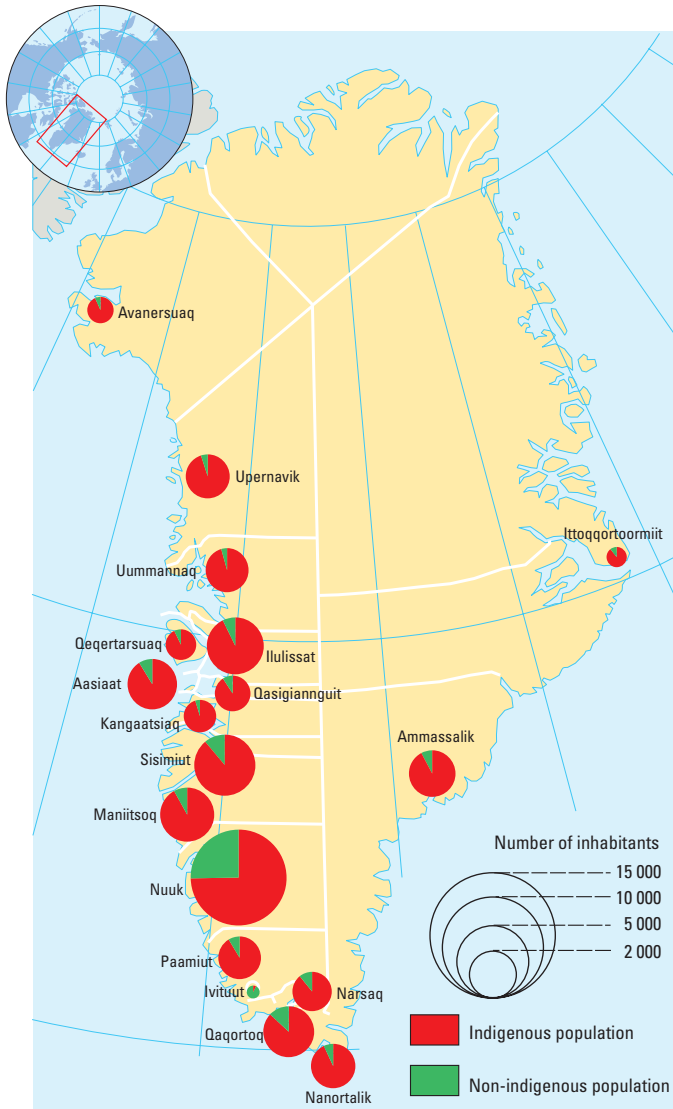


Figure 5·9. Total and indigenous populations of Greenland, by municipality, 1994 (Opgørelser fra Grønlands Statistiske Kontor 1994).

taken. Whaling is part of the hunting tradition and still has great importance to the Greenlandic society. In International Whaling Commission (IWC) terminology, Greenland's whaling is Aboriginal Subsistence Whaling, satisfying the local subsistence need. Neither the fin whale nor the minke whale, the two species taken in accordance with IWC regulations and quotas, is an endangered species. Small cetaceans like the narwhal and the beluga are not under IWC authority, but hunting is regulated nationally and bilaterally with Canada.

Hunting and fishing practices differ from location to location. Traditional hunting methods are rare outside of Avanersuaq, where kayak and harpoon are still in use, especially in connection with the narwhal hunt. Generally, hunters use modern hunting equipment such as rifles, dinghies, and speedboats. There are three categories of fishermen. The seagoing fishing fleet consists of boats larger than 80 gross tons, the coastal fishing fleet has boats from five to 75 gross tons, and dinghies are less than five tons.

The areas and species used for hunting and fishing vary by location and season. In some areas, hunters have to travel far to harvest certain resources. For example, caribou are usually hunted in August and September in the deep fjord areas far from the villages. Other resources like certain seals, fish, and birds may be available close to the village or town. Walrus, minke whales, and fin whales may only be available at sea or in the mouths of the fjords. Polar bear are hunted regularly in Avanersuaq, Ittoqqortoormiit, and Ammassalik.

In the south of West Greenland, polar bear are only taken occasionally, and in central West Greenland very rarely. Figure 5·10 shows similarities and differences in seasonal hunting patterns between two West Greenland communities, Ike-rasaarsuk and Qeqertarsuaq, approximately 130 km apart.

While sharing of subsistence foods today is usually limited to participants of a certain hunt, hunters and small fisherman engage in three types of trade: selling to the local processing plant, selling at the local outdoor market (*brædtet* or *kalaalimineerniarfik*), and selling to institutions, shops, and other commercial concerns. Within the fishing industry all products are sold to the major processing plants.

Food sold at the *brædtet* varies throughout the country. In Qeqertarsuaq, the products sold from September 1989 to July 1990 were various fish (26%), seal meat (22%), beluga and narwhal meat (14%), caribou meat (14%), various birds (9%), minke whale meat (8%), and berries and other plants (6%) (Caulfield 1991). This practice, which has evolved since the 18th century, is promoted by the Greenland Home Rule government as a means to provide nutritious food and sustainable economic opportunities for local hunters (Marquardt and Caulfield 1996).

5.4.4. Diet

A survey in the spring of 1994 indicates that 90% of hunters and small fishermen consume their own products: 44% eat them daily; 13%, three to four times a week; 15%, one or two times a week; and the remaining 28%, less often. For the Inuit population as a whole, 31% eat local products (Inuit foods) daily; 22%, three to four times a week; 25%, at least one or two times per week; and 22% eat Inuit foods less often (Skydsbjerg 1994). Another 1994 survey based on 1728 interviews indicates that 63% of village residents eat Inuit foods daily during summer. In the towns, 26% ate Inuit foods this often (Bjerregaard *et al.* 1995).

In south Greenland, sheep farming provides a local supply of lamb meat. The demand is greater than the yearly production, however, and lamb meat is imported from Iceland and New Zealand. Beef, pork, and chicken are imported from Denmark.

Most Greenlanders believe that Inuit food has great importance for their health and well-being. The types of foods eaten depends on their availability. Certain foods, like seal meat, are available throughout the year. Berries, in contrast, are available only in August, September, and October (see Figure 5·10). One study found that the three Inuit foods considered most delicious are *mattak* (skin and blubber of whales), dried cod, and thick-billed murre.

Among hunter families in West Greenland and East Greenland, the preparation of food, including the flensing of seals, is usually performed by the women. In North Greenland, men flense the seals. Inuit foods are still mostly prepared in the traditional way by being boiled. Among the younger generation, many European cooking traditions have been accepted. Although extremely expensive, vegetables are often served as part of a traditional dinner.

While cold storage plants are found in most of the villages, traditional food storage practices continue in some villages. In the towns, almost every private home has its own deep freezer.

5.4.5. Employment

In the villages, 45% of the male residents are hunters and fishermen. In the towns, only 19% are thus employed. Of the work force, including men and women, 14% are directly

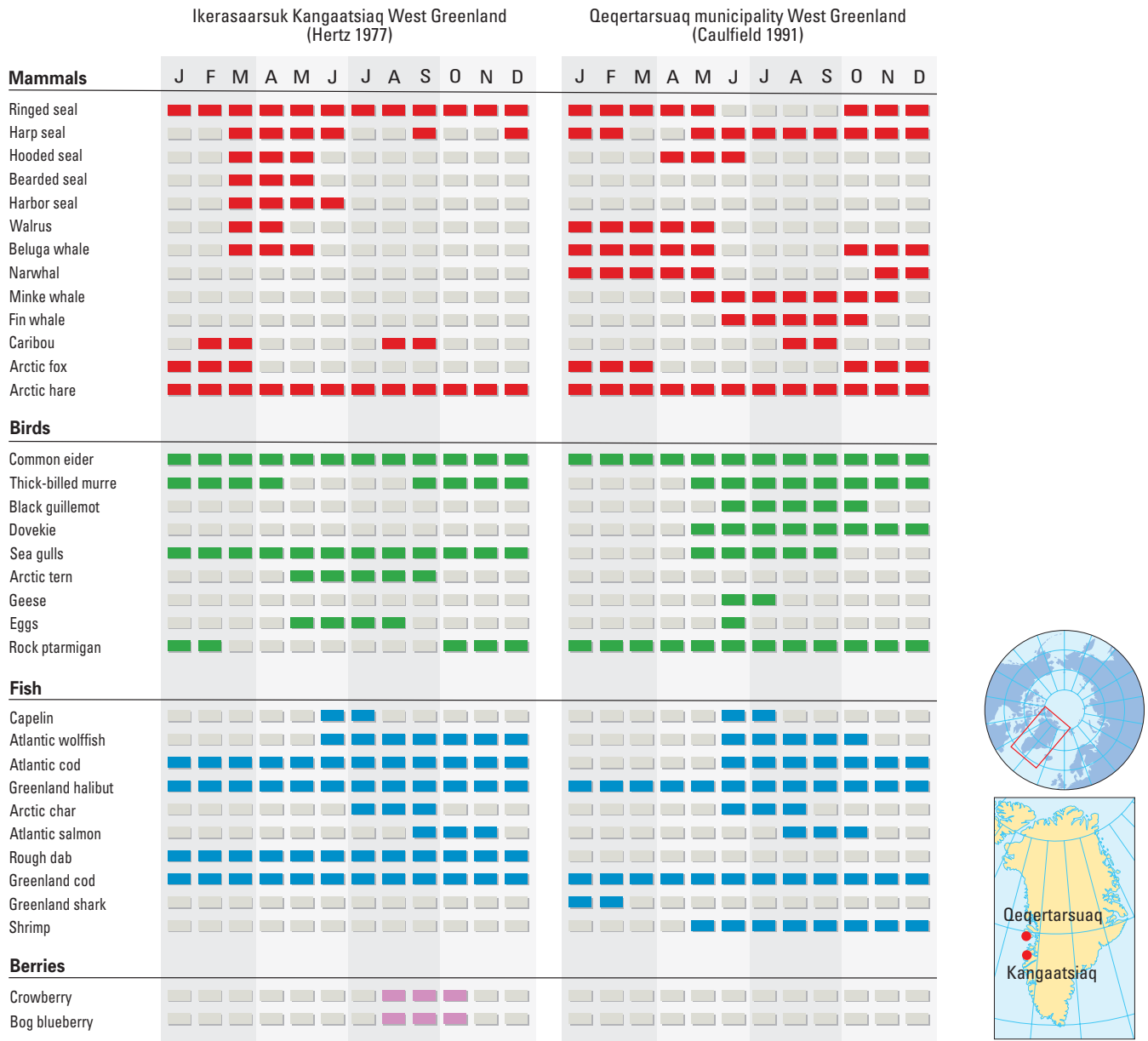


Figure 5-10. Seasonal resource utilization patterns, by month, for two communities in West Greenland.

involved in hunting and fishing activities, 3% are self-employed, and the remaining 83% are wage earners.

Approximately 65% of all wage earners are employed in the public sector. This high percentage is due in part to the fact that a major portion of the commercial fishing industry, transportation, technical plants, and commercial warehouses are owned by the Home Rule Government. The Home Rule Government has announced that these industries will be transformed into joint stock companies with private and public capital. Of public employees, 17% are non-indigenous, as are the majority of high-range clerks.

At present, no exploitation of mineral resources is taking place in Greenland. The last mining activity stopped in 1990, when the lead-zinc mine at Maarmorilik was exhausted. In North Greenland, a known resource of zinc may bring mining back to Greenland. Though there are known reserves of gold, platinum, uranium, oil, and iron, it has not yet been economically or ecologically prudent to develop them.

In 1991, the total labor force was 33 313 persons, with an average income of DKK 130 475. However, there are considerable discrepancies between the incomes of persons born in Greenland and those born elsewhere, and between residents of the towns and those of the villages. Persons born

in Greenland are more likely to have lower incomes than persons born elsewhere, and residents of towns are more likely to have higher incomes than residents of villages.

5.4.6. Housing

A combination of the Arctic climate and high transportation costs makes housing very expensive in Greenland. As a result, there is a chronic housing shortage. For Greenland as a whole, the average persons-per-room is over 1; in the Ittoq-qortoormiit municipality, the figure is 1.4. In the larger towns, large apartment houses were built in the 1960s and in the 1970s. Recent construction has favored row houses and single-family houses. In the smaller towns, apartment houses are uncommon. In the villages, most residences are small single-family houses.

5.4.7. Education

Schools are run at the municipality level, in accordance with policies established by the Home Rule Government. The school system consists of a preparation class (1st grade), a basic school (2nd to 9th grade), a continuation school (10th

and 11th grade), and a course class (12th grade). School attendance is compulsory for nine years. Most schools are able to offer this, but in certain villages, the children are sent to boarding schools in the towns to complete their education. For further education, there is a wide range of vocational training available throughout Greenland. University preparatory schools exist in Aasiaat, Nuuk, and Qaqortoq. Nuuk has both a teacher-training college and a university. Education levels in Greenland are shown in Table 5-9.

Table 5-9. Education levels in Greenland, by birthplace, gender, and age, by percent of adult population (Skydsbjerg 1994).

	<7 years school attendance	7-9 years (general education)	9-12 years (extended education)	University preparatory school
Total population	23	58	12	7
<i>Birthplace</i>				
Greenland	26	62	9	3
Denmark	3	29	32	36
<i>Greenland-born</i>				
Males	26	65	6	3
Females	26	60	11	3
Age 18-29	9	74	11	6
30-39	22	66	10	2
40-49	31	56	11	2
50-59	50	47	2	1
60+	55	41	4	0

5.4.8. Language

The Greenlandic language is called Kalaallisut and is an Inuit (East Eskimo) language with several local dialects. Kalaallisut is spoken throughout West Greenland. The Tunumiut and the Inughuit speak dialects that differ from Kalaallisut, though neither is a written language. Kalaallisut is the official language of Greenland, but in accordance with the Home Rule agreement, Danish must be taught in the schools. In all official matters, both languages are used. In schools and churches, in administrative matters, on radio and television, and in the newspaper, Kalaallisut is used.

5.4.9. Mortality and morbidity

The average lifespan in Greenland (1986-1990) was 68.4 years for women, and 60.7 years for men. This is substantially lower than life expectancy in Denmark, and is of concern since it has remained stagnant for decades. Mortality from accidents and suicides is high in both sexes, but highest in young men. The suicide rate is increasing. Mortality from ischemic heart disease is lower than in Denmark, while mortality from strokes is higher. Among cancers, the incidence and mortality of lung and other tobacco-related cancers is very high.

Infant mortality has been decreasing steadily for more than 40 years, but is still considerably higher than in Denmark. Due to the small population, the rate fluctuates annually, but during the 1990s has been around 25 per 1000 live births. Regional variations are high, with lowest infant mortality in Nuuk and other towns and villages on the central west coast, and much higher rates in remote municipalities and villages.

In spite of local outbreaks, infectious diseases such as AIDS and tuberculosis seem to be under control. Meningitis and hepatitis B are relatively common.

Smoking is common in Greenland, for both sexes and among all age groups. A recent survey found that 82% of Inuit men and 78% of Inuit women are currently smokers. In the Disko Bay area, 62-70% of pregnant women smoke (Bjerregaard *et al.* 1995).

Alcohol abuse and marijuana smoking are considered major social and health problems, largely due to their high prevalence. Other illegal drug use is minimal.

5.4.10. Health care

The health care system today is organized in 17 medical districts (the 18 municipalities except Ivittuut, which is served by the naval hospital). Each district has a small hospital. The sole exception is Kangaatsiaq, which has only primary health care, and so patients who need hospital facilities are transported to the hospital in Aasiaat. An outpatient clinic connected with each hospital provides primary health care, which constitutes the majority of work in the medical districts. The medical service in each district also includes health care in the villages.

The Nuuk hospital offers some degree of specialization and serves as the central hospital for the whole country. Patients who cannot be treated here are referred to the University Hospital in Copenhagen. All treatment, whether outpatient or in hospital, is free. Prescribed medicine is free, and so are most medical appliances. There are no private practices in Greenland.

5.5. Iceland

5.5.1 Geography

Iceland is the second largest island in Europe, and is located in the North Atlantic just south of the Arctic Circle. The total area of the country is 103 000 km², all of which is considered to be in the Arctic.

According to the Book of Settlement (1972), Iceland was settled by pagan Norse between the years 874 and 930. Iceland was thus the last European country to be settled. Early on, law and order were established in the country and in 930, the Althing (General Assembly) was formed. Its establishment inaugurated the Icelandic Commonwealth (Lindal 1974, Njardvik 1978), a republic which lasted until 1262 when Iceland came under Norwegian rule. In the late fourteenth century, Iceland came under Danish rule and this colonization lasted until 1904 when Iceland gained home rule. In 1944, Iceland declared itself independent of Denmark, establishing the Republic of Iceland (Rosenblad and Sigurdardottir-Rosenblad 1993).

Today Iceland is a republic with a parliamentary government. A president serves as head of state. Since 1987, the Althing has had 63 members, elected by a system of proportional representation.

5.5.2. Population

Icelanders are both of Norwegian and Celtic origin. Scholars disagree about the Celtic strain in the Icelandic peoples. However, evidence from physical anthropology and comparisons of blood groups indicate this affiliation (Steffensen 1975, Sigurdsson 1988).

Iceland is the most sparsely populated country in Europe with an average of 2.4 inhabitants per km². On December 1, 1994, the total population of Iceland was 266 783, of whom 133 781 were males and 133 002 females (Figure 5-11). In 1880, there were only three towns in Iceland, where 5% of the population lived. By 1991, there were 31 towns of 1000 inhabitants or more, and by 1994, 91.5% of the population lived in towns or villages of more than 200 people, while 8.5% lived in rural districts. This pattern is similar to that of other industrialized countries and in the future it is estimated that most Icelanders will live in the greater Reykjavik area.

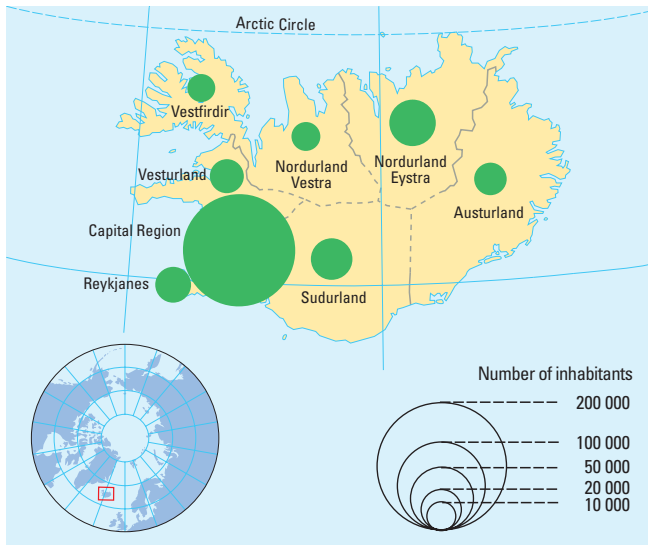


Figure 5-11. Population of Iceland, by geographic division, 1994 (based on administrative districts as of July 1, 1995) (Statistics Iceland, monthly statistics).

Compared with neighboring countries, Iceland's population is young. In 1994, 10.8% of the population was 65 years old or older, and 24.8% was 15 years old or younger.

The Icelandic population is culturally and socially homogeneous. There has been little immigration to Iceland, and no coherent minority groups have formed. In 1994, the number of citizens from foreign countries totaled 4715, mostly from Scandinavia and other European countries. In recent years, other nationalities have immigrated, some as political refugees.

Iceland's infrastructure is similar to that of other Scandinavian countries. It consists of an extensive welfare system, practically free education, health services with nominal fees, a social security system, and a national pension plan. Due to the economic recession of recent years, some of the welfare services have been limited or fees have been introduced, mainly in the health sector.

5.5.3. Diet

The Icelandic diet is typically western in most respects. Nevertheless, it retains some characteristics of a subarctic region. Fish, meat, and milk are traditionally the main foods produced in Iceland and this local production affects what people consume. Icelanders consume more fish than any other nation in Europe (73 g/day/person) and foods of animal origin are a large component of the Icelandic diet. Young people consume the least amount of fish while people over fifty consume the most (Steingrimsdottir *et al.* 1991). Except for occasional barley and oat cultivation, grains and fruits are not grown on Iceland, and vegetable production is mostly limited to potatoes and greenhouse plants. Consequently, Icelanders eat fewer vegetables than most European countries, even though the economy allows substantial import of various foods. The diet of Icelanders is unusually rich in protein (17.4%) and fat (41%). Unlike trends in many other western countries, this is not entirely a modern development since the Icelandic diet has always had some of these characteristics (Steingrimsdottir 1993).

5.5.4. Employment

The gross domestic product per capita and the living standard are similar to those of other Nordic countries. However, during the last few years a lack of real growth in the

economy has affected government revenue. Iceland has not escaped the global trend toward higher unemployment. In September 1995, unemployment was recorded at 3.6%, continuing an upward trend since the mid-1980s (Statistics Iceland 1995). However, it is not uncommon for one person to hold two or three jobs. International statistics show that the Icelandic population has been willing to supply more labor per capita, averaging 46.6 hours work per week in 1994, than is customary in other countries with similar income.

The Icelandic economy has undergone rapid restructuring since the end of the nineteenth century. Within a period of a few decades, the country was transformed from a traditional farming economy to an industrialized market economy. The move away from low-productivity agriculture into a modern, diversified society was led by the fishing industry (Jonsen 1984, Snaevarr 1993a).

At present, the fisheries are the cornerstone of the economy. Fish and fish products constitute about 80% of Iceland's export industry and account for about 25% of gross national product. The total Icelandic fisheries catch in 1994 was 1.5 million tonnes. Despite its overwhelming importance, the fisheries sector employs only 11.6% of the workforce, 4.7% in fishing and 6.9% in processing.

For decades cod has been the single most important seafood species, accounting in recent years for some 40% of the fisheries sector's export revenues. Other important species are redfish, saithe, shrimp, and haddock, together with Greenland halibut, ocean catfish, scallops, Norway lobster, capelin, and herring. The most important fishing gear types are bottom trawl, gillnets, long line, and purse seine (Arnasen 1995). The Icelandic fishing fleet is among the best equipped in the world. It has around 1000 vessels, including 100 stern trawlers. Increasingly, fish processing has been shifting from land-based facilities to freezer-trawlers.

About 5% of the work force is employed in the agricultural sector. Overproduction has been a great problem in agriculture for decades. Thus, quota systems are in force for milk and some other products (Sigthorsson 1987, Snaevarr 1993b). Cultivated areas in Iceland cover only 1% of the country. Agriculture in Iceland is based mainly on grass cultivation and animal husbandry. Sheep and dairy cattle are the main livestock. Reindeer live wild in the highlands in the east of the country and are hunted during restricted periods in the autumn.

In recent decades, barley and oats have been grown on experimental farms in the south of Iceland with fairly good success. Potatoes and turnips are also grown and there is extensive greenhouse cultivation of tomatoes, cucumbers, and flowers in areas with geothermal energy supplies.

Around 17.5% of the Icelandic work force is employed in manufacturing industries, including the 6.9% in fish processing mentioned above (Snaevarr 1993c). Other industries include manufacture of woolen goods, fishing equipment and computer software, and biotechnology (Rosenblad and Sigurdardottir-Rosenblad 1993).

Iceland has vast hydropower and geothermal energy reserves, which are used for electricity and heating, and in energy-intensive industries such as fertilizer production and aluminum smelting. All towns, villages, and farms receive electricity from public supply utilities, and the National Power Company has built all of the largest hydropower stations in the country. Geothermal energy is mainly used to heat houses and the majority of the Icelandic population (86%) make use of geothermal space heating (Ragnarsson 1995). Houses in Reykjavík, and in a dozen other towns, are heated with natural water from hot springs. Due to its inexpensive, renewable, and pollution-free energy sources, Iceland has become an increasingly competitive and desirable location for foreign industrial ventures.

Table 5-10. The ten most common causes of death in Iceland, by category (with ICD-9 codes), per thousand, 1991 and 1992 (Directorate General of Public Health, unpubl. data).

Category	1991			1992		
	Total deaths	per thousand deaths	per thousand of population	Total deaths	per thousand deaths	per thousand of population
Heart diseases (391, 392.0, 393-398, 402, 404, 410-416, 420-429)	604	336.3	2.34	573	333.3	2.19
Cancer (140-208, 230-234)	446	248.3	1.73	429	249.6	1.64
Cerebrovascular diseases (430-438)	176	98.0	0.68	148	86.1	0.57
Injury and Poisoning (800-999)	121	67.4	0.47	136	79.1	0.52
Pneumonia and Influenza (480-486)	116	64.6	0.45	106	61.7	0.41
Diabetes mellitus (250)	18	10.0	0.07	–	–	–
Chronic bronchitis (491)	18	10.0	0.07	20	11.6	0.08
Emphysema (492)	16	8.9	0.06	35	20.4	0.13
Sudden death. cause unknown (798)	16	8.9	0.06	–	–	–
Parkinson's disease (332)	14	7.8	0.05	–	–	–
Other diseases of upper respiratory tract (478)	–	–	–	23	13.4	0.09
Congenital Anomalies (741-759)	–	–	–	16	9.3	0.06
Atherosclerosis (440)	–	–	–	14	8.1	0.05
Other unspecified	251	139.8	0.97	219	127.4	0.84

– indicates no data

5.5.5. Housing

Icelanders spend a greater proportion of their income on housing than do citizens of neighboring countries. Thus, housing in Iceland is of a very high standard. The housing stock is both relatively new, solidly built, and spacious (average size of about 120 m²). Most houses are well insulated with double-glazed windows. The climate makes such housing desirable, since Icelanders spend a lot of time at home, especially during the long winter months (Gislason 1973).

Around 63% of Icelandic families live in dwellings which contain more than one room per family member (excluding kitchen and living-room), and have an average size of 48 m² per inhabitant. As a comparison, the corresponding figures for Norway, Sweden, and Finland are 50%, 37%, and 18%. Another special feature of the Icelandic housing situation is the very high owner-occupant ratio. A recent study indicates that around 84% of people in the 25-70 years age group own their dwellings (Ministry for Foreign Affairs 1995).

5.5.6. Education

The Icelandic school system is mainly based on the Primary School Act of 1974 and is similar to that in the other Nordic countries. School attendance is compulsory between the ages seven and sixteen. Admission at the age of six has, however, become a standard. The upper secondary level covers the ages sixteen to twenty years, and after that students can further their studies at universities or other institutions of higher learning, within the country or abroad. There are two universities in the country, one in the capital and a smaller one in Akureyri which mainly offers industry-related subjects, such as fisheries and management.

There are no charges to students for compulsory schooling. At upper secondary level there is a small enrollment fee, and comparatively low registration fees are payable at the universities and state-run colleges. There are only a few private schools in the country and they charge tuition fees. Students attending university or college, both in Iceland and abroad, are eligible for educational loans from the Government's Student Loan Fund. Many students seek M.A. and Ph.D. degrees in foreign universities, mostly in Scandinavia, Great Britain, and the United States.

The enrollment rate for the 6-23 age cohort is 81%, and in 1992 persons aged 25 and older had an average of 9.2 years of schooling (Josepsson 1987, Ministry for Foreign Affairs 1995).

5.5.7. Language

Icelandic is the national language, and has always been an important focus for Icelandic culture and society. It is thought to have changed very little from the original tongue spoken by the Norse settlers. The Icelandic language lacks distinct dialects and has two unique letters of its own (Rosenblad and Sigurdardottir-Rosenblad 1993). Outside Iceland there are only a few thousand people who speak Icelandic, mostly as a result of past emigration to Canada, the United States, Sweden, Denmark and Belgium.

Much effort is put into preserving the language and preventing too much foreign language influence. Danish is the second language taught at school and English the third, however Icelanders prefer to speak English to Danish, even when they travel to the Scandinavian countries.

5.5.8. Mortality and morbidity

Iceland has higher fertility rates than most Nordic countries, at 2.143% in 1994 (Bender 1994). However, the birth rate has declined sharply in recent years and seems to be stabilizing around 17-18 per 1000. With a life expectancy of 77.8 years, Icelanders have the prospect of a lifespan longer than that enjoyed in most other countries. The maternal mortality rate is 2 per 100 000 live births, and infant mortality is 6.0 per 1000 live births.

The older generation now living in Iceland has experienced a tremendous change in general health. In 1910, infectious diseases caused the most mortality, and until the 1930s tuberculosis was one of the biggest killers in Iceland. Today, lifestyle related diseases, such as cancer and cardiovascular disease, are the biggest killers (Table 5-10). AIDS is on the rise: through November 1995, a total of 91 cases of HIV-infected individuals had been reported. A total of 29 individuals have died of AIDS in Iceland (Olafsson and Briem 1995).

Other social problems familiar in the western world are on the rise in Iceland, such as drug abuse, especially among young people, thefts, and violent crimes. The greatest social ailment is probably alcoholism, and considerable amounts of money are used to finance highly specialized institutions to assist people recovering from alcohol abuse. Alcohol was prohibited in Iceland from 1909 to 1935, although wine was allowed after 1922. Sale of strong beer was only made legal in 1987.

5.5.9. Health care

Health standards and health services in Iceland are similar to those of the other Scandinavian countries. During the last few years, due to the economic recession, new fees have been introduced in the health sector. At present, health coverage is not complete and patients need to pay part of their medical care and a large share of dental care.

The country is divided into eight medical areas with populations ranging from 10 000 to 100 000, and 27 primary care districts. The health districts contain over eighty health centers which offer a wide range of services, such as twenty-four-hour practice and home visits, dentistry, rehabilitation, prenatal, infant, and child care, mental health care, and social work. The health centers serve as a referral mechanism to the hospital system. Specialized operations and transplants are referred to hospitals in the United States and in Scandinavia (Directorate General of Public Health 1994).

By the end of 1992, there were six specialized hospitals in Iceland, seventeen general hospitals, thirty nursing homes and nursing wards, three rehabilitation institutions, one patient hotel, and five institutions for alcoholics. At this time, there were 15.0 beds per 1000 inhabitants. This is very close to the recommended number of beds, given the age distribution of the population. However, the availability of these beds is unevenly distributed across the country. Thus, there is a shortage of beds in Reykjavik, but an excess in small hospitals in rural areas which cannot offer specialized treatment (Matthiasson 1994).

Currently, Iceland has no shortage of doctors (one for every 354 inhabitants) and other health personnel, and may even be experiencing hidden unemployment since many specialists who have been studying abroad and wish to return home cannot get suitable jobs. About 88% of the total health care costs in Iceland are public. Many voluntary organizations work to combat various diseases, such as cancer, heart diseases, mental illness, and alcoholism. Some of these organizations run their own rehabilitation centers.

5.6. Denmark: The Faeroe Islands

5.6.1. Geography

The Faeroe Islands are located in the North Atlantic Ocean between Iceland and the United Kingdom. Of the 18 islands in the Faeroes, 17 are inhabited. The total land area is 1399 km², and the largest island is Streymoy, with an area of 373.5 km². The capital and largest city, Tórshavn, is on Streymoy. The entire archipelago is considered to be within the Arctic for consideration in this chapter.

5.6.2 Population

The population of the Faeroes on January 1, 1995 was ca. 43 700. This is a ten-fold increase over the course of the previous two centuries, but recent trends have been downward. The birth rate, at 1.5%, remains relatively high, and with a mortality rate of 0.8%, gives a natural increase of 0.7%. In the 1970s and 1980s, net immigration created additional population growth. Since 1989, however, there has been substantial net emigration, resulting in a net population decline in 1994 of 3.7%. From 1990 to 1994, the population declined 8.7%.

There are about 100 towns and villages in the Faeroes, of which the largest is the capital, Tórshavn, with a population of 15 000. The second largest town is Klaksvík, with a population of 4600.

The Faeroese are descended from Norwegian settlers, who replaced an Irish settlement around year 800. Since 1380, the

Faeroes have been associated with Denmark. In 1856, the Royal Trade Monopoly was abolished, and the Faeroes began a period of rapid expansion and modernization, based largely upon exports of fish.

In the late 19th century, a Faeroese nationalist movement began, seeking to protect the Faeroese language and culture against a growing Danish influence. This led, eventually, to an agreement in 1948 under which the Faeroe Islands are a home rule area within the Kingdom of Denmark. This is the same as the more recent agreement between Denmark and Greenland.

Today, internal affairs are governed by the 27-member Løgting, or parliament. Areas of governance which are controlled by the Faeroese authorities are fully financed by the Faeroes. The Danish Government provides funds for affairs under their control, such as the police and judicial systems. The costs of joint responsibilities are shared. Social legislation is based on the Danish model.

5.6.3. Diet

Recent surveys of Faeroese adults showed a daily consumption of 72 g of fish, 12 g of whale meat, and 7 g of whale blubber (Vestergaard and Zachariassen 1987). Fish and pilot whale constitute 44% and 9.5% of Faeroese dinner meals, respectively. Cod is the main fish consumed in the Faeroes.

Faeroese whaling, known as *grind*, is an integral part of Faeroese culture (Sanderson 1994). This practice has taken place for centuries, as long-finned pilot whales are driven into shallow waters to be killed, butchered, and distributed equally among the residents of the district. The traditional measures of whale shares are still used, and as the dietary survey noted above showed, whale meat and blubber are a significant portion of the Faeroese diet. *Grind* provides the majority of meat production in the Faeroes, and accounts for one-quarter of meat consumption. Despite pressure from anti-whaling groups, *grind* continues today as a significant activity in Faeroese culture, diet, and community.

5.6.4. Employment

The Faeroese economy is overwhelmingly dependent upon fisheries. Fishing, fish farming, and fish processing account for one-fourth of gross national income, and nearly all exports. To a great extent, other industries are suppliers to the fishing industry, and like the public sector, are highly dependent upon the income derived from the fishing industry. Fluctuations in fish prices, size of the fish catch, exchange rates, and the relative prices of imported supplies such as oil are of critical importance to the health of the Faeroese economy.

In 1994, about half the catch of the Faeroese fleet was taken in Faeroese waters. The main commercial fish here are cod, haddock, coalfish, blue whiting, redfish, tusk, ling, blue ling, Greenland halibut, mackerel, and herring. Most of these are landed in the Faeroes for processing. Fish landed in the Faeroes are either exported fresh, or processed into fresh and frozen filets and salt fish in factories located throughout the islands. Some fish are processed into fish meal and oil, or into feed for the fish farms. The principal export markets are Denmark, the United States, several European countries, and Japan.

Fish farming is very productive in the Faeroes. In 1993, the breeding population of farmed salmon and trout produced 16 000 tonnes for export.

5.6.5. Housing

Living conditions, including housing, are generally good in the Faeroes. Although the economy has undergone recession in recent years, and the cost of living remains high, most people live in good and spacious houses, with all modern conveniences.

5.6.6. Education

Faeroese education is based on compulsory schooling through seven grades (up to age 14), with three additional optional grades, and a gymnasium, or senior school. There are also technical and commercial schools, a folk high school, a teachers' training college, a nursing school, and a navigation and engineering school. The University of the Faeroe Islands offers university-level courses in many subjects, and confers bachelor's degrees in some disciplines. More advanced education is pursued outside the islands, most frequently in Denmark.

5.6.7. Language

Faeroese is a Nordic language, closely related to Icelandic and the dialects of western Norway. Following the Reformation, Danish became the language of official business, and Faeroese went out of use in its written form. The spoken language remained strong, and continued to carry the rich oral tradition of stories and ballads, which were usually sung with the traditional Faeroese ring dance.

In the mid-19th century, a new written version of Faeroese was developed, and was reinstated in education in 1937, and as an official language of the islands in 1948. In 1993, 104 books were published in Faeroese, of which 57 were in the original language and 47 were translations. In addition, six Faeroese newspapers appear daily or weekly. Faeroese Broadcast (established in 1957) uses Faeroese exclusively, while Faeroese Television (established in 1984) uses a mixture of languages.

5.6.8. Mortality and morbidity

Public health is good on the Faeroe Islands. Life expectancy, at 72.8 years for men and 79.6 years for women, is comparable to that of other Nordic countries.

5.6.9. Health care

The Faeroese health service is administered by the Faeroese under supervision of the Danish Health Administration, and educational standards for health professionals are the same as in Denmark. In the Faeroes, there are 26 general practitioners, 30 specialized physicians, 42 dentists, 3 pharmaceutical divisions, 3 hospitals with a total of 300 beds, and arrangements with the Danish National Hospital in Copenhagen for treating complicated cases.

5.7. Saami

5.7.1. Geography

The traditional homelands of the Saami are northern Fennoscandia and the Kola Peninsula of northwestern Russia. While most of these areas are north of 66°N, the Saami are found as far south as 62°N. Recognizing the shared culture and history among Saami and the contiguity of this area despite its division into four countries, this section will describe the Saami together as one group. Specific factors relating to each country,

including such national systems as education and health care, will be described under sections on the individual countries.

The Saami homelands, and the Saami people, are in parts of northern Norway, Sweden, Finland, and northwestern Russia, though some Saami have moved to other parts of these countries or abroad. The homelands encompass approximately 400 000 km². Several national Saami organizations and the international Saami Council have worked to unite Saami from the four countries. These organizations, together with the Saami Parliaments in Norway, Sweden, and Finland, address issues of concern to Saami in regard to traditional rights and use of the lands they inhabit.

In Russia, the Saami area is the Kola Peninsula, where today there are 11 villages inhabited by Saami. Of these, Lovozero has the largest Saami population. In Finland, the Saami area is in Lappi, the northernmost province. At the beginning of the twentieth century, Saami lived in six municipalities, but now only live in four: Inari, Enontekiö, Utsjoki, and northern Sodankylä. In Sweden, the Saami area is primarily in the counties of Norrbotten and Västerbotten, plus the mountain fields of Jämtland and Härjedalen. In Norway, the Saami area is primarily in Finnmark, Troms, and northern Nordland, though it extends as far south as Engerdal municipality in Hedmark county.

Starting in the 1300s, the Saami territory was taxed by Russia, Sweden, Finland, and Norway. The unofficial administrative boundaries bore little relation to the traditional migrations and herding patterns of the Saami, and many Saami found themselves paying multiple taxes until the 18th century. In 1751, a treaty defined national borders in the region for the first time. This treaty included a supplement entitled the Saami Codicil (*Lappecodisillen*), which resolved this problem and acknowledged the civil rights of the Saami. It was designed to safeguard the economic activity of Saami in border areas, including their freedom of movement, and is sometimes known as the Saami Magna Carta. Some provisions, such as free movement of Saami across the Norwegian/Swedish border, were not actually implemented for over a century after the treaty was signed.

5.7.2. Population

Calculating the total Saami population is difficult because ethnicity is not always recorded as part of the census, and because there are different definitions of what it is to be Saami. Furthermore, some people with Saami ancestry choose not to identify themselves as Saami for various reasons. In 1980, the Nordic Saami Conference adopted the following definition of Saami:

Any individual who:

- has Saami as his/her first language, or whose father or mother, or one of whose grandparents has Saami as his/her first language; or
- considers himself/herself a Saami and lives entirely according to the rules of Saami society, and is recognized by the representative Saami body as a Saami; or
- has a father or mother who satisfies the above criteria for being a Saami.

The Saami Parliaments in Norway and Sweden have a similar definition to determine eligible candidates. You must declare that you consider yourself a Saami, and that you, one of your parents, or one of your grandparents uses or used Saami as an everyday language.

In Norway, estimates of the Saami population rely on using data on the proportion of Saami in rural areas from

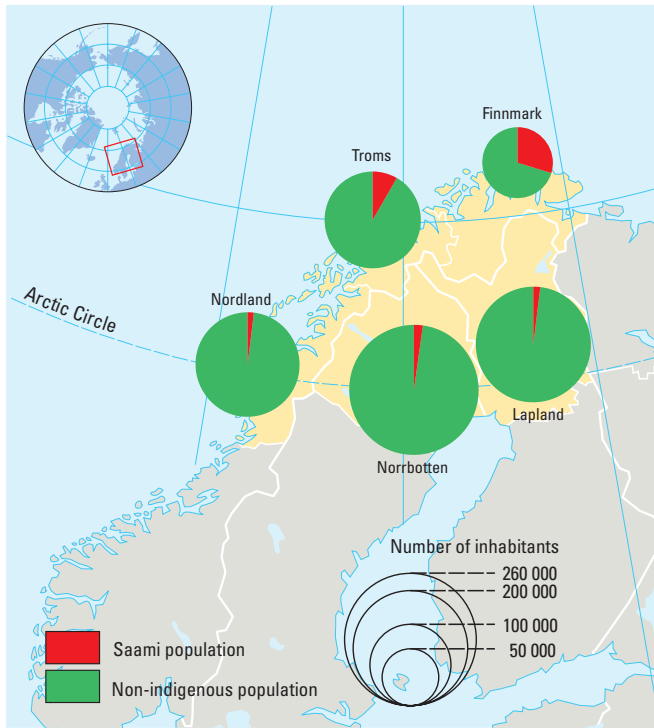


Figure 5-12. Total and Saami populations of Arctic areas of Fennoscandia (based on national census data).

the 1900 census (which identified Saami). For areas where the ratios are assumed to be similar today and assuming a population increase consistent with the total population relative to the 1990 census, current estimates are calculated using the method developed by Gjerde and Mosli (1985).

Despite the difficulties of accurately making a census of the Saami, it is possible to estimate the Saami population in the Arctic at approximately 50 000. In this area, the total population is approximately 2 million, so the Saami comprise about 2.5%. Today, Saami are in the majority only in Nesseby, Tana, Porsanger, Kautokeino, and Karasjok in Norway, and in Utsjoki, Finland.

The Saami can be classified into four societies, depending upon place of residence and economic base. These are coastal societies, based upon sea fishing; fjord societies, based on

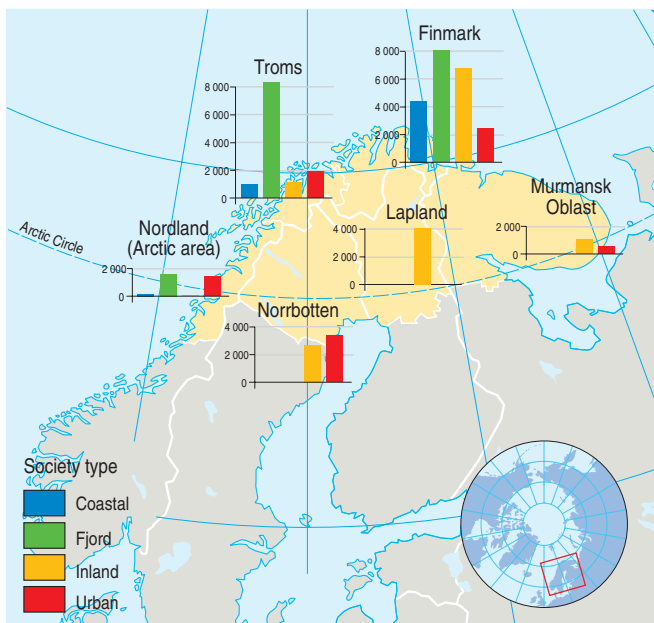


Figure 5-13. Calculated Saami population in the Arctic areas of the Saami region, by society type and region.

combining farming and fishing in local waters; inland societies, dependent upon farming or reindeer husbandry, with some freshwater fishing; and urban societies, working in the cash economies of the cities. Figure 5-12 shows the Saami and total populations for selected areas of the Saami region, and Figure 5-13 shows the approximate distribution of Saami by type of society.

People have inhabited this region since the end of the last ice age, approximately 10 000 years ago. The Saami may have descended from these early peoples, as the region's cultures evolved and absorbed immigrating peoples. The earliest written references to Saami date from the first century, as does the earliest archeological evidence of Saami-style dwellings. In Roman times, and during the first millennium, the Saami are described as hunters, fishermen, trappers, and later as reindeer herders.

The arrival of immigrant populations from the south from the 15th century onward forced the Saami to change their patterns of land and resource use. In part, these changes were a reaction to reductions in game populations as a result of multiple tax burdens, payable in furs, imposed on the Saami. The arrival of Norse settlers on the Norwegian coast restricted the migrations of Saami, and led to the establishment of inland, fjord, and coastal societies. Finns moving north displaced the sedentary Saami of northern Finland, causing them to switch from hunting and trapping in the forests to fishing and reindeer herding. In Russia, immigrant populations also pushed the migratory Saami northward, beginning in the 17th century.

Later changes, such as the demarcation of national boundaries and the closing of the borders of the former Soviet Union, forced further alterations to migratory patterns. Economic policies, especially during the Soviet period, led to additional disruptions in the traditional way of life. Unlike other Saami areas, the number of Saami in the Kola Peninsula area has not increased since the beginning of the 20th century, due in part to the effects of forced assimilation, as well as the Second World War.

5.7.3. Diet

The Saami diet varies according to the areas and type of society in which they live. Coastal Saami naturally have diets high in fish, especially cod, and other marine products. Fjord Saami eat some fish, which are more likely to come from local stocks, but they also eat more farm products. Inland Saami consume large quantities of reindeer meat, as well as moose and fish. These patterns vary seasonally, with the availability of the resources. For example, salmon are commonly eaten in summer, but are not available in spring.

While little detailed information is available about quantities of food consumed, Figure 5-14 shows frequencies of consumption of different food types for the four societies described. Most meat consumed is locally-produced reindeer.

Surveys in 1987 among the Saami population of Västerbotten, Sweden, showed that the traditional diet of reindeer-herding Saami is high in protein, fat, niacin, B-12, iron, zinc, selenium, cholesterol, and sodium, and low in carbohydrates, vitamin C, calcium, disaccharides, and fiber. A study of nutrient intakes in 1990, comparing Västerbotten Saami with Swedes in the same area, found that the Saami intake of carbohydrates had risen since 1987 and was closer to that of the general Swedish population, while Saami intake of zinc, phosphorus, and vitamin B-12 remained higher. Saami women had lower total energy intake than men, and their intake of vitamin B-6, iron, magnesium, zinc, and selenium was below the recommended level (Håglin 1988, 1990).

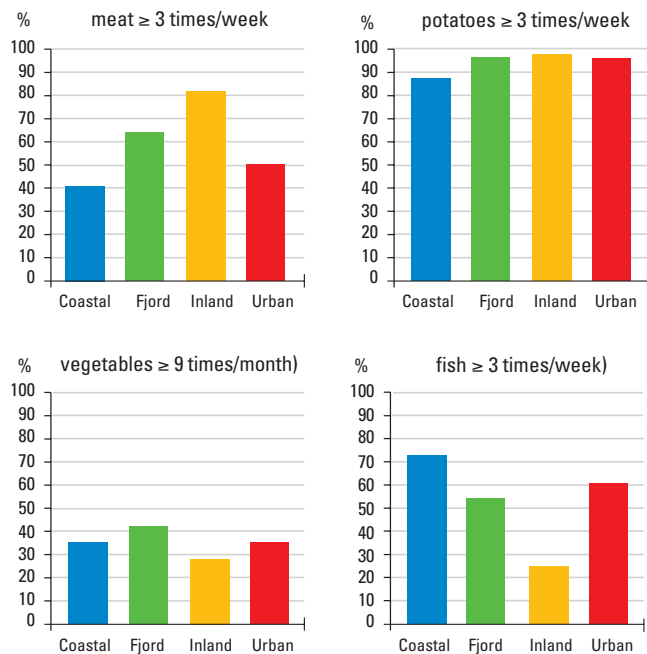


Figure 5-14. Frequency of consumption of food categories by Saami in Norway, percent of respondents, by society type (Westlund and Sogaard 1993).

5.7.4. Employment

The traditional occupations of Saami are fishing, farming, and reindeer herding. In Norway and Sweden, only Saami are allowed to engage in reindeer herding. Compared with the general population, Saami are more likely to work in agriculture and less likely to work in industry and construction, but have a similar proportion working in the service sector of the economy.

Most hunting in the Saami areas today is recreational, and is usually done by urban residents visiting the area. While bringing some economic benefits, sport hunting for ptarmigan conflicts with traditional Saami hunting and other occupations.

5.7.5. Language

The Saami languages are Finno-Ugric, of the Uralic family. They are closely related to Finnish and Estonian, and to indigenous languages such as Komi in Russia. There are ten distinct languages, of which six are still spoken: Northern Saami, Southern Saami, Lule-Saami, Inari-Saami, Skolt-Saami, and Kildin-Saami. Each language has its own dialects. In Norway, there are approximately 20 000 speakers of Saami; in Sweden, 10 000; in Finland, 3000; and in Russia, 1000. The boundaries of the Saami languages do not follow national borders, but are more related to resource use and natural geographic features.

5.8. Norway

5.8.1. Geography

Arctic Norway includes the counties of Finnmark and Troms, as well as the area of Nordland north of the Arctic Circle, an area of 95 489 km². Svalbard is not included in this section.

5.8.2. Population

The 1990 population of Arctic Norway was 379 461 (Almanakk for Norge 1996). For use of statistics given at the county level, this section will include all of Nordland, which in-

creases the region's population to 468 691 as of January 1, 1995. Between 1960 and 1980, the population decreased and the mean age increased, due to extensive emigration, mostly to cities in southern Norway. In the past five years, however, the population has stabilized, and the mean age is decreasing. Young people are becoming more likely to stay in the area in which they were raised, and also to return to northern Norway after education in the south.

The non-indigenous population has a very urbanized lifestyle and dietary pattern, with modern equipment in fishing and agriculture (Aase 1994). Assessing environmental exposures for indigenous inhabitants of this region will include the risk levels faced by non-indigenous residents.

The Saami of Arctic Norway have been described earlier, but it is important to note recent immigrants to this area from other countries. For example, Tamils from Sri Lanka have moved to many small towns in Finnmark. Finnmark also has many groups of Finnish-speakers.

5.8.3. Diet

The diet of the general population in northern Norway is similar to that in the rest of the country (Westlund and Sogaard 1993). The main differences include higher consumption of potatoes and fish and lower consumption of fruits and vegetables. Trends to a healthier diet are leading to reduced rates of coronary heart disease for both men and women.

5.8.4. Employment

Industries in northern Norway include fishing and mining, which form the economic base of the region (Almanakk for Norge 1996). Norway is one of the top ten fishing nations in the world, with a catch in 1989 of 1.76 million tonnes. The oil industry, which supports a significant portion of the national economy, is based farther south. Unemployment in Norway has been stable at about 10% for the past five years.

Among Saami in Norway, 13.2% are engaged in agriculture, 20.5% in industries including construction, and 66.2% in trade, transport, and services (Aase 1994). The most notable difference between Finnmark and Troms is the greater percentage of Saami engaged in reindeer herding in Finnmark (5.36% vs. 0.48%), and the greater percentage in Troms engaged in farming (5.80% vs. 1.52%). Overall, the Saami are more likely to be engaged in agricultural occupations than are members of the general population.

In Arctic Norway, average income levels are lower than for the country as a whole, but unemployment has been at the national average over the last three years.

5.8.5. Housing

Housing in northern Norway is generally of good standard, with adequate living space and modern conveniences (Aase *et al.* 1996).

5.8.6. Education

Education in Norway is obligatory and free of charge from age 6 to 15. The college schools, for ages 16 to 19, are also free. At university, students must pay for their expenses, although tuition is free. For post-graduate education, however, students must provide their own financing.

Education levels in northern Norway have increased dramatically in recent years, and may prove one of the most effective means of achieving improvements in health in the region.

5.8.7. Language

In the late 19th and early 20th centuries, the Norwegian government attempted to assimilate the Saami by eliminating the use of the Saami language. In 1902, it was forbidden to sell land to persons who could not speak Norwegian, and speaking Saami was not allowed in schools. Since the Second World War, these attitudes have been gradually changing, and Saami culture and identity have enjoyed a renaissance throughout the Saami area.

The Saami language has been used in education in Norway since the mid-1960s. The Basic Education Act in 1974 established the right to study the Saami language, and since 1974, it has been possible to study Saami from primary school through graduate studies. In 1985, it became possible to study all subjects in Saami during the first nine years of education. The Saami Education Council, established in 1975, advises the Ministry of Education, and helped develop the new curriculum guidelines that have been used since 1987. There are also two upper secondary schools for Saami and the Saami College, providing teacher training and Saami language education through the university level. The Saami College is hoping to add fields such as nature and resource management to the courses offered.

The Saami language has had official status since 1992, with special application in the six districts with significant Saami populations. More Saami-speakers are becoming medical doctors, in part because the University of Tromsø gives extra credits to students who can speak Saami (J.Ø. Odland pers. comm.).

5.8.8. Mortality and morbidity

For all of Norway, the birth rate in 1994 was 13.3 per 1000, and the death rate was 10.4 per 1000 (Aase *et al.* 1996). The fertility rate was 1.8 children per woman of childbearing age. Infant mortality was 6.3 per 1000 live births. Life expectancy in 1994 was 74.0 for males, and 80.9 for females. Current population increases are due in part to increasing life expectancy, which is leading to an older population and the attendant medical and social changes that this will create.

Arctic Norway, however, has long been behind the rest of the country in these areas. The first mortality studies in Norway, in the early 19th century, showed that the northernmost counties had the highest mortality rates. This has not changed. The most common causes of death are coronary heart disease, accidents, and cancers of the stomach, lungs, and esophagus. The highest mortality rates within the region are in the fishing communities along the coast. Because of this geographical pattern, and the fact that the coastal population is mostly Norwegian while most Saami live farther inland, Finnmark has the unusual situation that the indigenous residents show better overall health characteristics than the general population. Nonetheless, better health is most strongly correlated with a higher education level (Aase 1994).

In recent years, there has been no relative improvement of the mortality rates of northern counties in relation to the rest of the country. In 1985, life expectancy in Finnmark was five years shorter for males and three years shorter for females when compared with the best southern county, Sogn og Fjordane. The trends for younger people, however, show a more optimistic pattern. Infant mortality in the Arctic, until recently much higher than for the country as a whole, is now at the national level.

Lifestyle factors may contribute in part to these improvements. As noted above, dietary changes have led to reduced rates of coronary heart disease in males born after 1930,

and a similar trend can be seen for females. Smoking, on the other hand, remains more common than in other parts of the country. For males, the prevalence of smoking is decreasing in urban areas, but stable or increasing elsewhere. For females, it is increasing everywhere, especially in fishing communities. Pregnant women, however, are smoking less frequently (Eriksson *et al.* 1996). Smoking appears closely correlated with coffee drinking, which is more common in Finnmark than anywhere else in Norway.

Accidental deaths, however, remain relatively high. Deaths from snow machine accidents, often related to alcohol consumption, are an obvious area where preventive measures are needed (Brattebø 1994).

An epidemiological study of atopic diseases, especially atopic dermatitis, in relation to environmental factors among school children in Sør-Varanger has shown a higher frequency of atopic disease than any other area studied in Norway or elsewhere (Dotterud *et al.* 1994, Dotterud 1995). The frequency of atopic dermatitis has doubled in one generation in this community. Two thirds of children showed symptoms of atopic disease by age 2, more frequently in girls than boys. Asthma onset was typically early, as is usual. Contact allergy had high prevalence, and was twice as common in girls as in boys. Metal allergies accounted for three-fourths of all contact allergies in schoolchildren, and nickel allergy was responsible for two thirds of all patch test reactions. Nickel allergies were also significantly higher among girls with pierced ears than among girls without pierced ears.

5.8.9. Health care

Health care in Norway is based on primary care at the community level, financed by the local communities, under the supervision of the National Health Control System. In northern Norway, the biggest difficulty is attracting and keeping capable health professionals. Since few are from the north originally, most do not stay in the region longer than a few years (J.Ø. Odland pers. comm.). Recent initiatives have begun to open more places at medical schools to try to relieve this shortage, but it will take several years before improvements are seen at the local level.

While health facilities exist in northern Norway, the sparse population and small, isolated communities cannot support full-service hospitals in any but the largest population centers.

5.9. Sweden

5.9.1. Geography

For this section, Arctic Sweden consists of the county of Norrbotten, the northernmost in Sweden, which covers 98 911 km².

5.9.2. Population

The population of Norrbotten has increased from 50 000 in the mid-nineteenth century to 263 735 in 1990. Of these, approximately 64 000 live north of the Arctic Circle. Much of this increase was due to internal migrations from the late 19th century through the 1940s, as the county's forests, iron deposits, and water power were developed. Recently, the population has remained stable; in 1994, the net increase was 555 persons. Of the population, 81.5% lives in towns, 5.5% in rural villages, and 13% in other rural areas.

Norrbotten has a greater proportion of persons under the age of 25 than Sweden as a whole, although the age structure

of the Swedish population has shifted dramatically in the past 25 years. In 1970, 40% of males and 39% of females in Norrbotten were under 25, compared with 36.5% and 35% for all of Sweden. In 1993, 14.9% of Norrbotten residents were under 25, compared with 14.5% for all of Sweden. Correspondingly, the proportion of persons older than 64 has increased from 11% to 16% (National Central Bureau of Statistics 1975, 1995).

The general population of Norrbotten is similar to the population of the country as a whole, although the Saami and immigrants from Finland provide cultural diversity. In Norrbotten, only 0.5% of the people are immigrants from outside Fennoscandia.

5.9.3. Diet

National dietary surveys conducted recently have shown that the population of northern Sweden consumes less vegetables and wine, but more fat, beer, and spirits than those living in central and southern Sweden (Becker and Enghardt 1994, Becker 1995). In Norrbotten, the general population consumes more reindeer than the Swedish average. Food preparation habits, however, are similar in Norrbotten to other parts of Sweden.

5.9.4. Employment

Compared with Sweden as a whole, Norrbotten has a higher percentage of workers in mining, electricity, water services, forestry, and public services, and a lower percentage in manufacturing (National Central Bureau of Statistics 1995). Farming has declined significantly as an occupation in Norrbotten since the 1930s (Granström 1942, SOU 1970). Today, dairy production is the main agricultural activity of the county.

There were only 523 registered reindeer owners in Norrbotten in 1990, and less than half of these were engaged in reindeer breeding. The average number of reindeer in the region for the period 1980-89 was 181 200. Today, only 15% of Saami in Sweden are engaged in reindeer herding; the rest are engaged in occupations similar to those of the general population.

In Norrbotten, 75% of the population is economically active, compared with 77.7% of Sweden as a whole. Of those who are economically active in Norrbotten, 48% are women. The average salary is SEK 160 000 per year.

5.9.5. Housing

Housing in Norrbotten is similar to that in the rest of Sweden. Nearly all houses and apartments have running water and sewer systems, as well as central heating.

5.9.6. Education

The Swedish education system is public, and compulsory for nine years. More than 95% of students continue for another three years of upper secondary school, where they can choose between theoretical and practical programs.

For their education today, Saami children have a choice between attending regular municipal schools, where some lessons are available in Saami, or government Saami schools, which aim to provide the same education while taking into account the Saami students' linguistic and cultural backgrounds.

5.9.7. Mortality and morbidity

Mortality in Norrbotten is described in greater detail in Chapter 12 on Human Health. Life expectancy for the county is half a year lower than for Sweden as a whole, and the rela-

tive mortality is higher for the four northern counties of Sweden than for southern Sweden. Mortality due to accidents, alcohol-related diseases, circulatory organ diseases including ischemic heart disease, and stomach cancer is higher in the north than the south, but mortality from most other cancers and suicide is lower (Samverkansnämnden Norra Sjukvårdsregionen 1992). Mortality for men is higher than for women, especially from ischemic heart disease and alcohol-related disease. Lung cancer mortality is increasing, especially among women. Perinatal mortality is higher in Norrbotten (0.86%) than in Sweden overall (0.66%) (Larsson *et al.* 1992).

Disease patterns in northern Sweden are similar to the rest of the country, with some exceptions. Cancer incidence is generally lower, while circulatory diseases are more common. This has been related to higher dietary intake of fat, and genetic factors may also play a role. Disturbances and diseases in the musculo-skeletal system are more common in northern Sweden. The number of daily smokers in northern Sweden is distinctly lower than in the country as a whole.

5.9.8. Health care

Health care is provided by the Swedish welfare system. Most health care units and hospitals are public, and the yearly maximum fee for treatment is SEK 2200.

5.10. Finland

5.10.1. Geography

The northernmost province of Finland, Lapland, is close to 99 000 km², or one third of the country. Lapland's borders with neighboring countries are long: 715 km with Norway, 550 km with Sweden, and 370 km with Russia.

Although Lapland's topography is smooth, except in fell areas, its northerly location makes for a fragile environment. The region is a subarctic transition zone between Arctic and boreal zones. Coniferous forests cover half of Lapland, marsh lands cover 34%, and the treeless or birch highlands, mostly situated in the northern half of Lapland, comprise 16% of the area. One third of Lapland, 34 000 km², is protected by diverse programs such as natural parks and wilderness areas.

5.10.2. Population

Lapland is sparsely populated, with slightly more than 200 000 inhabitants, half of whom live in the largest cities in the south. The population is slightly younger than the average in Finland. In 1995, 24.6% of Laplanders were younger than 17, compared with 22.8% of the Finnish population as a whole.

There are just under 7000 Finnish Saami. Of these, about 4000 live in northern Lapland, 500 live abroad, and the rest live in other parts of the country. The so-called Saami areas in Finland are the three northernmost municipalities in Lapland, Inari, Utsjoki, and Enontekiö, plus the village of Vuosto in Sodankylä municipality.

The standard of living in Lapland equals that of the rest of Finland. Government assistance and development measures play an important role in the communal economy. Essential municipal infrastructure (i.e., water supply, waste treatment) and services (i.e., education, health care, organized waste collection) reach all population groups well. The road system is well developed with an 8000 km network of public roads and, in addition, a wealth of private and forestry roads.

Natural population growth has decreased in recent years. In 1995, the natural increase was 492 persons, while the decrease, mostly by out-migration, was 1439 persons. Immigration from other areas or countries to Lapland is of minor importance.

5.10.3. Diet

The origin of food consumed in Lapland is changing, as more is imported from outside the region. Reindeer meat and fish are the main locally produced and consumed foods. A 1986 study (Hälinen and Sikkilä 1993) found that the northernmost reindeer herders ate 338 g of meat a day, of which 235 g was reindeer meat. People in the south ate 188 g of meat per day, of which only 30 g was from reindeer. The northernmost reindeer herders also consumed less than half the amount of dairy products consumed by the southerners (456 g/d vs. 954 g/d). Other dietary patterns were broadly similar.

From reindeer, meat, fat, bone marrow, heart, and sometimes liver are eaten. Reindeer owners consume more reindeer than others, who eat more imported meats. Reindeer meat is usually cooked, often by frying or in soups. Drying and smoking are common ways to preserve the meat.

River trout, brown trout, salmon, and whitefish are all eaten, including the roe. Fish are cooked by frying, roasting, and are also smoked. Ocean fish are now imported to the region, including herring from the Gulf of Bothnia and a variety of Arctic Ocean fishes.

Berries are also used in Lapland. Cloudberries are mostly eaten raw. Lingonberries and blueberries are eaten raw, boiled, or baked. Crowberries are often turned into juice, which is very rich in vitamin C. Other berries, such as bog bilberries, are consumed, often with blueberries.

5.10.4. Employment

Service and tourism occupations predominate, and are the most rapidly growing industries in Lapland. Tourism employs 4000 people. Sightseeing tours and winter sports experiences are important sources of income for both tourist centers and small family-run enterprises.

In rural areas, the traditional way of life consists of a mixture of livelihoods, such as reindeer and animal husbandry, minor scale agriculture, forestry, fishing, hunting, and service. In northern Lapland, this primary production comprises 14.5% of the economy. For the northeastern parts of the province, which has been the focus in Finland of AMAP's human health monitoring program, this figure is 16.1%.

Large-scale industries are concentrated in the Kemi-Tornio area on the coast of the Bothnian Bay for forest-products and metals, and in the southeastern part of Lapland for forest products. About 43% of Lapland's industrial output is exported.

Although forests grow slowly in Lapland, they produce 10% of the country's annual growth and Lapland's timber inventory is 16% of the country's total. Forestry is a significant contributor to Lapland's economy, providing 50% of the province's industrial production and 70% of its export earnings (Varmola 1995). Sustainability is the goal of northern forestry today, and research is directed toward developing and improving such management strategies.

Large areas of common land are used for reindeer herding. Improvements in regulations governing reindeer herding have allowed living conditions for Saami to approach those of the general population. Under the Reindeer Farm Act of 1969, lands have been granted to 280 families, 250 of which

are Saami, to establish reindeer farms. Subsequent acts promise further improvements for primary producers in northern Finland. Recently, conflicts have arisen between Saami and Finnish reindeer herders, relating to legal protection of traditional activities. The number of reindeer fluctuates between about 200 000 in winter and 350 000 in summer before slaughtering. Because reindeer use natural lichen areas as winter feeding grounds, and fell tops in summer as refuge against insects and parasites, impacts on the vegetation of both areas are seen in the form of changes in species composition and, in certain areas, erosion. The problem of overgrazing is evident, and has been under investigation. The management of reindeer husbandry is developing toward a more controlled and modest strategy; reindeer herds in many areas have been decreased and the awareness of environmental effects is changing the practice of reindeer husbandry.

Among Saami in Lapland, 14.9% are engaged in agriculture (including reindeer herding), 12.6% in industries including construction, and 72.4% in trade, transport, and services.

Unemployment remains a serious problem in Finland, with a rate in recent years of about 25%. The rate is higher in Lapland, and the prevailing trends show a decreasing number of young persons among job applicants, and increasing long-term unemployment.

5.10.5. Housing

Measured as rooms per person, housing standards are lower in Lapland than in elsewhere in Finland. Since 1970, the living conditions of the Saami population have improved, largely as a consequence of the legislative actions noted above. Today, the worst housing conditions are found among unemployed non-indigenous people.

In the effort to build energy-efficient homes, houses built since 1980 are often too airtight, and in winter, too dry. This has contributed to increased health problems of the mucous membranes such as respiratory and middle ear infections.

5.10.6. Education

Universal education is guaranteed in Finland, and begins at age seven. In Lapland, 54% of the population has completed the basic education (up to 16 years old), 45% has graduated from high school, and 8.8% is university educated. There is one university in Lapland, the University of Lapland in Rovaniemi.

5.10.7. Language

Finnish is the mother tongue for the majority of Lapland's population. In three northernmost municipalities which comprise the Saami area, Saami languages have official status, though most Saami in Lapland speak Finnish as well as Saami.

While Swedish is also an official language of Finland and is compulsory in all Finnish schools, it is spoken more generally in the southern regions and especially the western coast of Finland. The most popular foreign languages at school are English, German, French, and Russian.

5.10.8. Mortality and morbidity

Morbidity in Lapland today does not differ significantly from that in the southern parts of Finland, although heart and circulation diseases are more common in northern and eastern Finland. The incidence of cardiovascular disease among the Saami earlier was very low, but as a consequence of changed living habits, such differences have decreased.

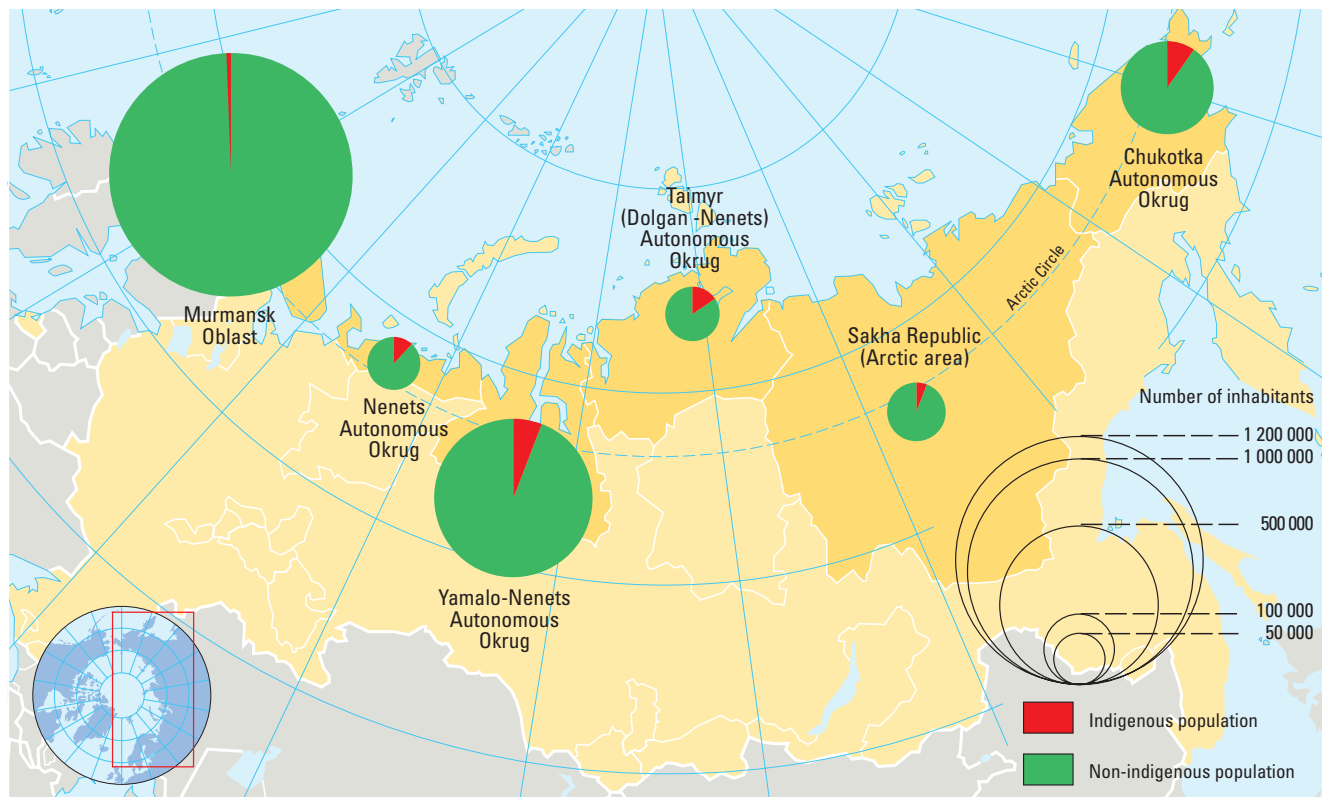


Figure 5-15. Total and indigenous minority populations in the Arctic area of the Russian Federation, by region, according to the 1989 Census (Republican Information and Publication Center 1992a, 1992b; State Committee of the Russian Federation for Statistics 1992).

In general, the incidence of cancers is lower in Lapland than in other parts of Finland. Incidences of colon and rectal cancers of both genders and melanoma, breast, cervix, and uterine cancers of women are lower. Incidences of pulmonary and stomach cancers of men and thyroidea of women are higher.

Muscle, joint, respiratory, and middle ear diseases are typical in the cold, northern climate. Diabetes was formerly very rare in Lapland, but today its prevalence is the same as the national average. Among Saami, congenital hip luxation has been common. Lactose malabsorption remains common, reaching 60% among those not used to fresh milk. Accidents are a big problem in the north. Snowmobiles cause loss of hearing, vibration disease, and worst of all, severe accidents.

Mortality rates in Lapland were 878 per 100 000 in 1989, and 870 per 100 000 in 1991. From 1987 to 1991, cardiovascular diseases were the leading cause of death (418 per 100 000 per year, or 48%), followed by cancer (163 per 100 000, or 19%), and injuries and accidents (103 per 100 000, or 12%). For Finland as a whole, the corresponding figures are 50%, 20%, and 9%. For males, the main cause of accidents was poisoning, usually from alcohol. The rate of accidental death among males was 34 times higher than among females.

Between 1991 and 1995, mortality in Lapland was 8% higher than for Finland as a whole. Because the total population is relatively small, there are large variations between years, especially at the municipality level.

5.11. Russia

5.11.1. Geography

The Arctic area of the Russian Federation stretches from the Norwegian border at about 27°E longitude, eastward to Ostrov Ratmanova at about 169°W, nearly halfway around the world. This section describes the area defined by the Russian Federation's delineation of the Arctic zone, including the Murmansk Oblast, the Nenets Autonomous Okrug, the Ya-

malo-Nenets Autonomous Okrug, the Taimyr (Dolgan-Nenets) Autonomous Okrug, the five Arctic districts of the Sakha Republic (Yakutia), and the Chukotka Autonomous Okrug. The Russian Arctic Sector, including offshore territory in the Arctic Ocean, is approximately 9 million km² (Kolesnik 1971). The combined land area of these regions is approximately 3.1 million km².

5.11.2. Population

This vast area encompasses varied geography, history, economic activity, and, officially, eleven of Russia's thirty northern indigenous minorities, as well as more numerous indigenous peoples such as the Komi and the Yakut (see Krupnik 1994 and Vakhtin 1992). The eleven indigenous minorities considered to be Arctic are the Saami, Enets, Nenets, Khanty, Nganasan, Dolgan, Even, Evenk, Chukchi, Eskimo (Yupik), and Yukagir. In addition, five northern indigenous minorities live close to or within the Arctic region. These are the Selkup, Chuvan, Mansi, Ket, and Koryak (Republican Information and Publication Center 1992a). Note that more recent figures (e.g., State Committee of the Russian Federation for Northern Affairs 1996a) show some changes in the numbers of indigenous minorities, but these figures are not as complete as those from the 1989 Census, which is used throughout this chapter.

While groups such as the Komi, Yakut, and the Russian 'Old Settlers' have lifestyles similar to the indigenous minorities, and hence share similar environmental risks, this section gives prominence to the indigenous minorities for two reasons. First, they are few in number and very susceptible to cultural erosion, especially through changes to their traditional ways of life. Second, they live only in or near the Arctic zone, and are thus particularly sensitive to changes in the Arctic environment (Aipin 1994).

Immigrant populations in the Russian Arctic greatly outnumber the indigenous inhabitants (Figure 5-15 and Table

Table 5-11. Populations by region and ethnicity (indigenous minorities) in the Arctic area of the Russian Federation, according to the 1989 Census (Republican Information Publication Center 1992a, 1992b; State Committee of the Russian Federation for Statistics 1992).

People/Region	Murmansk Oblast	Nenets A.O.	Yamalo-Nenets A.O.	Taimyr (Dolgan-Nenets) A.O.	Sakha Republic, Arctic area	Chukotka A.O.	Russian Arctic	Russia
Saami	1615	0	0	2	0	0	1617	1835
Enets	4	0	2	103	0	0	109	198
Nenets	176	6423	20917	2446	0	10	29972	34190
Khanty	10	5	7247	3	0	4	7269	22283
Nganasan	5	0	3	849	0	0	857	1262
Dolgan	18	0	14	4939	0	4	4975	5363
Even	10	1	46	34	1793	1336	3220	17055
Evenk	20	27	78	311	1285	54	1775	29901
Chukchi	2	0	11	1	428	11914	12356	15107
Yupik	3	6	7	0	0	1452	1468	1704
Yukagir	3	0	3	0	476	160	642	1112
Selkup	1	1	1530	8	0	0	1540	3564
Chuvan	9	0	0	4	0	944	957	1384
Koryak	5	1	31	16	0	95	148	8942
Ket	0	3	6	11	0	0	20	1084
Mansi	18	1	216	1	0	3	239	8279
Total indigenous minorities population	1899	6468	30111	8728	3982	15976	67164	
Total population	1164586	53912	494844	55803	66632	163934	1999711	
% indigenous	0.16%	12.00%	6.08%	15.64%	5.98%	9.75%	3.36%	
Urban	1070970	34336	385614	36717	48456	118986	1695079	
Rural	93616	19576	109230	19086	18176	44948	304632	

5-11). These immigrants are ethnic Russians, Byelorussians, Ukrainians, and others, who have moved to the Russian Arctic over the course of several centuries. Most immigrants have arrived within the past century, live in cities and large towns, and are engaged in industrial enterprises or related support services. In western areas of the Russian Arctic, the ethnic Russians known as Pomors have lived in the area for five centuries, living a traditional lifestyle similar to that of indigenous peoples. In Siberia and the Far East, as well, there are some immigrant families that have adopted a lifestyle closer to the indigenous way of life than the industrial one.

According to the 1989 Census (from which all population figures in this section are taken), the total population of the Russian Arctic is approximately 2 million. Neighboring regions with conditions similar to the Arctic have another 1.5 to 2 million inhabitants. The population as a whole is older than is typical for Arctic regions of other circumpolar countries (Figure 5-16). In addition, there are roughly 260 000 inhabitants of the Norilsk mining complex which, though located north of the Arctic Circle and surrounded by the Taimyr (Dolgan-Nenets) Autonomous Okrug, is considered part of the Krasnoyarsk Krai for statistical purposes. Of the residents of the Arctic, approximately 67 000 are indigenous

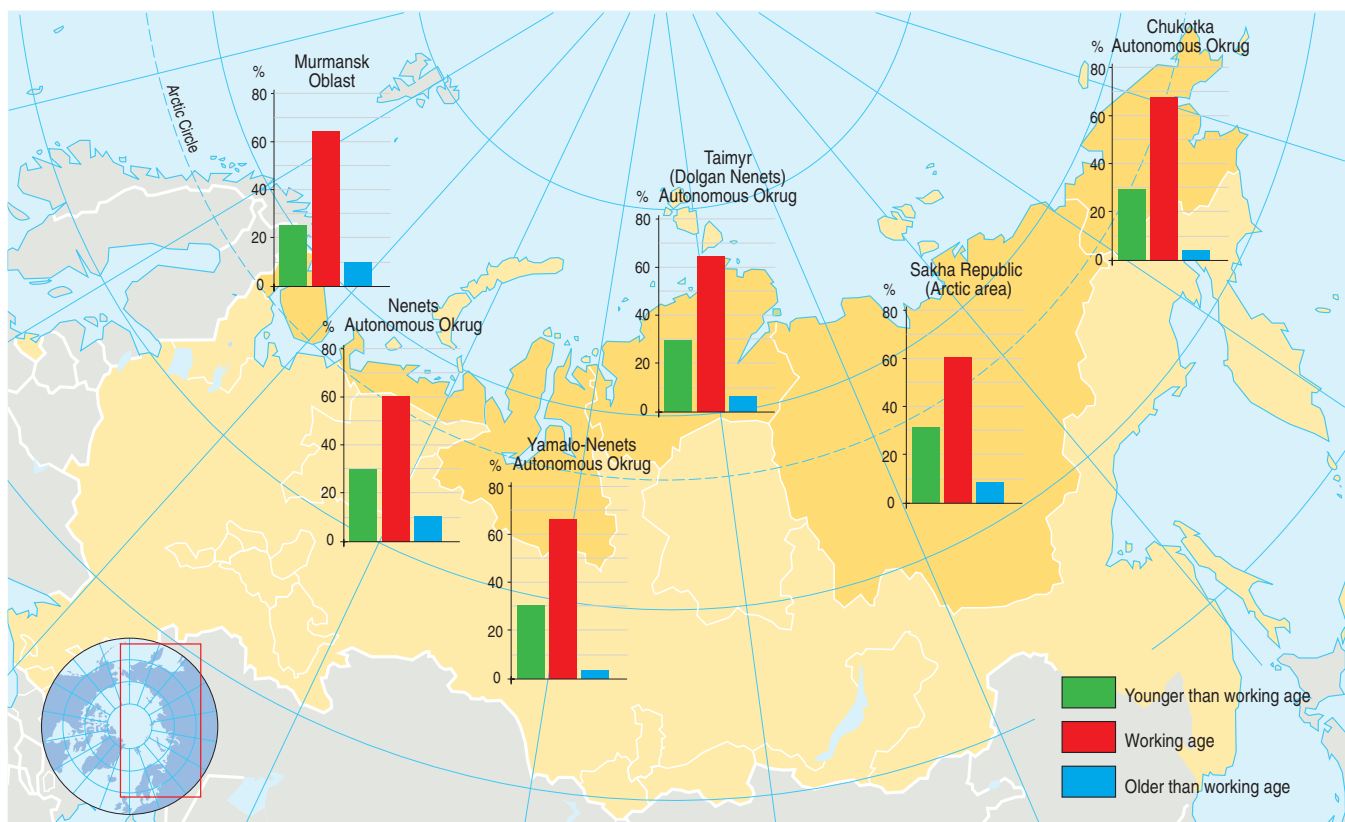


Figure 5-16. Age structure of the Arctic population of the Russian Federation, % of the total population, by region, 1993 (State Committee of the Russian Federation for Statistics 1994b).

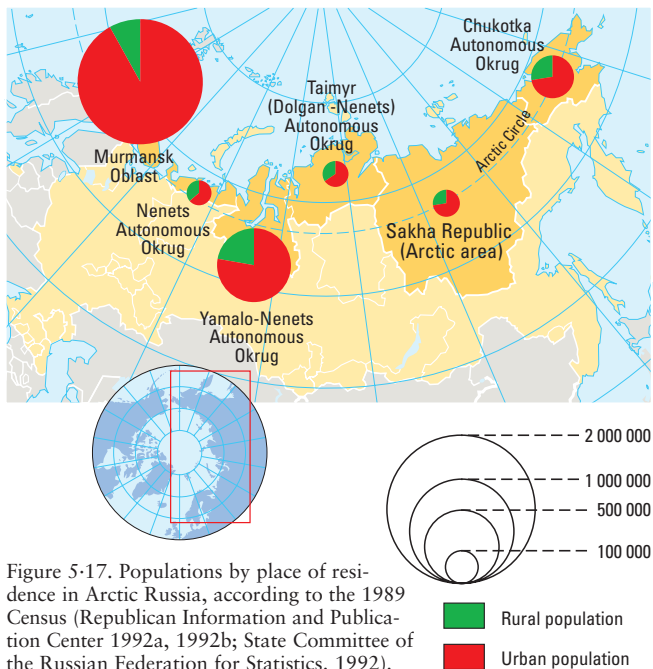


Figure 5-17. Populations by place of residence in Arctic Russia, according to the 1989 Census (Republican Information and Publication Center 1992a, 1992b; State Committee of the Russian Federation for Statistics, 1992).

minorities. Of these, 75% live in rural areas. In contrast, over 80% of the non-indigenous population lives in urban areas (Figure 5-17) (State Committee of the Russian Federation for Statistics 1989, 1992, Republican Information and Publication Center 1992a, 1992b, *Sovietskaya Entsiklopedia* 1988).

This section starts with a general description of conditions in the Russian Arctic, and then provides specific information about each region, starting with the Murmansk Oblast in the west and ending with the Chukotka Autonomous Okrug in the east.

The recent economic changes in Russia are felt acutely in the Arctic, where supply lines and employment opportunities have been disrupted. Examining current conditions must also take into account recent trends in living conditions. At the same time it is important to recognize that the changes are rapid enough that many recent statistics may already be out of date.

5.11.3. Diet

Dietary information since 1990 (Figure 5-18) suggests a general decrease in food consumption, especially of imported foods, including different kinds of meat (Russian Academy of Sciences 1994a, State Committee of the Russian Federation for Statistics 1994c, 1995). Official statistics, however, may conceal wide variations and recent economic impacts (Mikhail Balonov pers. comm.). Data presented in chapter 8 of this report show different patterns. Among indigenous peoples, there is a trend to return to older lifestyles and a more traditional diet (V. Klopov pers. comm., Corbett and Swibold 1996). Overall, the diet is poor in fruits and vegetables.

5.11.4. Employment

Prior to 1992, employment among indigenous peoples showed a continuous upward trend. From 1981 to 1991, the number of workers, officials, and farmers among indigenous peoples increased on average 22.6% in all sectors of the economy. Employment rates among women increased faster still. Among some groups, including the Nenets, Enets, and Yukagir, employment almost doubled.

The transition to a market economy, however, has led to a reduction of indigenous persons employed in all sectors of

the economy. This has been most severe among the Eskimo (Yupik), whose employment rates have dropped 30.9%, among the Chukchi, at 28.6%, and among the Saami, at 22.1%. The main causes of this decrease in employment are declines in reindeer stocks due to reorganizations in collective and state farms, depletion of fish stocks, closure of forest plots, and a sharp reduction in investments in construction, trade, and other services.

The result today is an unemployment rate among indigenous minorities of 25 to 30%, which is even higher among young persons and women. Of the potential work force, 15% do not seek work. An additional problem for indigenous peoples is the relative lack of mobility. Among non-indigenous workers, 20% will look outside their region for work if they lose their jobs. For indigenous minorities, this index is as low as 2%, and may be lower since most may return if they fail to find employment in other areas.

Among those working, indigenous persons account for 70% of agricultural workers in Arctic regions. Of indigenous workers, over half work in areas related to traditional activities, such as reindeer herding, fur trapping and farming, hunting, fishing, and making handicrafts. Among the Even, employment in agriculture was 77.8% of workers, and among the Chukchi, 70.2%.

In industrial occupations, the opportunities for indigenous workers appear limited. Few workers in mining and oil and gas industries are indigenous, and about one-tenth of indigenous workers are employed in construction. Typically, they are in less skilled positions, due to low educational and professional status (State Committee of the Russian Federation for Publishing 1995).

Traditional fields, on the other hand, are narrowing in some respects, while showing opportunities for growth in others. There is also a loss of interest, particularly on the part of younger people, in pursuing traditional occupations. These areas face additional difficulties in the transition to a market economy, where low educational status hinders the acquisition of the new skills that are needed. As discussed below, the ecological disruption to traditional areas has also reduced the opportunities available for pursuing traditional livelihoods. Nonetheless, these occupations still hold the greatest opportunity for indigenous peoples in the Arctic.

Traditional economies can be classified in four types: marine mammal hunters (Eskimo, Chukchi, Koryak), reindeer herders of the tundra and forest tundra (Nenets, Enets, Nganasan, Dolgan, Chukchi, Koryak, Even, Evenk, Khanty), river fishermen (Khanty, Selkup, Koryak), and hunters and herders of the taiga (Evenk, Even, Dolgan, Nenets, Selkup, Yukagir, Khanty). Divisions among these economies are typically complex, though in most regions, one or two branches predominate.

Working in nomadic occupations, such as reindeer herding, while trying to maintain a family that is settled in a village produces great strain. In areas where herding is done on a shift basis, and the migration routes do not exceed 400 km, herders can maintain a satisfactory lifestyle. When the migration routes are longer, additional efforts are required to allow families to move with the herders, and to provide suitable dwellings along the migratory route. These factors led to a small increase in the number of migratory workers in 1992.

Fur farming is another occupation close to the traditional way of life that provides employment for indigenous residents of rural areas. In the Provideniya district of the Chukotka Autonomous Okrug, over 2000 indigenous persons are employed in this field. Food for the foxes is produced locally, by brigades of marine mammal hunters. With the market economy, these farms are allowed to negotiate their prices, and seek profitable means of production and marketing.

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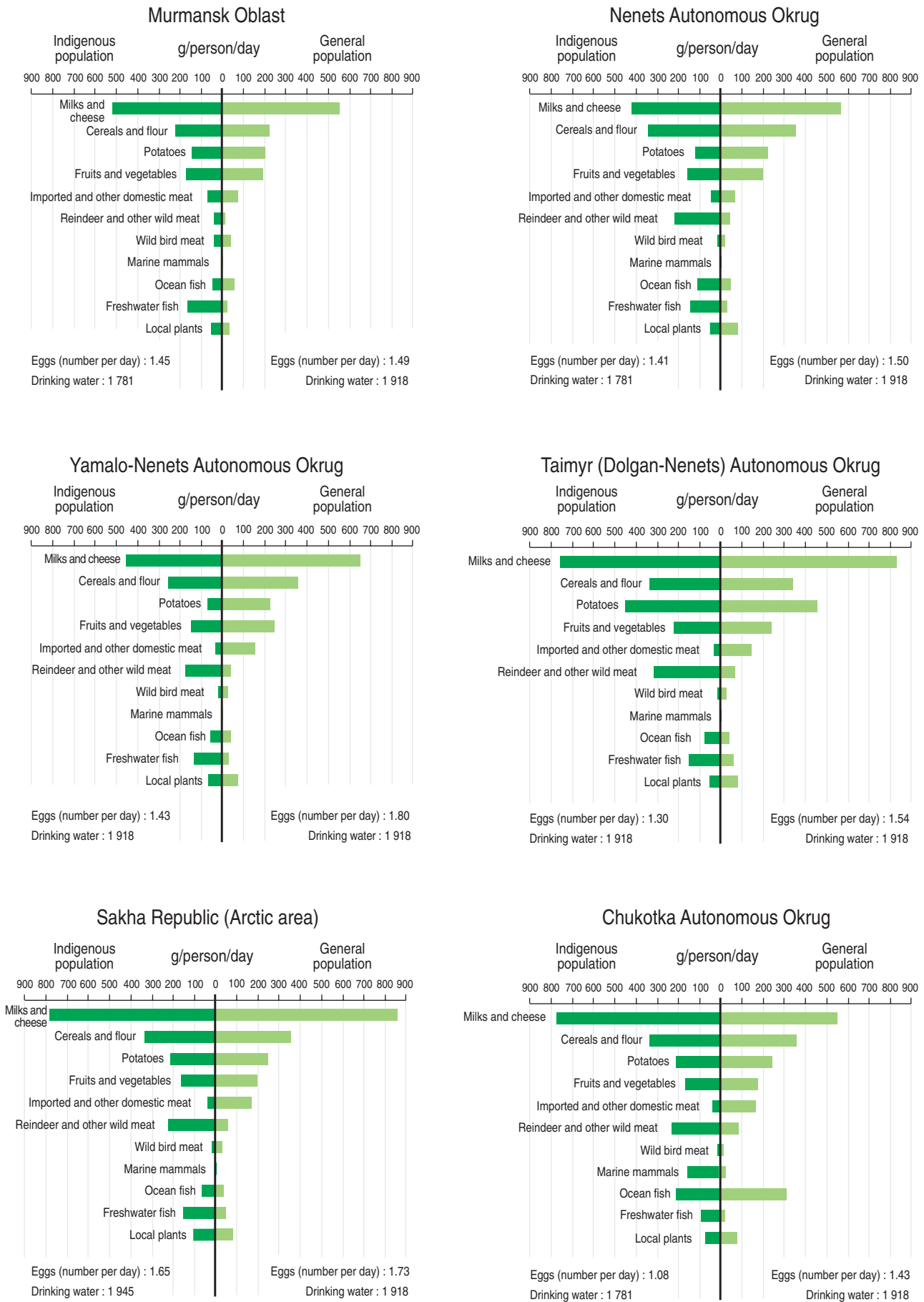


Figure 5-18. Average daily consumption of selected foods by indigenous and general populations in Arctic Russia, by region, g/person, in 1993 (State Committee of the Russian Federation for Statistics 1994c, 1995; Russian Academy of Sciences 1994a).

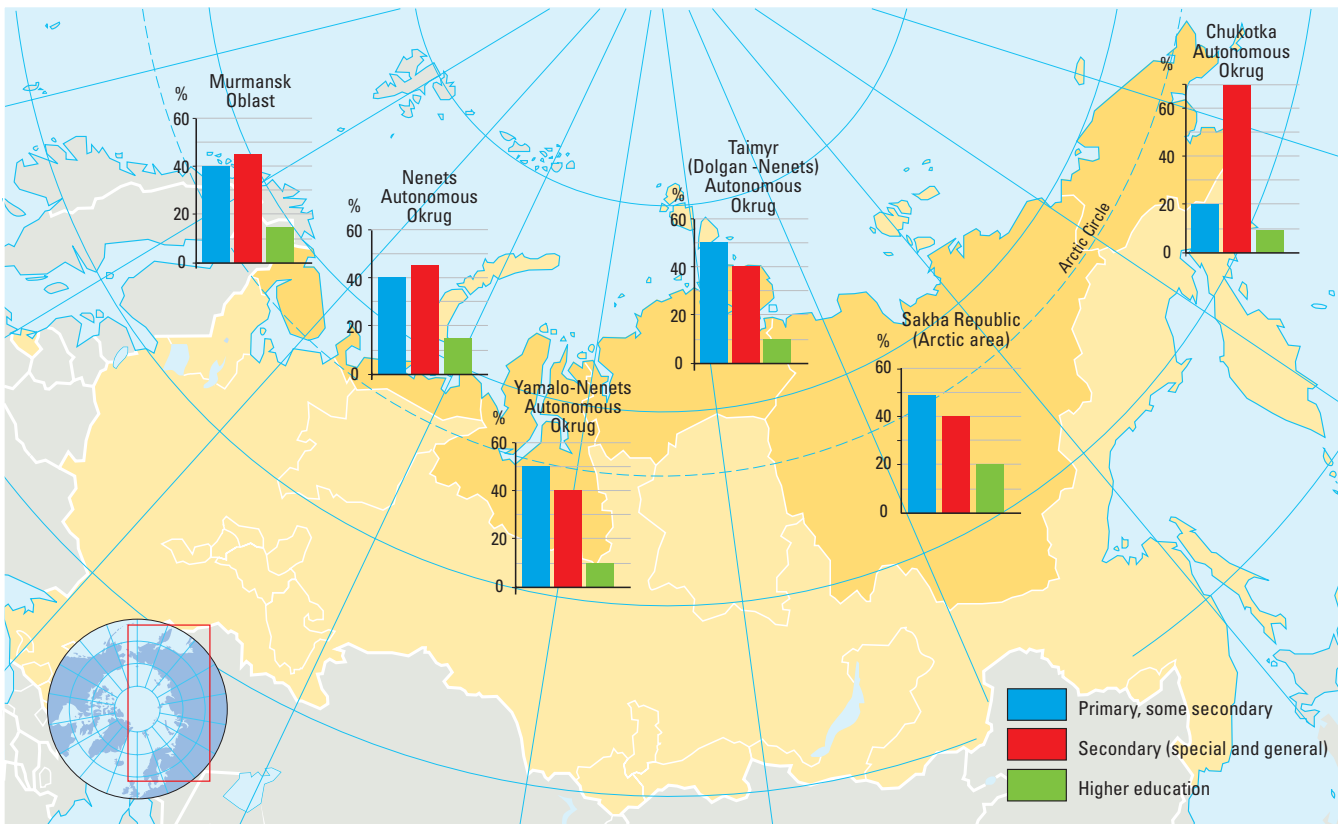


Figure 5-19. Educational attainments of indigenous peoples in Arctic Russia, by region (State Committee of the Russian Federation for Statistics 1994a).

A survey in the Taimyr (Dolgan-Nenets) Autonomous Okrug found that over 90% of indigenous persons felt that traditional occupations, and related fields such as fur farming, should be the basis for their lifestyle in the modern world. New independent farms are beginning to appear, often based on traditional family or clan structures. On single farms, the average number of workers typically ranges from three to six, and the number of such farms is increasing (Ministry of Labor of the Russian Federation and Committee of the State Duma on Nationalities 1993).

New laws and regulations encourage this type of production, as well as the allocation of lands to private enterprises and individuals. Since many traditional occupations are at present unprofitable, it will take time for the new system to reach its potential economic capacity. New production technology and infrastructure, especially in terms of transporting goods to market, are needed to ensure the success of these new ventures. Until these potential opportunities are developed, economic conditions among Russia's indigenous peoples will remain poor (Ministry of Nationalities and Regional Politics and Ministry of Economics 1983, Republican Information and Publication Center 1992b, State Committee of the Russian Federation for Statistics 1994a, 1995, Tyumen Oblast Committee for Statistics 1994).

5.11.5. Housing

Housing conditions appear to have improved in recent years, though mainly as a result of the decline in population which has helped ease overcrowding, resulting in more space per resident. In the urban areas of the Murmansk Oblast, there is an average of 16.8 m² per person, while in rural villages of the Taimyr (Dolgan-Nenets) Autonomous Okrug, this figure is only 8.9. Most residential buildings were built in the 1950s and 1960s, and are overdue for maintenance, improvement, and repairs. In rural areas especially, housing stan-

dards are low. In the Nenets Autonomous Okrug, for example, only 14% of rural dwellings have sewage systems, and only 18% have running water. Central heating and a supply of hot water are also in short supply in many areas.

New construction of housing in the Arctic has declined by 40% in recent years, compared with a 23% decline for Russia as a whole. Population declines have led to very low prices for housing, compared with other parts of Russia. Nonetheless, 30% of the indigenous population still live in traditional structures (*chum*, *yaranga*) or sub-standard housing, often because housing in rural areas and along migration routes does not exist (Republican Information and Publication Center 1992a, Ministry of Labor of the Russian Federation and Committee of the State Duma on Nationalities 1993, State Committee of the Russian Federation for Statistics 1994a, 1995).

5.11.6. Education

Education levels among indigenous minorities in Russia are typically low (Figure 5-19). This is a significant factor in limiting the economic opportunities for indigenous workers. There are several possible reasons for this low educational attainment: the qualitatively different social environment found at school, differences between the traditional way of life and learning and the formal system of school education, and starting school relatively late in childhood.

In part, this is due to a lack of indigenous teachers. The number of indigenous students training for education declined by 36.7% between 1987 and 1992. Most indigenous specialists are trained in cultural areas, in which there is, if anything, an overabundance of specialists. Another factor is the local availability of schools. Primary schools are located in each local village, but secondary education is usually offered only at boarding schools in the regional center. There are some technical and commercial schools in these centers, but they are few.

While many indigenous students enroll in universities, up to 90% drop out. They are often inadequately prepared to handle the rigors of university life, and become frustrated by the academic setting. In the end, this contributes to the unemployment rates of indigenous youth. Similar situations can be found in technical schools as well. At the Northern Academy in St. Petersburg, academic programs are adapted to the special needs of indigenous students. A branch of this academy will soon open in Khanty-Mansiisk, perhaps increasing the chances of success for indigenous students (Ministry of Labor of the Russian Federation and Committee of the State Duma on Nationalities 1993, State Committee of the Russian Federation for Statistics 1994b, 1995).

5.11.7. Language

Prior to the revolution in November 1917, none of the indigenous minorities of the Arctic area had a written language. Schools, most of which were run by the church, were few in this region. With the exception of a few individuals, most of these groups were illiterate. Combined with little knowledge of the Russian language, this helped isolate them from Russia and the world at large.

In the 1920s, the Soviet government attempted to bring the northern peoples up to the same standards of education and cultural development as the rest of the country. Given the migratory lifestyle, remote locations, and cultural traditions of these peoples, special methods were developed in this attempt. Cultural bases were set up, including schools, clinics, veterinary units, and other modern facilities. In addition, the so-called 'Red Tents' were established. These were mobile cultural units, equipped with libraries, medical supplies, radio, and other equipment. The staff of these Red Tents provided medical assistance, taught literacy, showed movies, conducted sanitary work, and so forth, to try to eradicate 'backwardness' among the northern peoples (Slezkine 1994).

Recognizing that literacy, especially among adults, would be easier to promote in the indigenous languages at first than in unfamiliar Russian, the authorities developed writing systems for each language. At first these were in the Latin alphabet, but this was eventually changed to the Cyrillic alphabet in the 1930s. Developing these writing systems and publishing books in them took time, however, and so the first schools were taught in Russian.

This process, in combination with the boarding schools that took children away from their traditional activities and left them unprepared for life on the tundra, led to decreasing use of indigenous languages. While many are still spoken widely, their use has been declining, and Russian is increasingly common as the first language. At the time of the 1989 census, the Nenets language was still considered the mother tongue of 80% of Nenets in the Nenets Autonomous Okrug, though this had declined from 85% in 1959. The Nenets have the largest population of the indigenous minorities in the Arctic, however, and it is likely that other groups have lost their languages to a greater extent (Kurilov 1996).

Indigenous peoples' use of their own languages is closely correlated with their involvement in traditional activities. This is due in large part to the range of precise vocabulary designed for those activities, including many words that cannot be translated adequately into other languages. Such words include terminology for reindeer depending on age, sex, condition, behavior, and other distinctions, as well as tools and implements used in the traditional way of life.

The languages of the indigenous minorities of Arctic Russia fall into several linguistic families. The Finno-Ugric

group includes the Saami in the Finnish branch and the Khanty and Mansi in the Ugric branch. Nganasan, Nenets, Enets, and Selkup are Samodic languages; Evenk and Even are Tungus languages; Dolgan is in the Turkic family; and Eskimo (Yupik), Chukchi, Koryak, Ket, and Yukagir are Paleo-Asiatic languages (Aipin 1994, Slezkine 1994).

5.11.8. Mortality and morbidity

Birth rates have declined in the 1990s, and mortality rates have increased (Figure 5-20), reflected in part by an aging population. These changes follow general increases in population among indigenous peoples in Russia through most of the 20th century. Some of the decline is attributable to assimilation and social change, which have led to smaller families. The average family size of indigenous peoples declined from 4.7 in 1970 to 4.3 in 1979 to 4.0 in 1989. This process has also weakened traditional interdependence within indigenous families, and the customs regarding marriage, including intermarriage between ethnic groups.

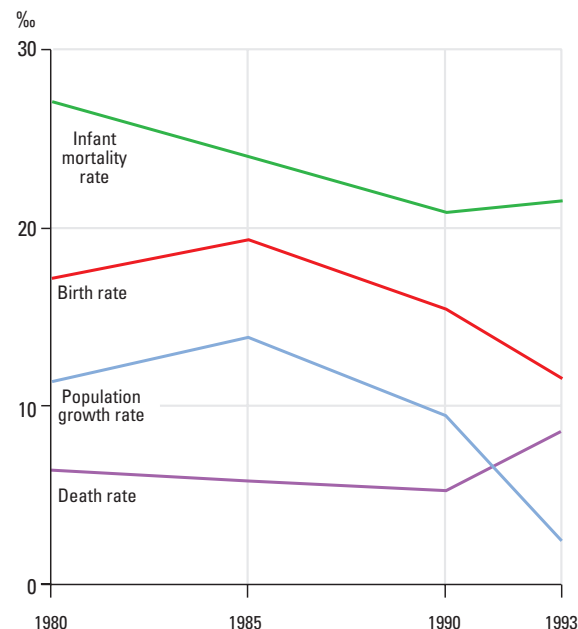


Figure 5-20. Rates of birth, death, infant mortality, and natural population growth (excluding in- and out-migration), averaged over all regions of Arctic Russia, per 1000 of population, 1980, 1985, 1990, 1993 (State Committee of the Russian Federation for Statistics 1994a).

Mortality rates are also of great concern. In the North, the mortality rate of indigenous peoples in 1989 was 10.4 per thousand, compared with the rate of 6.6 per thousand for other residents of the area. This is also true of mortality among working-age persons, where indigenous mortality rates are three to four times higher than among persons from other areas of Russia. The mortality rate is highest among males aged 20 to 34.

The overall life expectancy of indigenous persons in Russia in 1988-89 was 54 for men, and 65 for women. This is 10-20 years lower than the Russian average, and about 15 years lower than the European and North American average. These values have declined in the 1990s. Life expectancy among the general population has also decreased during this period, due to a variety of factors, including increased consumption of alcohol and declining availability and quality of health care.

Among the main causes of death are trauma, infectious disease (especially tuberculosis), and cardiovascular, parasitic, and respiratory diseases. Diseases related to alcohol are especially common. Deaths from these factors exceed the

Russian average by a factor of 2.5. Some of this stems from social factors leading to high rates of alcoholism and suicide. These and other disruptions to the health of indigenous peoples as a group threaten to destroy the populations within a few generations.

Infant mortality is also very high, at 30 per 1000 among indigenous peoples. This is 50% higher than among others in indigenous regions, and 70% higher than the Russian average. A special federal program, 'Children of the North,' has been established to address this problem. The highest rates recorded in official statistics are among the Koryak, at 52.6 per 1000, and the Eskimo (Yupik), at 47.6 per 1000 (Ministry of Labor of the Russian Federation and Committee of the State Duma on Nationalities 1993). Lupandin and Gaer (1990) report infant mortality of 80 to 100 per 1000 among the Chukchi in 1989.

Morbidity among northern residents is also high for certain diseases. These include many diseases that are associated with pollution in industrial zones elsewhere such as respiratory, blood, and skin ailments. 'Northern lung' describes a suite of respiratory diseases that are chronic among indigenous peoples, though perhaps only acute among non-indigenous people. This is due to several factors, including lifestyle as well as the greater susceptibility of indigenous peoples to certain diseases associated with large, sedentary populations in Europe and southern Asia. Chronic ear infections are found 16 to 18 times more frequently among indigenous persons than among the immigrant populations. Indigenous residents have 2.5 to 3 times higher incidence of tuberculosis than newcomers.

Dietary changes, including a great increase in carbohydrate intake compared with traditional diets, may be in part responsible for a higher incidence of gastrointestinal disorders, which are 2.5 times more common among indigenous peoples than among those from temperate latitudes. Vitamin deficiencies and dental disease are found in up to 95% of examined persons.

The patterns of morbidity reflect lifestyle and residence patterns. A study in the Nenets Autonomous Okrug found that among the sedentary population, the overall incidence of disease was 50% higher than among those living on the tundra. Psychological disorders were 2.5 times higher among sedentary persons. Eye disease is also common, especially among indigenous children, and is often associated with deficits in cardiovascular and neural development (Northern Polygon 1990).

Incidence of diseases, as well as traumas, has increased by several hundred percent since 1970 (Avtsin *et al.* 1985, Dobropravov 1991, Ministry of Labor of the Russian Federation and Committee of the State Duma on Nationalities 1993, Boyarskii 1993, 1994).

Males in Russia are heavy smokers, with a prevalence of 70%. Among pregnant women, it is the reverse. Among women in an AMAP-related study, only 4 to 5% of pregnant women smoked. Recent social and cultural trends in Russia toward western habits, however, seem to be leading to large increases in smoking among young women (J.Ø. Odland pers. comm.).

5.11.9. Health care

Total medical personnel and hospital beds per capita have not declined in most areas, but support facilities and materials are in short supply. The number of doctors per 1000 residents ranges from 2.9 in the Nenets Autonomous Okrug to 4.9 in the Taimyr (Dolgan-Nenets) Autonomous Okrug. Hospital beds per 1000 residents range from 11.2 in the Murmansk Oblast to 23.8 in the Taimyr (Dolgan-Nenets) Autonomous Okrug.

Many medical specialists, however, have left the Arctic zone due to the economic situation, leaving a great demand for these skills. To help control tuberculosis, a special program was adopted recently which will provide increased numbers of specialists as well as specialized training for local and indigenous health workers (State Committee of the Russian Federation for Northern Affairs 1996a).

Hospitals in indigenous regions provide only two-thirds of the facilities found in other areas of Russia. Of 19 medical facilities in these areas, only four were built after 1970, while most were constructed between 1934 and 1948 (Republican Information and Publication Center 1990, Ministry of Labor of the Russian Federation and Committee of the State Duma on Nationalities 1993, State Committee of the Russian Federation for Statistics 1994a).

5.11.10. History of indigenous minorities of Arctic Russia

Since contact with Europeans and others from outside the Arctic, the indigenous minorities of this region have gone through several stages of interaction with these newcomers.

First, the European North and Siberia were included in the Russian state, and Christianity was introduced. This was a gradual process over the course of several centuries, reaching the Chukotka Peninsula only in the eighteenth century. It did not greatly influence the traditional activities of the indigenous peoples. The introduction of the *yasak*, or tribute payments, increased the fur-based economy, but this was done using traditional traps. Similarly, Christianity did not result in substantial changes in traditional beliefs or practices. During this period, lasting over a century, the tsarist government did not introduce education or medical care in the Arctic.

Second, beginning in the 1920s, the Soviet system was introduced across Russia. In the Arctic, this meant collectivization of economic activities as well as the introduction of basic services including primary health care. Bolshevik activists came to the north to introduce this new system, but only a few indigenous people took part in developing the new regime. While this disrupted some aspects of the social structure of the traditional cultures, the material aspects of life on the tundra were not greatly affected.

In the early 1960s, however, a third phase brought great disruption. This was the introduction of the huge, multi-purpose state farms, which combined the smaller collective farms that had been established on the basis of single activities. While the collective farms had been largely under local control, the state farms were too large to be run in that fashion. Instead, administrative authority was vested in a leader who was far removed from most of the activities of the farm. While indigenous people had run many of the collective farms, they could now only aspire to becoming heads of work teams within the state farm structure.

The state farm administration, physically and culturally separated from the workers, was often unable to make appropriate decisions, while the workers were unable to influence the directions they received. It is quite possible that this sense of frustration and powerlessness was responsible in part for the increased rates of alcoholism seen among the indigenous peoples at this time (Slezkine 1994, Aipin 1990 and 1994).

5.11.11. Development and prospects for the future of indigenous minorities

The Russian North contains abundant natural resources, including timber, oil and gas, coal, and minerals. For centuries, these areas and resources have been explored and ex-

exploited, providing raw materials for Russia and creating the legacy of an industrial culture. Northern regions, including the Arctic areas and those bordering them, contribute one fifth of Russia's GNP, producing 75% of Russia's oil, 92% of its gas, 15% of its coal, and almost all of its non-ferrous mineral ore concentrate (Boyarskii 1993, 1994, State Committee of the Russian Federation for Publishing 1995, Shustov 1996).

The growth in this development has been dramatic, and its effects have been felt throughout Russia and throughout the Arctic (State Committee of the Russian Federation for Publishing 1995). This trend is expected to continue, as large hydrocarbon reserves are known to exist in the Naryan-Mar region and offshore near Novaya Zemlya.

Most of the development to date has not taken place in uninhabited wilderness, but in the homelands of the indigenous peoples of northern Russia. The consequences for indigenous peoples have been severe. Many lands and rivers once used for reindeer herding, fishing, and hunting have been lost to industrial expansion and associated pollution. While only 2% of the Russian Arctic zone experiences industrial and pollution impacts at a high level, some 68% of the total reindeer pasture area is disrupted. Nature reserves cover only 2% of the region, which is considered one-fifth of the minimum needed to sustain traditional ways of life (Yelena Sumina pers. comm.).

These economic shifts have also disrupted the traditional ways of life of indigenous peoples, threatening the cultural diversity of the Russian Arctic and the continued existence of groups with low populations. Patterns of resource use, group dynamics within a culture, and the social values associated with living close to the land have all been changed as a result of contact and interaction with large-scale extractive industries (Evdokimova 1995).

The social cost of this upheaval is great. While access to education and the opportunity to participate in the modern economy are available, in practice it is often difficult for indigenous peoples to take advantage of these. Students are usually unprepared for university and workers lack the skills needed for industrial jobs. Abandoning traditional lands and ways of life often leads to alienation and loss of self-esteem and identity.

These problems present a substantial threat to the meaningful survival of peoples and their cultures. While individuals may continue to live in these areas, their traditions, languages, and patterns of life are vanishing. In this context, the Russian Federation has passed new legislation designed to help protect the interests of indigenous minorities in the Russian North, but implementing and enforcing these new laws will take time and effort.

Since 1926, over 300 acts and some 1000 regulations have been put in place to address the problems facing indigenous peoples in Russia. During this time, policies of assimilation have generally failed, disrupting existing societal structures while providing nothing to take their place (Vakhtin 1992, Slezkine 1994).

The future of the indigenous peoples of the Russian Arctic is unclear. Many factors must be taken into account, not the least of which is the ability of the indigenous minorities to determine their own destiny. Traditional practices or closely related economic activities, such as reindeer herding and fur farming, offer alternatives to other forms of development and can help support indigenous communities in ways consistent with their cultural values and patterns.

Federal programs in Russia are beginning to support traditional land use practices, including family enterprises. Financial assistance has been given to some 1500 northern in-

igenous families. The Russian government has also approved the recommendations of the State Committee of the Russian Federation for Northern Affairs (1996a), which include the following items:

- Conservation of the environment and improvement of the ecology.
- Improvement of living conditions, energy supply, and social life.
- Development of traditional economies, employment, and local production.
- Development of medical and sanitary care.
- Development of communication.
- Development of education and culture, including spiritual rebirth.

Environmental contaminants, though perhaps not the greatest current challenge to the future of these peoples in most areas, are nonetheless a serious concern in the long term, for they may strike at the heart of the traditional ways of life that hold the greatest hope for protecting the identities and cultures of Arctic peoples. Disrupting local and regional ecology and creating concern about the safety of local foods, such as reindeer meat, are potential problems created by environmental contaminants.

The health and cultures of indigenous peoples are inextricably tied to the lands, rivers, and seas that sustain them. Legislation, economic opportunity, and other factors may help protect these cultures, but without a healthy local environment, all other efforts will be in vain (Krushanov 1981, Shumilov 1985, Slavin 1985, Kozlov 1988, Sangi 1989, Aipin 1990, 1994, Korobkova 1991, Simchenko 1992, Fondahl 1993, Ministry of the Environment and Natural Resources of the Russian Federation 1993, Khomich 1995, Kotov and Kononov 1995, Kucher 1995, Belikovich 1996).

5.11.12. Murmansk Oblast

5.11.12.1. Geography

The Murmansk Oblast, including the Kola Peninsula, is approximately 144 900 km². It has several large rivers, hills, and the Keiva Plateau which slopes southward.

5.11.12.2. Population

The population of the Murmansk Oblast is 1 164 586, with 468 300 living in the city of Murmansk. There are several other large cities in the Oblast, and most residents live in urban areas.

The primary indigenous group living in the Oblast are the Saami, most of whom live in the Lovozero and Kola districts of the eastern Kola Peninsula. The town of Lovozero, with about 3000 inhabitants, is the largest Saami community. There are ten indigenous communities in the Oblast, all between 10% and 50% indigenous.

5.11.12.3. Diet

Reindeer meat, fish (cod, herring, halibut, salmon, rockfish, haddock, whitefish, plaice), and birds (guillemots, murre, kittiwakes) are the main sources of food for the Saami in the Oblast. Reindeer meat is an important food source for all residents, because it is relatively inexpensive and available in the region. Other important sources of subsistence food include the mountain hare and moose.

In the traditional diet, reindeer meat is the predominant food in winter months, from November through May. It is eaten fresh, dried, and boiled. In summer, from May through

November, fish and birds are more common. Salmon and trout were customarily taken in large numbers, but there is currently a quota on the Ponoï River limiting the harvest to 25 to 30 kg of salmon per person per year.

5.11.12.4. Employment

Reindeer herding, hunting, fishing, and producing reindeer fur handicrafts are the most common occupations of Saami in the Murmansk Oblast. Small enterprises, however, account for less than 10% of the economy of the region. Mining and smelting of non-ferrous metals is the major industry, and is also the largest polluter. Tourism is growing, but has brought problems, such as leasing of fishing rights to western tour companies, which prevents local residents from using their traditional fishing areas.

Reindeer herding is done primarily in the Lovozero District, in the Ponoï River basin. Rangelands in the Oblast cover 32 000 km². The stock farm Tundra had 36 500 reindeer on January 1, 1992, plus an additional 3500 privately-owned reindeer. Reindeer herding teams include many indigenous peoples. Saami from the Oblast are joined by Nenets and Komi from the nearby regions, as well as a few ethnic Russians. Reindeer are driven on to the Keiva Plateau in summer, and south in winter. Herding practices had become more intensive, but are now shifting back to free-range grazing in summer, which is the traditional Saami method. The chief limitation on growth of the herd is that the migration routes are restricted and cannot support additional animals as they move from summer to winter range and back.

5.11.13. Nenets Autonomous Okrug

5.11.13.1. Geography

The Nenets Autonomous Okrug is approximately 176 700 km² in area. It is mostly tundra and forest tundra, with only a little taiga. The western Kanino-Timansk district is largely an extensive marsh, including the Kanin Peninsula, which is excellent summer range for reindeer. The Malozemelsk region is a large coastal tundra marsh between the Indiga and Pechora rivers, and has large reindeer areas that are used at various times during the year. The Pechora River flows into the Okrug in a wide valley, and the western bank of the Pechora is home to a large reindeer breeding farm. The Malozemelsko Pripechora district has over one-third of the reindeer of the region. Eastern regions of the Okrug, including the Bolshezemelsk tundra and Yugorsk Peninsula, are the least assimilated. They are less marshy, and are widely used for reindeer.

5.11.13.2. Population

There are 53 912 people in the Nenets Autonomous Okrug. Most indigenous residents of the Okrug are Nenets, though other groups are represented as well. Most Nenets live in tundra and forest tundra areas of the Okrug. The administrative center is Naryan-Mar, with 19 900 residents, of whom 20% are indigenous. There are 29 indigenous communities in the Okrug, 11 of which are over 50% indigenous.

5.11.13.3. Diet

Reindeer meat is the primary food source in the Okrug. Additional sources include moose, brown bear, bighorn sheep, and alpine hare. Lesser sources are seal, beluga whale, ptarmigan, ducks, geese, and snowy owl.

5.11.13.4. Employment

Reindeer herding, hunting, fishing, and fur and leather craftsmanship are the main occupations of indigenous peoples of the Nenets Autonomous Okrug. The region is one of the main reindeer breeding areas in Russia, with 11 reindeer breeding farms. In the Bolshezemelskaya district, reindeer breeding provides over 80% of the income.

Reindeer are grazed in summer on the coastal tundra. In autumn, the herds move south along strictly defined passages to southern tundra, forest tundra, and taiga. The migrations may cover 1800 km. Availability of reindeer moss is the chief limitation on the size of the reindeer population in the Okrug (Filimonova 1973, Dobropravov 1991, Khomich 1995).

5.11.14. Yamalo-Nenets Autonomous Okrug

5.11.14.1. Geography

The Yamalo-Nenets Autonomous Okrug encompasses 750 300 km², including the Yamal Peninsula and the lower Ob valley.

5.11.14.2. Population

The Okrug has a population of 494 844. The Nenets, Khanty, and Yukagir are the most numerous of the indigenous minorities in the Okrug. The administrative center is Salekhard, with a population of 32 000, 15% of whom are indigenous. There are 45 indigenous communities in the Okrug, of which 30 are over 50% indigenous.

The Nenets live primarily in the Yamal and Gydan Peninsulas, and the basins of the lower Ob River, and the Nadym, Taz, and Pur Rivers. These areas are primarily tundra and forest tundra. The Khanty live in the upper and middle reaches of the Taz River.

5.11.14.3. Diet

Reindeer meat and fish are the largest parts of the diet, with reindeer the more significant of the two. Additional sources of food include moose, brown bear, bighorn sheep, and alpine hare. Lesser sources include seal, beluga whale, ptarmigan, ducks, geese, and snowy owl.

5.11.14.4. Employment

Reindeer herding, hunting, fishery, and fur and leather craftsmanship are the primary occupations of the indigenous peoples of the Okrug. Small enterprises account for about 15% of the economy of the region. The major industries are oil and gas production, which are also the sources of most of the pollution as well as disruptions to the tundra and rivers of the region.

The Yamalo-Nenets Autonomous Okrug is one of the largest reindeer breeding areas in Russia. The present stock is over 530 000 animals, of which 230 000 are part of the communal herds, and 300 000 are privately owned. The migration routes run for thousands of kilometers, but industrial development has had a large impact on rangelands. Approximately 68 000 km² have been polluted (by oil seepage and other spilled materials), or damaged (by caterpillar tractors and cross-country vehicles), or are for other reasons no longer available for use by the reindeer herders. This has greatly reduced the productivity of the reindeer industry (Shapalin 1965, Evdokimova 1995, Kucher 1995).

5.11.15. Taimyr (Dolgan-Nenets) Autonomous Okrug

5.11.15.1. Geography

The Taimyr (Dolgan-Nenets) Autonomous Okrug covers 862 100 km². Of this area, 13% is reindeer moss, 10% mossy and tussock tundra, and 9% shrub tundra. The remaining area is largely comprised of forests.

5.11.15.2. Population

The Okrug has 55 803 people. The largest city is the port of Dudinka on the Yenisey River, which has 36 300 residents, of whom 15% are indigenous. There are 20 indigenous communities in the Okrug, of which 14 are over 50% indigenous.

The indigenous peoples of the Okrug are the Dolgan in the southern Taimyr and the Khatanga River basin, the Nenets in the western areas of the region, including the lower Yenisey River and the Yenisey Bay coast, the Nganasan in the Kheta River basin, the Evenk in the southern parts of the Okrug, the Enets in the western parts of the Okrug, including the lower Yenisey, plus some members of other indigenous groups.

5.11.15.3. Diet

Reindeer is the main source of food, and fish and birds are also significant sources. Secondary sources of food include moose, brown bear, bighorn sheep, Siberian ibex, alpine hare, ringed seal, common seal, beluga whale, bearded seal, ducks, geese, snowy owl, and ptarmigan.

The main item in the traditional diet is reindeer, both wild and domestic. It is eaten smoked, dried, and fresh. Fish is eaten dry, smoked, or boiled, most commonly between June and October, though sliced frozen fish (*stroganina*) is popular in winter. In summer, fresh or lightly salted fish is popular, and boiled fish is popular throughout the year. The most commonly used species are cisco, whitefish, herring, Siberian sturgeon, Arctic char, nelma, muksun, Arctic grayling, pike, perch, smelt, and others. Marine mammals are a relatively small food source.

Nganasans involved in reindeer herding eat mainly venison, boiled, frozen, or smoked. After a deer is killed, they will eat fresh meat, liver, and kidneys. A strong meat bouillon is also popular.

5.11.15.4. Employment

Small enterprises comprise less than 10% of the economy, and include reindeer herding and the production of fur and leather handicrafts. Mining is the largest enterprise in the area, although the mining complex of Norilsk is not part of the Okrug. The port facilities at Dudinka, however, are within the Okrug. Mining is also the main polluter of the region, releasing large amounts of heavy metals and sulfur dioxide into the air.

The reindeer population of the Okrug included 595 000 wild reindeer in 1990, which had been reduced by hunting from 650 000 reindeer in 1985. Hunting of wild reindeer is an important occupation of Nganasans. The population of domesticated reindeer includes herds in the Ust-Yenisey district (44 600 animals), Khatanga (19 000), and Dudinka (13 500). The rangeland assigned to state reindeer farms covers 10 000 - 40 000 km².

In summer, the reindeer herds roam throughout the East Siberian Lowland and through the tundra of the West Siberian Plain. In winter, the herds are driven south to

forest tundra. The migration routes are 500-600 km long, and have been overgrazed, limiting the growth of the herds.

Since the opening of year-round navigation of the Yenisey River in the 1970s, combined with the construction of the Messoyakha-Norilsk pipeline, winter rangelands on the west side of the Yenisey have been inaccessible to the herders, causing the effective loss of large areas of rangeland (Shumilov 1985, Korobkova 1991).

5.11.16. Arctic districts of the Sakha Republic (Yakutia)

5.11.16.1. Geography

Five districts of the Sakha Republic fall within the Arctic. The districts are Anabarsk (population about 4000), Allaykhovsk (5200), Bulun (14 600), Ust-Yansk (31 100), and Nizhnekolymsk (11 700). These districts cover 432 300 km².

The terrain is largely tundra and forest tundra. The northern coast is lowland lichen and tussock tundra, but forest tundra begins within 100-200 km south of the coast. East of the Kolyma River, the region is a vast lowland tundra plain.

5.11.16.2. Population

The region has 66 632 residents. The Yakut population of the area is 22 255, and their traditional activities are largely similar to those of the indigenous minorities, who include the Even, Evenk, Yukagir, and Chukchi. There are 19 indigenous communities in Arctic Sakha, of which two are over 50% indigenous minorities.

5.11.16.3. Diet

Reindeer meat, fish, ringed and common seal, and birds are the main sources of food. Secondary sources of food include moose, Kolyma moose, alpine hare, ptarmigan, brown bear, whitefish, ducks, geese, Siberian sturgeon, pike, berries, roots, nuts, and herbs. In coastal areas, fish are of great importance. Inland, meats and fat are the most common food, and may be eaten fresh, roasted, barbecued, dried, or smoked. Organs are commonly eaten, including liver, kidneys, lungs, and bone marrow. Evens are known for eating the intestines and blood sausage of reindeer. Soups are also popular.

5.11.16.4. Employment

Reindeer herding is the main occupation of indigenous minorities of Arctic Sakha, especially for Evenks and Chukchi, and commercial hunting and fur trapping are also important, especially for Yukagirs. Northern Sakha produces one-third of Russia's Arctic fox pelts.

Fishing is also important, as several Evenk and Yukagir villages are located at good fishing sites in the forest tundra zone. Coastal people are involved in fishing and marine mammal hunting.

Small enterprises account for less than 10% of the regional economy. Fires have destroyed reindeer range and migration routes, damaging the economic capacity of the area, which is a significant concern in Sakha. The major industry of the area is mining, especially tin and polymetallic ores. This is also the chief, though relatively small, source of pollution in the area (Korobkova 1991, Simchenko 1992, Khatilayev 1993).

5.11.17. Chukotka Autonomous Okrug

5.11.17.1. Geography

The Chukotka Autonomous Okrug is 737 700 km² in area, encompassing forest in the west, tundra in the central and northern areas, and mountainous terrain on the eastern end of the Chukchi Peninsula.

5.11.17.2. Population

There are 163 934 residents of the Okrug. The administrative center is Anadyr, with a population of 15 200, of whom 10% are indigenous. There are 40 indigenous communities in the Okrug, of which 23 are over 50% indigenous.

The indigenous peoples of the Okrug include the Chukchi throughout the Okrug, Eskimo (Yupik) along the eastern coast, Even in the western areas, Chuvan in the southern parts, Koryak in the south, bordering the Koryak Autonomous Okrug, and small numbers of other groups.

Of indigenous Chukotkans, 30% live in sedentary villages along the coast, and the rest are involved in inland reindeer herding activities.

5.11.17.3. Diet

The traditional diet varies between coastal dwellers and inland reindeer herders. The reindeer herders' diet in winter, from October to May, is mostly reindeer, eaten fresh, dried, boiled, or frozen. In summer, their diet includes fish and marine mammal meat and fat, which are obtained from coastal people in exchange for reindeer meat. Coastal dwellers eat marine mammals, eaten fresh, dried, boiled, and frozen, and fish throughout the year, as well as reindeer meat from inland. Marine mammal meat and blubber are often aged, and also seasoned with wild plants. Subsistence hunting in the Okrug produces six to eight thousand tonnes of meat per year, as well as one thousand tonnes of fat (i.e., from terrestrial mammals) and blubber (i.e., from marine mammals).

5.11.17.4. Employment

For the Chukchi, the main occupations are reindeer herding, terrestrial and marine hunting, and producing ivory and fur handicrafts. For the Eskimo (Yupik), fur farming, marine hunting, and fishing are the chief occupations. Small enterprises account for 15% of the economy, and mining is the major industry.

The large state farms in Chukotka are being dismantled, replaced by individual farms, family communities, cooperative, and other non-state-owned ventures. During this reorganization, reindeer herding has suffered. In 1989, there were 500 000 reindeer in the Okrug. By 1993, the population had declined to 400 000 of which 30 000 were privately owned. The reindeer in the Okrug are of two types. Tundra reindeer are smaller, with more fat, averaging 80-120 kg. In the west, the forest reindeer are taller, with less fat, and weigh up to 130 kg. There are a total of 420 000 km² of reindeer rangelands, including 60 000 km² of winter ranges. The total carrying capacity of these lands is estimated at 550 000 reindeer.

The Anadyr district is important in reindeer breeding, having one-third of the Chukotka stock. The Bering district is the only one that is self-sufficient in meat production, although adequate winter grazing range is problematic. The Bilibino district has one-quarter of the Chukotka stock, but tundra fires in 1991 caused severe problems, and today the district has trouble producing sufficient meat for its needs (Golubchikova 1985-94, State Committee of the Russian Federation for Statistics 1993, Kotov and Kononov 1995).

5.12. Development and the future

While environmental contaminants pose a potential threat to the survival of indigenous peoples and their cultures, in many areas there are more immediate concerns for the future of the peoples of the Arctic. These cultures are often vulnerable to social and economic changes of modern life. While this section does not presume to address this complex issue, it is important to bear in mind that indigenous ways of life are changing rapidly, and that such change is often beyond the control of the peoples themselves.

It is necessary to protect traditional lands and waters, hunting rights and methods, and other cultural practices to ensure that the residents of the Arctic, individually and collectively, can determine their own future. A number of nations have enacted legislation designed to provide some of these protections, but implementing these laws can be difficult, and some contain provisions that have had unintended consequences detrimental to the interests of the peoples they seek to protect (Minority Rights Group 1993).

Many of the changes now taking place in the Arctic have improved the lives of indigenous peoples, through greater economic opportunity, better medical care, and the beneficial aspects of modern technology. These changes can bring with them dangers of social and cultural disruption, and it is essential that indigenous peoples have the ability to take part in all matters that affect them, and to make the final decisions regarding their own futures. This is as true with environmental contaminants as it is with hunting rights, land claims, and self-governance.

The various aspects of a way of life cannot be separated from one another, but must be addressed as a complex system in which each part is tied to all other parts. Examining the impacts of contaminants in isolation from other changes prevents both an understanding of their true impacts and the possibility of achieving a lasting solution to the problem. Thus, future work to address the problems of contaminants in the Arctic must also consider the full story of the lives of Arctic residents, and must draw on this experience in efforts to avoid damage caused by these insidious threats to their future.

One threat to the future of indigenous peoples deserves special attention in this section. Industrial development, if done without consultation with local residents, can have a devastating effect on both local ecosystems and local patterns of resource use. Such large-scale development often takes place on hunting lands and waters, cuts across migratory paths, and forces the relocation of settlements or camps. These, in turn, can alter hunting, fishing, and herding patterns by changing peoples' ability to reach areas, or by changing the patterns of the game in areas that are used.

This type of development, usually associated with mining, oil and gas, and hydroelectricity, is increasingly common throughout the circumpolar North. As southern resources are used and new technologies are developed, northern areas are becoming more attractive for development. This trend includes remote areas, which often harbor the most traditional indigenous communities remaining. Roads to these areas increase access by outsiders, and help speed social and economic change. While economic opportunities may come with development, the benefits to the local communities are often small.

For development to co-exist with indigenous cultures, there must be close cooperation between the developers and local residents, and the local residents must be able to make meaningful decisions about matters that affect them.

5.13. Indigenous knowledge and environmental contaminants

Indigenous peoples are keen observers of the natural environment, and are acutely attuned to small ecological shifts. Recently, there has been great interest in applying this expertise in a number of Arctic environmental arenas, especially wildlife management (Brooke 1993). There has also been interest in exploring the potential applications of indigenous knowledge to research concerning environmental contaminants.

To date, there has been relatively little research done on this topic, and the observations and knowledge of indigenous peoples have been largely ignored. Some studies and discoveries have developed from phenomena first noted by indigenous people. However, there have been few systematic attempts to document what is known to the elders, hunters, herders, gatherers, and fishermen of the Arctic in order to see whether this collective knowledge can shed light on the shared concerns of scientists and residents.

In the course of preparing this assessment, AMAP conducted a survey of available literature and other sources to determine whether available indigenous knowledge could add to the report. Apart from the few instances where such knowledge has led to discoveries such as Arctic haze, there is little available at this time, primarily because the basic research to document this knowledge has not yet been conducted. This section briefly outlines some methods by which indigenous peoples and their knowledge can contribute more directly to future work.

In September 1994, the Government of Iceland hosted the Seminar on the Integration of Indigenous Peoples Knowledge, designed to provide substantive recommendations to the Arctic Environmental Protection Strategy (AEPS) and its programs, including AMAP. The recommendations included the following:

- Indigenous Peoples should be involved in the scientific monitoring of pollutants and contribute their observations on pollution effects. Indigenous participation can in many cases fill gaps in the AMAP monitoring program and can provide on-site and continuous monitoring effort which is also of value in climate change studies.
- Indigenous perceptions of risk need greater attention by AMAP and government authorities. Information dissemination and policy formulation must take into account different cultural perceptions and attitudes toward pollution and its potential effects on human health.
- Indigenous Peoples should be provided with education and training opportunities which would facilitate their participation in AMAP and the AEPS (Arctic Environmental Protection Strategy 1994).

These recommendations together describe the basic principles that must underlie efforts to involve indigenous peoples and their knowledge.

The Inuit Circumpolar Conference, in a report to AMAP, identified several specific projects which could be carried out to start including indigenous knowledge in the work of AMAP. These included:

- Documentation and analysis of observed environmental change.
- Documenting elders' observations and perceptions.
- Establishing local monitoring programs.
- Assessing indigenous perceptions of risks and impacts from contaminants.
- A program for information and communication regarding human health.

While the results of any of these projects cannot be known in advance, indigenous knowledge and the involvement of indigenous peoples is an area where greater attention is needed in future work on environmental contaminants.

5.14. Discussion and conclusions

This chapter has given an introduction to the inhabitants of the Arctic. There is great diversity of landscapes, cultures, living standards, economic opportunities, diets, resource use, and other aspects of human society in the circumpolar north. This diversity is apparent among nations, as this chapter has shown, and also among communities and individuals.

While such a range of activities, ways of life, perspectives, and values is a source of vitality, it also confounds our attempts to summarize the characteristics of the Arctic population. Statistical averages may conceal widely ranging figures, and demographic categories appropriate to societies in the temperate zone may obscure important facets of life in the Arctic.

For example, the variability in dietary patterns makes generalized, quantitative analyses of dietary intakes of limited utility for characterizing individual exposure to and risk from contaminants. A qualitative assessment of intakes, combined with analyses of contaminant burdens in specific foods, can, however, lead to more focused analyses of particular dietary patterns of concern.

Similarly, employment and income statistics often imply great disadvantages for Arctic residents. While this impression may be accurate, the statistics may not reveal an extensive and productive subsistence economy that exists outside the better-documented cash economy.

Despite these cautions, the descriptions in this chapter demonstrate certain broad similarities across the countries and regions of the Arctic. The Arctic population is, in general, young. In many regions, birth rates are high, and infant mortality is low or declining. The exception is Russia, where the economic situation has caused extensive emigration, and declining health care has led to increased mortality of all age groups.

Arctic populations typically live in close contact with the local environment. This is especially true of indigenous peoples, but also applies to many of the other inhabitants of the region. While Iceland and the Faeroe Islands have no indigenous peoples, local foods remain important dietary and cultural resources. Use of local and indigenous foods is a common characteristic of indigenous groups in the Arctic, and a wide range of animals and plants are used in this way. Meats and other animal products, especially from reindeer or caribou, marine mammals, and fish, account for the vast majority of indigenous foods.

Living standards vary by country. In North America, Greenland (compared with Denmark), and Russia, living standards in the Arctic are on average substantially lower than elsewhere in each country. Housing is in demand and crowded, and often lacks both modern conveniences and basic amenities such as running water. Jobs are scarce, and advanced schooling is available only outside the region. In the Nordic countries, this distinction is not as apparent, and Arctic populations enjoy housing, employment, and education opportunities that are similar to the overall population of each country.

As an indication of overall health, life expectancies in the Arctic areas of each country are lower than the national averages. This is largely due to high accident rates, as well as the physical and psychological stresses of the Arctic climate.

Specific diseases vary, often by ethnicity. While this may be due to genetic factors, lifestyles and diets are also important determinants of cancer, heart disease, diabetes, and other major illnesses.

Health care in the Arctic is improving, but sparse populations and long distances limit the capacities of hospitals and clinics to provide medical care at the levels expected in less remote or more densely populated areas. Again, Russia is an exception to the overall trend, as disruptions to supply lines and removal of incentives to live in the north have reduced health care capacities below their 1980s levels.

Two conclusions emerge from this review. First, while we have a basic understanding of the living conditions and lifestyles of Arctic residents, many data are lacking, prohibiting study of trends or conditions among Arctic residents that might help illuminate the potential and actual impacts of environmental contaminants. This is especially true of dietary and health data.

Second, effectively communicating information about contaminants is critical, especially in the absence of quantitative data on exposure and effects at low levels. This is a two-way process, for not only do Arctic residents have the right to good information about their lands, seas, and their bodies, they also have knowledge that may assist our overall understanding of environmental change. While many facets of contaminants in the Arctic are not well understood, gaining knowledge requires sound research and effective partnerships between researchers, policy makers, and the residents of the region.

As a final note, statistics on living conditions and lifestyles, though interesting and useful, do not reveal the vitality and resilience of the cultures of the Arctic, nor do they make clear the fragility of the links between the environment and the people. The demographic characteristics of Arctic populations are helpful in studying the impacts of environmental change, including contaminants. They are also of use in designing strategies to avoid detrimental effects from such change.

Figures alone, however, do not always show why the future of Arctic peoples depends on preventing the degradation of the Arctic environment. These are intangible or elusive matters, but they also lie at the heart of the global debate about pollution, climate change, and sustainable development. For the peoples of the Arctic, these are crucial questions today. Their lives and cultures are affected, and their daily decisions often include such previously arcane questions as the levels of industrial and agricultural chemicals in local foods such as seal and reindeer. These peoples, these societies, these cultures must be at the forefront of research and policy addressing the Arctic.

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