A Contribution to the International Polar Year

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Indigenous Peoples of Northern Russia: Anthropology and Health

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Dear readers,

We offer you now the first issue of a new publication: Circumpolar Health Supplements (CHS). The need for this type of publication was recognized already in 2004 by the International Association of Circumpolar Health Publishers, which decided in its annual meeting in 2007 to initiate the publishing of this series.

CHS is an independent publication series and publishes a wide variety of material in the field of circumpolar health and wellbeing. It is intended that the produced material is of considerable value for health care professionals and officials in circumpolar areas, or may otherwise be useful for health care development and practices in the circumpolar areas. It is planned, and depending on our clients and collaborators needs, that we will publish a varying amount of supplements annually. At this moment the first issue of the Circumpolar Health Supplements is available at the web pages of Int J Circumpolar Health (IJCH) (www.ijch.fi). This issue has also been distributed to all subscribers of IJCH free of charge. At present we are preparing to include the new supplement series in the different indexes. How to subscribe, how to conduct group orders of hard copies, and other practical issues will be detailed at the web pages of IJCH. This information will be also be indicated in the coming issues of IJCH and the next issue of CHS, which will be published in January 2008.

We are proud to publish this monograph of the anthropology and health of indigenous people as the first issue of CHS. The production of the supplement was co funded by the Nordic Council of Ministers and the International Network for Circumpolar Health Research. We would like to thank the authors, Andrew Kozlov, Galina Vershubsky, and Maria Kozlova for producing this valuable material. Our warm thanks are also forwarded to Dr. Kue Young who has markedly contributed to this project, both financially and intellectually.

Circumpolar Health Supplements

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Editor

A contribution to the International Polar Year

Indigenous Peoples of Northern Russia: Anthropology and Health

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Galina Vershubsky
Maria Kozlova

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Foreword

Kue Young
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I am delighted to be asked to write a foreword to this inaugural monograph of our new series, *Circumpolar Health Supplements*. Issue No.1 is devoted to the important topic of the anthropology and health of indigenous people in Arctic Russia by Andrew Kozlov, Galina Vershubsky, and Maria Kozlova.

Among circumpolar health researchers and practitioners, there is substantial interest in the health of Russia's northern indigenous peoples. Until now, information is greatly limited, and much of what exists is not available in English. While Russian scientists have contributed to our journal and also participated in the international circumpolar health congresses, there is no single convenient source from where one can obtain basic information about the human biology and health patterns in the Russian North. Professor Kozlov and his research team have done us all a great favour by compiling, reviewing and integrating a massive amount of scientific data into this monograph. The Kozlov team has adopted an interdisciplinary approach which regards the health of a population from a variety of perspectives, including genetics, physiology, epidemiology, economics, anthropology and history.

Much of the data presented here have been collected by the Kozlov team themselves over the years across the breadth of the Russian Federation and other parts of the former Soviet Union. Their perseverance under trying conditions and devotion to the acquisition of scientific knowledge serve as an example for us all. Furthermore, throughout their research careers, they have consistently demonstrated sensitivity towards, and respect of, indigenous people.

There is much in this volume which appeals to specialists in many fields, as well as to generalists who have a broader interest in the Russian North. The publication of this monograph is a landmark event, and its appearance as the first of the new supplement series is therefore fitting. It is our intent that future supplements will address in depth other important aspects of circumpolar health.

Preface

This book is based on the results of studies conducted in 1986–2007 with various indigenous groups of the Yamal-Nenets, Khanty-Mansi, Komi-Permyak and Chukchi Autonomous Okrugs, Tyumen, Perm and Murmansk Oblasts, Krasnoyarsk and Khabarovsk Krays, and the Republic of Buryatia. We tried to present our own data in the context of existing scientific literature on the indigenous populations of Arctic Russia. The Russian literature focusing on the physical anthropology, health and genetics of native northerners of the Russian Federation is voluminous. Unfortunately, lack of space does not allow us to provide an extensive bibliography of Russian publications. Therefore, we often refer the reader to a monograph by A. Kozlov and G. Vershubsky published almost ten years ago (1999). This monograph contains an extensive reference list of papers by Russian researchers, many of which have become out of date by now but are still useful.

Acknowledgements

This book could only have appeared with the help of many people. First of all, we are grateful to the northerners who underwent examinations within our programs with understanding, patience and often sincere interest. We owe a special gratitude to our fellow travellers on our expeditions: V. Akhmatov, T. Anttinen, L. Bogoslovskaya, Yu. Chernenkov, G. Chistikina, D. Dorzhieva, T. Grozdova, F. Di Giacomo, S. Kudryashov, D. Lisitsyn, A. Novelletto, M. Otavina, A. Sajantila, A. Sheludkov, A. Sokolov, A. Topunov and E. Varshaver. Without their contributions, we would have been unable to obtain the data that forms the basis of this book.

L. Bogoslovskaya, S. Borinskaya, V. Datsyshen, D. Lisitsyn, T. Mäkinen, A. Nemtsov and A. Topunov critically reviewed particular sections of the manuscript at different stages of its preparation. Their criticisms and recommendations have been accepted with gratitude, although not all of them were used in the final version of the text.

P. Orr (University of Manitoba) helped us immensely in locating materials published in Canada, the U.S. and Europe. We are extremely grateful to her for her care and attention.

We owe a debt of gratitude to Juhani Hassi and Tiina Mäkinen (International Journal of Circumpolar Health and University of Oulu) for their patience and help in raising invaluable funds for this publication.

Kue Young (University of Toronto) took immense trouble to transform the original text — which, in accordance with the traditions of Russian scientific literature, consisted of tedious and complicated passages full of latent meanings and innuendoes — into a more harmonious and neat product comprehensible even to native English readers (as the reader may have already guessed, this particular paragraph was not edited by Kue).

Many thanks to all of you!
As for any mistakes and discrepancies found in the book, all responsibility for these rests solely with the authors.

Introduction

It has become a tradition for modern public health services to rely on using normal standards that are based on the anatomical, physiological and biochemical parameters of an average "Reference Man." However, in populations whose medical and biological characteristics obviously differ from the average person, these conventional norms frequently fail to distinguish between "the healthy" and "the sick." The peoples of the Far North, continental Siberia and the Far East of the Russian Federation (RF) — all in all more than one million individuals — belong to such medically specific groups. The formation of an anthropological specificity of the indigenous population of the high-latitude areas in Russia was a process that took many centuries. The biological adaptation to the conditions of subarctic, continental and monsoonal environments led to the formation of specific adaptive complexes. By their morphological, physiological, biochemical and endocrinological characteristics, the representatives of corresponding populations differ not only from the natives of the temperate climatic zone but also from one another.

In terms of social ethnography, the indigenous peoples of the Russian Federation's Far North (hereafter referred to as the RF North) are ethnic minorities surrounded by considerably larger ethnic groups. Some of the northern peoples number just a few hundred, while the populations of larger groups number in the tens of thousands. Naturally, the intensity and, quite often, the direction of population-genetic and social processes in such numerically different groups also differ.

Some of the populations in our study (Mansi of the Sosva, Komi-Izhems, Northern Khanty and Nenets) represent more or less distinct isolates. Their "isolation" is supported by their cultural originality, as well as by the presence of some geographical barriers hampering active penetration by other ethnic groups into their territories. These barriers include long distances between national settlements and larger populated areas, lack of roads and so on. As the geographical isolation of small ethnic groups decreases (as in the case of the Nanais of the Sikachi-Aljan and Troitskoye villages of Khabarovsk Kray, or the Saami and Komi-Izhems of the Lovozero village of Murmansk Oblast in our research), the degree of their cultural and genetic assimilation grows.

An important characteristic of cultural assimilation is the degree to which "modernization" is affecting their life-style. The pressure of sociocultural stress accompanying this "westernization" appears to be very painful for the native northerners. Besides regulating the interrelations of community members, the social arrangement of traditional Arctic communities also creates an optimal balance with the environment. Therefore, the human infringements on the Arctic's natural environment in the "new industrial development areas" result not only in eco-catastrophes but also in social reorganization.

Today, the nomadic and semi-nomadic groups still maintain a way of life that is close to tradition and is based on reindeer herding,

hunting and fishing; and the same is true for the populations of the outermost "national" or "ethnic settlements" (in our research these are the Khanty, Mansi, Nenets and Komi-Izhems of Western Siberia). The life-style of the same ethnic groups constantly residing in relatively large settlements, however, is becoming quickly "westernized," even though an appreciable part of its "northern specificity" remains. Urbanization that naturally included the northern regions of Russia (by 2002, the share of urban population among the 26 numerically small peoples of the RF North reached 28%), is radically changing the northerners' way of life and world outlook.

Our study takes in diverse ethnic, geographical and social groups of native northerners of different ages — from newborns to middle-aged and elderly people. Together with the data of other researchers, these materials will give the reader an idea of the medical and biological specificity of the indigenous peoples of northern Russia.

Notes on Terminology

First of all, we would like to note that we are using the terms "indigenous," "native" and "aboriginal" interchangeably. In most cases, these terms agree with the formal definition of "the indigenous, numerically small, peoples of the North, Siberia, and the Far East," but in this book we suggest a somewhat broader interpretation of the term "native northerners" (for more details, see the next section).

Secondly, we would like to refer to the administrative and geographical division of the territories we are going to discuss. Climatic and landscape zones of the Russian North do not coincide either with territorial-administrative units of the Russian Federation or with the administrative units having the status of the "Far North districts and equivalents." According to the constitution of 1993, the Russian Federation is divided into more than 80 territorial-administrative units, with the designation (in descending order of autonomy) of *respublica* (republic), *kray*, *oblast*, *avtonomnyj okrug* (autonomous okrug or AO) and *rayon* (district). In this book, kray, oblast, okrug and rayon are used as Anglicized terms (with "s" added to form the plural).

Before 1980, AOs were referred to as *natsionalnyj* ("national" or, more appropriately, "ethnic") *okrug.* The formation of okrugs began in the period 1929–1932. It was an attempt to find a compromise between the need for industrial development of the territories and the support of native northerners engaged in traditional spheres of the economy. Administratively, an autonomous okrug is part of a kray or oblast, and it formally represents the traditional territories of some indigenous ethnic groups. However, due to an intense inflow of migrants to the North, the share of indigenous northerners in the okrugs declined rapidly and reached 4.4% by 1989. Today, the population structures of autonomous okrugs do not differ from other administrative units of the Russian Federation. Therefore, there are also "territories of primary residence of indigenous, numerically small peoples" within the okrugs (as well as within the republics, krays and oblasts). Most often, however, indigenous peoples do not make up the majority of populations even in these "territories of primary residence."

Defining the Russian North

The Russian North (*Sever*) stretches across the Eurasian landmass. The European North of the country extends from the Kola Peninsula to the Ural Mountains. "Siberia" (*Sibir*) as a geographical term is generally used to refer to all of Russia east of the Urals and sometimes, in a more restricted sense, excludes the Far East. In this book, the focus is generally on those parts of Russia located above the 60° N latitude, but the formal definition of the "North" in Russia can be problematic.

Decision No. 1029 of the USSR Council of Ministers adopted in 1967, and a number of statutory acts that followed, defined the "Far North districts and equivalents" in terms of awarding residents certain special privileges such as higher wages, longer duration of paid vacation, and so on. There are anomalies under this concept of the Far North. For example, the whole Khanty-Mansi AO has the

Table I. Linguistic affiliation, official and other names, and population of 26 indigenous numerically small peoples of the North, Siberia, and the Far East of Russian Federation.

Language family/branch	Official name of ethnic group	Other names	Population in RF (based on 2002 Census)
Altaic			
Tungu	Evenks	Tungus	35,527
	Evens	Lamuts	19,071
	Nanais	Golds	12,160
	Negidals		567
	Oroki	Ulta	346
	Orochi		686
	Udege	Kekar	1,657
	Ulchi	Mangus	2,913
Turkic	Dolgans		7,261
	Tofalars	Karagas	837
Uralic			
Samoyed	Enets	Yenisey-Samoyeds	237
	Nenets	Yurak-Samoyeds	41,302
	Nganasans	Tavgi-Samoyeds	834
	Selkups	Yenisey-Ostyaks	4,249
Finnic	Saami	Lopars	1,991
Ugric	Khanty	Ostyaks	28,678
	Mansi	Voguls	11,432
Chukotko-Kamchatkan (Paleoasiatic)			
Northern	Chukchi	Lauravetlans	15,767
	Koryaks		8,743
Southern	Itelmens		3,180
Eskimo-Aleut			
Eskimos	Siberian Yupik		1,750
	Aleuts	Unangan	540
Language isolates			
	Kets		1,513
	Yukagirs	Omoks	1,509
	Chuvans		1,087
	Nivkhi	Gilyaks	5,162

status of "the equivalent of Far North," while only three rayons of the Komi-Permyak AO have the same status, even though the whole Komi-Permyak AO lies almost on the same latitude on the other (European) side of the Urals.

According to the 1996 federal law, *On the Bases of State Regulation of Social and Economic Development of the North of the Russian Federation*, the indigenous, numerically small peoples (*korennye malochislennye narody*) of the North, Siberia and the Far East are those "living on the territories of traditional residence of their ancestors, adhering to their original way of life, and believing themselves to be independent ethnic entities; their total number in Russia is less than 50 thousand people." Between 1926 and 1993, this group included 26 peoples of various origins and languages (see Table I). As the names of peoples have changed repeatedly, Table I identifies both the modern and the most widespread old names that readers may come across in various publications. Numerically small peoples living in the Far East (Orochi, Oroki, Nanais, Negidals, Nivkhi, Udege and Ulchi) are often united in the group of "peoples of Amur and Sakhalin."

Since 1993 the list has expanded considerably. By 2000, 40 groups had been recognized and they were included in the 2002 Census. Many among the 14 new groups are resident in the southern parts of Siberia; some have been united with other groups. In 2005, the forty-first group, the Izhma Komi (or Komi-Izhems; population 15,607) in the northern Komi Republic, Kola Peninsula, and Western Siberia, was accorded this status.

According to the 2002 census, the total number of people in the original 26 ethnic groups mentioned above was 212,489 individuals, whereas the sum of all 40 numerically small peoples of the North, the Far East and Siberia totaled 279,794.

It is impossible to evaluate changes in the population size and other demographic parameters of the newly included peoples (before 2002, censuses did not record if individuals affiliated themselves with them). Therefore, in this book we analyse only the demographic data of groups listed in Table I.

There are also ethnic groups residing in the North who are considered neither indigenous nor numerically small (i.e., <50,000) but are nevertheless ethnic minorities within Russia. They are the Komi (the total number in Russia is 293,406 people; the share of Komi in the Komi Republic population is 25.2%), Komi-Permyaks (125,235 or 59% of the Komi-Permyak AO population), Yakuts (443,852 in Russia, 45.5% of the Sakha-Yakut Republic population) and Buryats (445,175 peopleor 27.8% of the Buryat Republic population). The representatives of these groups are also included in our analysis. The main residence areas of these ethnic groups are shown on the schematic map in Figure I.

Biocultural Diversity of Indigenous Peoples

It should be emphasized that "the indigenous, numerically small peoples of the North, Siberia and the Far East" is just a political term embracing peoples that are very diverse in their origins, languages and cultures. The data in Table I give us some idea of the

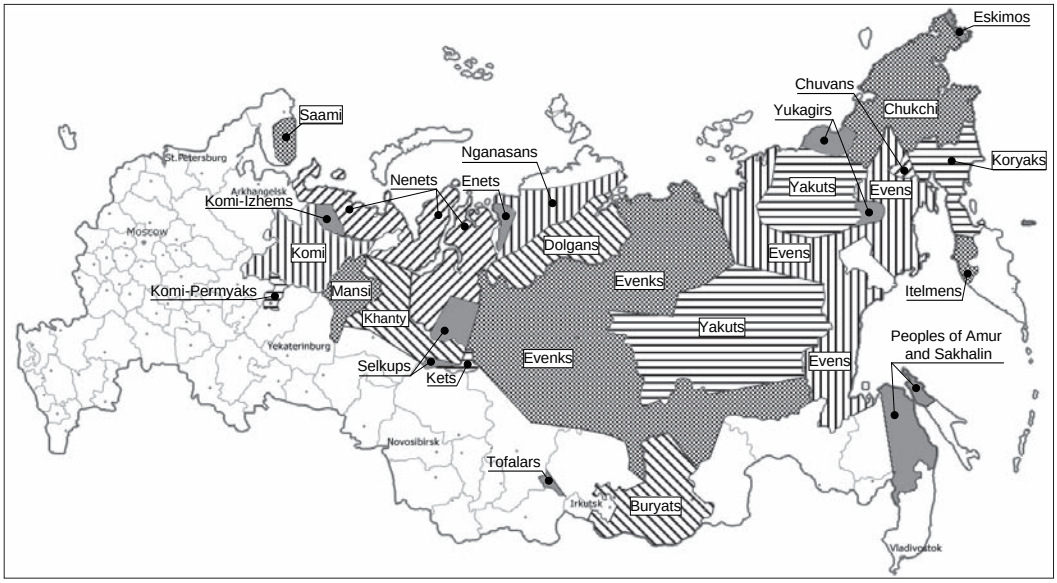

Figure I. Geographic distributions of indigenous peoples of the North of the Russian Federation.

linguistic diversity of the groups in question. The Komi and Komi-Permyaks who are not included in Table I belong to Finno-Ugric, the Yakuts to Turkic, and the Buryats to the Mongolian branch of the Altaic family of languages.

The anthropological diversity of the peoples of northern Russia becomes apparent in the classical features of physical anthropology (the specificity of facial and cranial structure, the body proportions and so on — see Alexeev and Gochman, 1983), and also in genetic characteristics — from blood group distribution by the ABO system to mt-DNA and Y-chromosomal lineages (Jobling et al., 2004). These differences are not just theoretical; they are of medical interest too. For example, by the frequencies of determinate alcohol metabolism *ADH1B*47His* allele, the Orochis resemble the Yakuts, Buryats and the peoples of South Asia more so than such northern natives as the Chukchi and Siberian Yupik.

No less diverse are the cultures of peoples living in the RF North. Even the inhabitants of the circumpolar zone, whose traditional economy was almost exclusively based on animal resources, practised various patterns of nature management. Following are descriptions of these resource-based cultures.

Maritime hunters: The Eskimos, Coastal Chukchi and Koryaks lived in permanent settlements consisting of dugouts or ground dwellings with a frame made of whale bones. They engaged in seasonal seal and walrus hunting on ice and on rookeries, whale hunting from skin boats (*baydara*, akin to the Inuit's *umiak*). Seal and walrus skins were highly valued for their versatile uses, such as in making dog harness straps, *baydara* covers and footwear.

Tundra reindeer hunters: The economy of the Tundra Yukagirs, Evens, Nganasans, Tundra Enets and some Saami groups was widespread across the north of Eurasia in

ancient times. Initially, permanent settlements originated next to where migrating wild reindeer herds crossed rivers, thus making it easy to organize big seasonal hunting with boats and nets. Meat was processed so that it could be kept either dry or frozen. Later, various hunting schemes were developed, including those with domestic draught reindeer, decoy reindeer, mobile camouflage shields and firearms. Tundra reindeer hunters lived in dugouts, semi-dugouts and (in the summertime) portable conical huts (called *chooms*) made of pole frames covered with reindeer skins.

Taiga hunters and fishermen: Their economy was based on reindeer, elk and mountain sheep hunting, and also fishing in rivers and lakes. With the spread of reindeer herding, many groups became semi-nomadic or nomadic. They changed their seasonal camps or moved along a circle route (part of the Yukagirs, Evenks, Evens, Enets and certain Saami groups). However, reindeer herding provided a means of transportation while the basic source of meat and skins was still wild ungulates. The Khanty, Mansi and Kets settled on riverbanks and used artificial fences (*abatis*), crossbows and hunting pits for hunting.

The dwellings of the nomadic groups were the *chooms*, covered with deer skins in winter and birch bark in summer. The settled groups lived in dugouts and semi-dugouts of various design, and later on in log huts (Khanty, Mansi, Okhotsk Evens).

Reindeer herders: Their economy was based on tending large reindeer herds that numbered in the hundreds of thousands. They constantly drove their herds to new untrampled pastures. Some groups (Saami of the Kola Peninsula, Nenets, Enets) made seasonal trips from the taiga zone to the tundra and back, while others (Chukchi, Koryaks) left the tundra for the sea coast in the summer.

Large-scale reindeer herding developed throughout northern Eurasia, although it probably originated independently in different areas, and it developed comparatively late — in many areas in the seventeenth and eighteenth centuries. Population growth and migration of peoples in this period resulted in a reduction of the wild deer population. Social stratification helped concentrate reindeer herds in the hands of individual owners. These factors led to a reorientation of the economy from herding wild reindeer to herding domesticated reindeer. Not only were their pastures overtaken by domesticated herds but wild reindeer also suffered further depletion as a result of intensive hunting.

Reindeer herders exerted a strong cultural influence on hunters, especially tundra hunters. Almost all hunters began using reindeer relays, wearing the outer clothing of reindeer herders (*malitsa*, *sokui*, *kukhlyanka*) and living in folding dwellings covered with deer skins. Even those groups that continued their hunting way of life became much more mobile.

Those peoples inhabiting areas to the south of the circumpolar zone were mostly oriented towards the "non-Arctic" type of economy. But even for the Komi and Komi-Permyaks — whose contacts with Russians began at least in the twelfth century and who practised slash-and-burn agriculture as early as the tenth and eleventh centuries — traditional nature management was always closely connected to their habitation in the forest-taiga zone. Cattle

breeding, although common in these groups, was inefficient at best. Until the beginning of the twentieth century, the economy of the Komi was largely focused on hunting, fishing and using forest resources, including gathering and storing berries, mushrooms and wild-growing plants. Emphasizing the traditional ties of the Komi-Permyaks and the Komi with the forest zone, the ethnographers of the latenineteenth century described them as "the foreigners of forests" (*inorodtsy lesov*).

The northernmost group of Komi, the Komi-Izhems, is characterized by an expressed specificity. Historically, their residence has always been centred in Izhma village (65°32' N, 53°55' E). In the second half of the seventeenth century, the Izhma Komi began to practise reindeer herding, which they adopted from their neighbours, the Nenets. The reindeer herding of the Komi-Izhems soon developed into a specific type of commodity economy, which, in turn, influenced the nature management of other peoples of northern Europe and Western Siberia — the Saami, Khanty and Nenets themselves. By the late nineteenth century, the Izhems became the major reindeer herders in northern Europe. In search of new territories for pasturing reindeer (each owner was in possession of a herd numbering about 2,000 head), groups of Komi-Izhems moved in the second half of the nineteenth century to Kola Peninsula and to the territories of modern Khanty-Mansi and Yamal-Nenets AOs, where they continue to live today.

The traditional occupations of the Yakuts, carriers of cultural traditions of the population of the South Siberian steppes who had settled far into the North, were cattle breeding and horse breeding (in Russian documents of the seventeenth century, the Yakuts were called "mounted people"). Horses were used for riding and as pack animals, while bulls usually served as draft animals for sledge. Fishing was widespread and became the main occupation of the poor (in the above-mentioned documents the term "fisherman" was used to mean "a poor man"). In the northern areas, reindeer herding and hunting were popular. Until the mid-nineteenth century, agriculture remained underdeveloped, but the harvesting of wild-growing plants and berries was wide spread. The Yakutia, on whose territory the "cold pole" of the northern hemisphere is located, is characterized by extreme temperature differences between winter and summer: in January it is –50°C, and in July, +19°C.

The Buryats, whose ancestors settled on the territories west and east of Baikal Lake as early as the Neolith and Bronze Ages, became a part of the Mongolian Empire of the Chingizides in the early thirteenth century. The Buryat's spiritual and material culture represents a local variant of the Mongolian culture, with rich oral and written traditions and advanced fine arts. From the seventeenth century onward, alongside traditional Shamanism, Buddhism (in the form of Lamaism) began to acquire popularity among the Buryats. Like the numerically small peoples of the Amur and Sakhalin, the Buryats represent one of the "southernmost" groups described in this book (the geographical coordinates of Ulan-Ude, the capital of the Buryatia Republic, is 51°50' N, 107°38' E). However, Buryatia, as well as Yakutia, is located in a zone of sharply continental climate with the yearly difference of mean temperatures of 40° (January,

–22°C and July, +18°C), which presents a serious challenge for the adaptation potential of a human body. The prevailing branch of the Buryat traditional economy was cattle breeding, which was typically Mongolian or nomadic in Transbaikalia, and semi-nomadic to the west and southwest of Baikal. Fishing and hunting were of subsidiary importance. After Buryatia was annexed to Russia in the seventeenth century, agriculture began to develop in the area, although some Buryat groups had been cultivating land even in the Middle Ages.

The annexation of northern peoples to the Russian state continued for many centuries. The management of linguistically and culturally diverse populations required specific politics. Therefore, as early as in the seventeenth century a specific practice of governing Siberian peoples and collecting a tribute (*yasak*) from them began to take shape. Suitable rules and laws soon spread throughout the territory of Siberia and, basically, held out until the nineteenth century. At that time, special laws were passed to preserve the natives' economic well-being and way of life and to protect them against the arbitrariness of Siberian authorities and fur traders. In 1822, the Charter or *Regulations on Governing Indigenous Peoples* was proclaimed, on which was based *The Statute of the Indigenous Peoples* (1892), which operated up until the Revolution of 1917.

During the Soviet period, the laws changed, but essentially the policy of the state towards the indigenous population of the North retained its imperial orientation. The ethnic policy of the state in the northern territories of Russia in the twentieth century largely defines the problems the northern natives encounter today.

CHAPTER 1

DEMOGRAPHY AND ETHNICITY

Ethnic policy in northern Russia

In tsarist Russia during the late –nineteenth and early twentieth centuries, gradual assimilation of the many non-Russian peoples in the empire was an officially agreed upon and widely accepted policy. Both the political opposition and pro-government circles supported the idea. As the primary goal was cultural and linguistic assimilation, the Russian national policy of that time may be described as acculturation.

It should be pointed out that Russia achieved the colonization of the Far North and Siberia generally without the use of overwhelming military power (Vakhtin, 1992; Fortsyth, 1992). The operations of the Cossack units on their way "towards the sun" cannot be compared with the scale of the conflicts between the Spanish Conquistadors and the Indians in Central America. The tsarist government, the local administrative authorities and the traders had no interest in the destruction or even the enslavement of the indigenous peoples; rather, they wanted to make them good tribute-payers (Vakhtin, 1992). Assimilating the diverse ethnic groups was, therefore, more productive.

In the late nineteenth and early twentieth centuries, ethnographers, anthropologists and travellers had different attitudes towards the imperial assimilation policy, but they were generally in agreement about the intensity of the process.

During the Soviet era, V. I. Lenin's works served as the theoretical basis for all national policies, including the policy concerning "numerically small peoples of the North." His article "Critical Remarks on the National Question," written in 1913, promoted the idea of assimilation. However, as S. Cheshko (2000) fairly pointed out, although Lenin considered ethnic assimilation as an impending reality for humanity and even considered it as one of the

ultimate goals for socialism, he did not assign the "fusion of nations" as a practical task to be accomplished urgently and by force.

After Soviet power had been firmly established by the end of the 1920s, the official policy concerning the indigenous peoples became increasingly restrictive. Despite the stout resistance of major ethnographers, it was the accepted official view that indigenous peoples were no different socially and culturally from the rest of the country, except for their "backwardness" and their "inability to conceive even the elements of culture" (for a review of the history of this issue, see Vakhtin, 1992).

As it was recorded in the minutes of the 12th Congress of the All-Russia Communist Party (Bolsheviks),

> [the small peoples], which have not or nearly have not come through capitalism, and have not or nearly have not their own proletariat, and therefore fell behind in their economy and culture, are incapable of exercising fully the rights and responsibilities of national equality, and they are incapable of moving up to the highest stage of development and thus catching up with the advanced nationalities, without an effective and long-term help from outside.

This "help from outside," which introduced modern medicine, education and other undoubtedly positive components, also resulted in the disruption of social, spiritual and economic traditions as well as the transformation of the administration of northern indigenous peoples. The attitude of the Soviet state towards the northern peoples in essence did not differ from the cultural imperialism practised by the western European states in their colonies. What was unique about the Soviet model was its ideological basis, as well as the fact that cultural integration should be achieved in the frame of a united society and not just for the purpose of adapting to the needs of the metropolis. On the whole, Soviet ethnic policy practised along the northern frontiers of the state was quite in accordance with the "European convictions" of those times (Cheshko, 2000).

Providing such "help from outside" for the numerically small peoples of the North and Siberia, and also for the "reclamation of new land for industrial purposes" (a cliché commonly used by Soviet newspapers), have resulted in a massive inflow of people belonging to many different ethnic groups. In less than 10 years, between 1926 and 1935, the proportion of indigenous peoples in the northern okrugs with nominal "autonomous" status dropped from 56 to 35% (Vakhtin, 1992).

The population size of various ethnic groups in the Russian North has changed over time, often reflecting changes in the extent of self-identification with a specific group within an environment of intense assimilative pressure and widespread inter-ethnic marriages. There were also instances where official actions may have resulted in an entire group suddenly disappearing from the ethnographic map of the country.

It has happened to the Enets, for example. The Enets population has never exceeded several hundred people. Yet, in the 1930s, the official records arbitrarily stopped registering Enets altogether. The name of the ethnic group, and consequently the possibility of declaring to belong to it, was not restored until 1989, when 103 persons registered themselves as Enets. By 1992, the number of self-identified Enets grew to 209. After five decades of official non-existence, the Enets have managed to come alive as a people again because they persisted in preserving their ethnic identity.

Ethnic identity, language and acculturation

The history of the Enets demonstrates that the intensity of assimilation (and the success of countervailing it) does not depend on the size of a minority group alone. What is important is ethnic self-consciousness, which is maintained by retaining the use of the language and keeping national school programs, newspapers, books, TV and radio broadcasts alive.

The Komi-Permyak Autonomous Okrug (KPAO) offers an example. (Note that as of December 2005, KPAO was absorbed into the new administrative unit of Perm Kray.) A study among different groups of Komi-Permyaks showed that in 1992 the proportion of respondents identifying themselves as "100% Komi-Permyak" was 1.5 times higher among rural residents in the southern parts of the KPAO (55.4%) than in the northern parts (34.6%) (Sabaev et al., 1994; see Table1.1)

The difference was to a large extent conditioned by historical events. Since the eighteenth century, the extent of contact between Komi-Permyaks and Russians was more intense in the north and north-eastern parts of the present-day territory of the KPAO. It was reflected in the geographic locality of the main administrative centres, which were situated in the towns of Cherdyn and Solikamsk. Consequently, the Komi-Permyaks there were more heavily Russified both culturally and linguistically. Many state-run logging companies (*lespromkhos*) were also located there, as well as the labour camps and colonies of the GULAG system of the 1930s to 1950s. Some of the GULAG's former prisoners settled in this area after their formal release. All of this resulted in a relative decrease of the Komi-Permyak population. The Komi-Permyaks accounted for only 35% of the population of Gaynsky rayon (in the north of KPAO), while they constituted 87% in Kudymkarsky and 54% in Yusvensky rayons located in the southern part of the okrug (Sabaev et al., 1994). Only the active promotion of interest in the ethnic culture at the end of the 1980s managed to slow down the intensive assimilation and acculturation of the Komi-Permyaks (Lallukka, 1995).

Acculturation poses a threat to the culture and identity of many indigenous peoples in the North. One of the markers of acculturation is the loss of native languages. Unfortunately, only the censuses which were conducted before 1989 provided data on linguistic diver-

Table 1.1. Ethnic self-identification in different groups of Komi-Permyaks (per cent).

Self identification	Residents of Kudymkar town	Rural residents		All respondents
		South of KPAO	North of KPAO	
Komi-Permyak	22.6	55.4	34.6	37.9
Equally Komi-Permyak and Russian	31.1	14.3	14.9	20.0
More Russian than Komi-Permyak	17.9	5.4	21.8	14.7
Citizen of the Russian Federation	23.6	20.5	26.7	23.6
Other	4.7	4.4	2.0	3.8

Source: Sabaev et al.1994

sity. As these censuses show, the proportion of northern indigenous peoples who used a native language as their primary language had been decreasing constantly until 1990 — from 76% in 1959 to 52% in 1989. This situation arose as a result of the influx of non-indigenous newcomers and because of the language policy of the Ministry of Education, which stipulated that Russian was the language of instruction in schools. As a consequence, native languages were only taught in special classes at the elementary school level.

Yet Russian has never ever been declared an official language. Formally, the USSR had no official language at all. In practice, the unity of the state required a means of communicating among its multiple ethnic groups, and Russian played that role naturally. As Russian was the de facto language of the authorities and taught to children in schools, it eventually became regarded as being "uncivil" to speak a native language. Only 45% of Khanty and Mansi with university degrees could easily speak their native languages, while the proportion was 70% among those with only a basic education. Better skills in native languages were retained by elderly people of low social activity and by those engaged in traditional economies. For example, 34% of Mansi and 80% of Khanty hunters and reindeer herders spoke their native languages fluently, while only 10% of those engaged in service trades could (Kharamzin and Khayrullina, 2002).

A "language gap" thus exists between generations. When we were working in Western Siberia, we often witnessed how grandparents and grandchildren, when talking to one another, needed the assistance of a middle-generation family member as an interpreter. This situation is catastrophic from the cultural inheritance perspective, as many traditions are skipping a generation and being handed over from grandparents to grandchildren.

Nowadays, as our study has shown, only 3% of Mansi and Khanty students use their native languages when communicating with their peers (friends, fellow students), while 91% prefer Russian. The preference for Russian is quite natural for these students, who are actively adjusting to the "modernized" urban environment. However, native languages succumb to the dominance of Russian even in the sphere where they usually have a very strong position: in everyday family life. Eighty-three percent of Kola Saami students questioned in 2005 regarded Russian as their first language. For family communication, the vast majority (81%) of young Khanty and Mansi use Russian exclusively, 12% communicate in both Russian and their native language and only 4% prefer their native language.

It is necessary to emphasize that the language situation in the Russian North is by no means uniform — it varies considerably from region to region and from ethnic group to ethnic group (Vakhtin and Ljarskaya, 2004). N. Vakhtin distinguishes eight levels of linguistic assimilation in the North, depending on how the language is used on an everyday basis in different age cohorts, the level of active and passive language knowledge, and the degree of proficiency in Russian and the languages of the dominant "numerically large" regional ethnic groups (Buryat, Yakut, etc.). Across the North, some languages like Yakutian, Komi and Tyvinian are thriving, while at the other end of the scale, some are on the verge of extinction (Aleuts, Itelmens, Kereks) and are spoken by only a handful of elderly people.

According to the reliable estimate of Cheshko (2000), in 1989 about 48% of northern indigenous peoples did not possess sufficient language skills in their native languages, ranging from 14% among Nganasans to 78% among the Orochi. We would like to emphasize that Cheshko's estimates were based on the 1989 Census, which was held before the breakup of the USSR and before the resurgence of indigenous cultures and languages which has become so popular among northerners since then. Despite a strong objection of Russian ethnologists and demographers, the questions in the 2002 Census protocol were formulated in such a way that the data obtained did not allow one to evaluate the dynamics of language assimilation in the intervening years.

Even the abandonment of a native language does not necessarily mean a decline of an ethnic group. The population size of the Itelmens and the Saami, who have practically lost their languages, actually increased between 1989 and 2002, mainly by absorbing those of mixed ancestry who had previously self-identified as Russians (Kharamzin and Khairullina, 2002; Bogoyavlensky, 2004; Vakhtin and Ljarskaya, 2004). This group generally does not speak any native languages. Thus, the ability to speak native languages and having a sense of ethnic identity are not synonymous among indigenous northerners in Russia.

Genetic admixture and ethnicity

The Kola Saami community of the Lovozero settlement in Murmansk Oblast serves as an example of the ethnic assimilation processes among indigenous peoples in the Arctic territories of Russia. According to household records, from 1969 till 1985 the number of individuals born from interethnic marriages in the Saami community increased almost threefold: from 65 to 179 (Table 1.2), while the total Saami population increased from 686 to 732. Thus the offspring of Saami/non-Saami marriages increased from 9.5% in 1969 to 24.5% in 1985.

Members of ethnically mixed families tend to prefer to identify themselves as Saami (Table 1.2). The proportion of the individuals who declared other than Saami ethnicity decreased from 40% in 1969 to only 14% in 1985.

It is possible to trace the change in genetic structure and the extent of admixture by the prevalence of traditional family names (Lasker, 1985). We compared the family names of those who identified themselves as Saami in 1970–1977, 1981–1989 and 1995 with the list of Saami traditional family names of the 1920s (Kiselev and Kiseleva, 1979).

Table 1.2. Ethnic self-identification in offspring of Saami interethnic marriages (per cent).

Ethnic self identification	1969 n=65 Saami	Other	1975 n=154 Saami	Other	1985 n=179 Saami	Other
Coincide with that of mother	29	37	35	11	62	10
Coincide with that of father	31	3	39	15	24	4
Total	60	40	74	26	86	14

The prevalence of traditional family name bearers in the Saami population of Lovozero was 55% in 1970–1977, 48% in the 1980s and 38% in 1995. The constant decline of Saami family names in the Saami subpopulation had confirmed that the Saami population was being "diluted" by other groups.

Another technique frequently used in population-genetic studies is a comparison of the prevalence of genetic markers in different age cohorts. We obtained data on the distribution of ABO blood groups and *p* and *q* genes in 1970–1977 and 1981–1989 in Saami women from the medical records of the local hospital in Lovozero. The data were compared with those of the Kola Saami study conducted in 1967–1968 (Khazanova et al., 1972).

The Saami population is characterized by a high *p* and low *q* gene frequencies (worldwide the frequencies are 0.215 for *p* and 0.162 for *q* gene, according to Mourant et al., 1976). It is seen from Table 1.3 that a sharp shift in the proportion of the blood groups occurred during the 20-year period. The *p* gene frequency had decreased by a factor of 2.6; while the *q* gene frequency had increased 4.7 times. By the end of the 1980s, the ABO blood group distribution in the Saami subpopulation of Lovozero no longer reflected the traditional Saami pattern.

Table 1.3. Change in the frequency of *p* and *q* genes in the group of Lovozero Saami.

Cohort (yrs)	*p*	*q*
1967-68	0.4108	0.1145
1970-77	0.2776	0.1739
1981-89	0.1597	0.5432

Source: 1967-68 data from Khazanova et al 1972

The situation among the Kola Saami seems paradoxical at first glance. On the one hand, the number of children born to Saami/non-Saami marriages is growing, which means that the Saami are being submerged by non-Saami peoples. It is further reflected in the reduction of bearers of traditional Saami family names and to changes in the distribution of genetic markers such as the ABO blood groups. On the other hand, the Saami subpopulation has also gained membership since the majority of the interethnic offspring have chosen to identify themselves as Saami (Kozlov, Lisitsyn et al., 1997). That conclusion has been confirmed by the data of the 2002 Census (Bogoyavlensky, 2004).

According to administrative records, between 1989 and 2002 the natural increase of the Saami population was negative — a net loss of 81 individuals. Yet, according to the Census, in those two years the Saami population in Russia had actually increased from 1,835 to 1,991 individuals, a net gain of 237 individuals. Hence, the natural decline of the

population had been compensated abundantly by a "non-demographic gain," that is, some persons previously registered as Russians or Komi, for example, had changed their ethnic identity to Saami.

This situation is not unusual for many numerically small indigenous peoples in the North of Russia. As a confirmation, consider the data from the genetic-demographic study of the Siberian Yupik (Eskimo) in Chukotka (Karafet et al., 1992). As with the Kola Saami, the Siberian Yupik had long-standing and intensive links with non-indigenous inhabitants. The contacts had intensified at the time of the Second World War and especially in the post-war period. The Eskimo became a minority even in the ethnic settlements of Lorino, Uelen and Novoye Chaplino due to the intensive migration from central Russia to Chukotka, which resulted in a rise of inter-ethnic marriages.

In 1984–1985 in Chukotka, data collected from household registers showed that 1,075 individuals were registered as Eskimos, among whom 587 (54.6%) were of mixed ancestry. Figure 1.1 shows the Eskimo population's age and sex structure based on the data of T.M. Karafet et al. (1992). The inner part of the pyramid depicts those of mono-ethnic ancestry ("Eskimo/Eskimo descendants"). It is clear that by the 1980s the ethnically mixed children constituted the overwhelming majority.

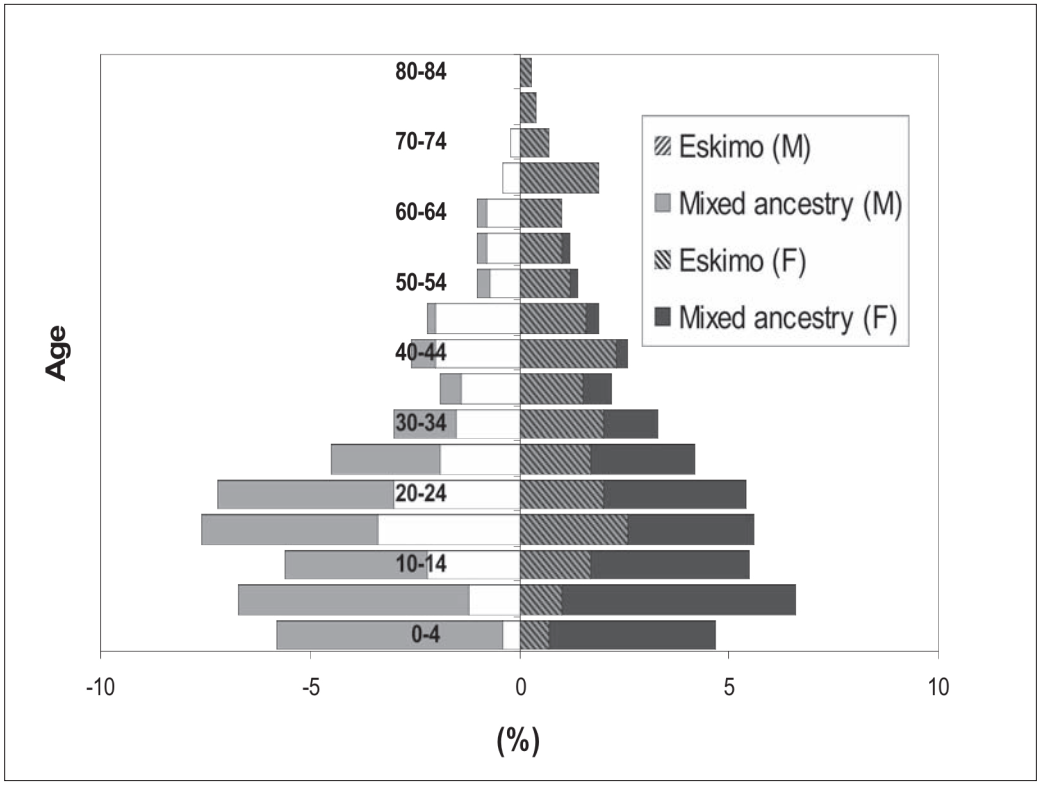

Fig. 1.1. Age and sex structure of Siberian Eskimo population, as of 1984-85. Source: Karafet et al., 1992

The mixing of different populations has been going on throughout human history. It is a natural process necessary for the survival of any biological species. However, in the modern world, political or economic factors could induce massive migrations in incredibly short time periods. The northern territories of the Soviet Union became a target for the intensive expansion of raw-materials-extraction industries in the second half of the twentieth century and have experienced a huge migration pressure. In 1959–1979, the population increased by a factor of 1.8 in Chukotka AO, by a factor of 1.6 in Yamalo-Nenets AO and by a factor of 3.6 in Khanty-Mansi AO (Vishnevsky, 2006). The "oil boom" period had drastically changed the ethnic composition of the traditional territories of the Mansi and Khanty.

At the beginning of the eighteenth century, indigenous peoples dominated the Berezovo district of Tobolsk province and composed more than 80% of the whole population. Interethnic marriages occurred rather rarely among the northern Mansi up until the 1940s. In 1963, the first "Tyumen oil" was produced in the Berezovo rayon of Khanty-Mansi AO. It caused a huge inflow of migrants and, as a consequence, a rapid assimilation of the local people. By the end of the 1960s, interethnic marriages averaged 30% of all the marriages of Vanzetur Mansi, and among those less than 22 years of age, it was 70% (Davydova, 1989). According to E. Pivneva (1995), the majority of interethnic marriages occurred among the Sosva Mansi in the 1960s. By the end of 1991, the Mansi in Berezovo rayon comprised 25% of the population (including the interethnic descendants who self-identified as Mansi).

Up to the end of 1960 the Mansi's remote settlements in the upper courses of the Sosva and Liapin Rivers still were almost monoethnic (Davydova, 1989). The situation became quite different in the last decade of the twentieth century (Table 1.4). The Mansi accounted for less than 30% of the population of Saranpaul and Niaksimvol *selsoviets* (the lowest subdivisions of the Soviet rural administrative units), and more than two-thirds of residents were Komi-Izems, Russians or other ethnic groups.

There was a similar situation in the group of northern Khanty. In the eighteenth to nineteenth centuries the interethnic marriages in that group accounted for 7% of marriages (Sokolova, 1983). Marriages were mostly concluded within the same ethnic group until the 1960s. Between 1981 and 1985, in the over 40 age cohort, only 14 % of couples were ethnically mixed and in the under 40 cohort, it was 32% (Vasiliev et al., 1987).

Taking into account the children born out of wedlock, who are mainly fathered by non-natives, one can conclude that the intensity of changes in the gene pools of the northern Mansi and Khanty populations is comparable to that in the Siberian Yupik (Eskimo).

The trend towards admixture with other numerically more dominant ethnic groups is still strong. The realities of modern life associ-

Table 1.4. Ethnic composition of the population along the Sosva and Liapin rivers, 1991 (percent).

Territory	Mansi	Khanty	Nenets	Others
Liapin (Saranpaul selsoviet)	24.7	1.4	6.0	67.8
Upper Sosva (Niaksimvol selsoviet)	28.4	7.1	4.2	60.3
Middle Sosva (Sosva selsoviet)	53.5	2.6	5.1	38.8
Lower Sosva (Vanzetur selsoviet)	52.9	6.2	0.2	40.7

ated with a high level of mobility and urbanization inevitably lead to a decrease in endogamy. At the present time, a significant (in some cases overwhelmingly) proportion of self-identified indigenous peoples are of mixed ancestry. Genetically they differ from the original peoples considerably, and even mono-ethnic marriages (at least according to records) will eventually lead to further changes in the genetic structure of the population.

Human adaptation to the environment is increasingly less biological (i.e., genetically based) and more technological and cultural. The rise of ethnic consciousness and the absorption of other ethnic groups by the numerically small indigenous northern peoples are more important for sustaining the peoples as cultural communities rather than maintaining their genetic uniqueness.

Economy and population movements

In the 1990s significant demographic changes took place in the Russian North. The economic collapse led to unemployment and to a considerable outflow of residents. Political matters also played a role. After the breakup of the Soviet Union, the recent newcomers, who were mainly migrants from various former Soviet republics, wanted to return to their places of origin because they wanted to become citizens of the newly independent states in order to be eligible for social benefits. This migration back to their places of origin resulted in a relative rise of the indigenous population in the northern areas.

At first, different localities experienced a similar situation. For example, the total Saranpaul population, the largest settlement on the Liapin River in Khanty-Mansi AO, decreased by some 23% — from 4,061 to 3,137 individuals, while the number of Russians dropped by 36%. The proportion of indigenous peoples in the settlements increased correspondingly from 58% in 1992 to 69% in 1995. The population of Chukotka AO in 1989 was 164,000 residents but had been reduced to 74,000 by the time of the 2002 Census. The okrug's economy remained stagnant until a change in the regional government in 2001, when gradual development began. Until then, more than half of the inhabitants (almost exclusively non-native) had left the peninsula. In the following years the outmigration decelerated, although in 2002 there was still an attrition of 1,518 persons. The total population of the northern territories was reduced by 18% between 1989 and 2002, compared with an all-Russia decline of 2%. Between 1989 and 1997, Chukotka AO lost almost half of its population, the Koryak, Evenki, Taymyr AO about 20%, and the Nenets AO, 15% (Vishnevsky, 1999).

By the end of the 1990s, the situation in the oil and gas bearing Yamalo-Nenets and Khanty-Mansi AO had begun to reverse. The outmigration here had stopped and it soon gave way to a net inflow of people. population increase in Khanty-Mansi AO (1.6%) was the largest among all the Russian territories in 1998, primarily as a result of in-migration (Vishnevsky, 1999).

It was the economy that caused the redirection of the flow of population in Western Siberia. The average per capita income in the KMAO during 1997–2002 was 2.9 times that of the all-Russia average; and the poverty rate of 16% was considerably less than the 30% reported nationally. The economically booming region, as a centre of the oil and gas industry, attracted a great number of people: in 2002 alone, there were 11,500 new arrivals.

The economic and migration trends in the north of Western Siberia have also affected the indigenous peoples — the Khanty, Mansi, Selkups and Nenets. For example, one of the expected consequences has been yet another decline in the proportion of indigenous peoples in the total regional population. According to the official data of the KMAO administration, the share of the indigenous minorities was 1.5% in 1989, 2.1% in 1999 and, by the year 2004, had decreased to 0.1%.

Another trend has been the increasing urbanization of the indigenous population. In 1979, 24% of all indigenous northerners lived in cities; in 1989, it was 39%; and, in 2004, it grew to 44%. Undoubtedly, better opportunities for education and employment are the main incentives for relocating to the towns (see chapter 6 for a fuller discussion).

The "non-demographic gain" in population tends to be a characteristic of the economically well-off regions, which are in a better position to offer more generous social supports to the indigenous population. The population data for the 26 numerically small northern peoples of the Russian Federation as a whole and for the three ethnic groups in the Yamalo-Nenets and Khanty-Mansi AOs are shown in Table 1.5.

The overall non-demographic increase of the northern indigenous population is only 1,525 people (with half of the ethnic groups reporting negative growth). The aggregated non-demographic increase in the combined Mansi, Khanty and Selkups populations, however, is 3.8 times higher.

The indigenous groups in the economically disadvantaged northern regions of Russia tend to suffer non-demographic losses. The natural increases of the Chukchi and Eskimo (Siberian Yupik) are 1,814 and 169 with non-demographic losses of 1,154 and 123 people, respectively. On the whole, the overall population of these ethnic groups by 2002 had been reduced by about 7% compared with 1989.

Table 1.5. Population changes in the peoples of Russian North and Western Siberia in 1959-2002.

Northern peoples	Population by Census data			Natural increase by register data	Non-demographic change
	1959	1989	2002	1989-2002	
26 northern peoples combined	131111	181517	208980	25938	1525
Khanty	19410	22283	28678	3620	2775
Mansi	6449	8279	11432	780	2373
Selkups	3768	3564	4249	98	587

Source: Bogoyavlensky 2004

Trends in fertility and mortality

The major demographic trends since the 1960s and 1970s among the local populations of Kola Saami, Komi-Permyak, Mansi and Khanty have been extensively investigated (Kozlov and Vershubsky, 1999; Mizernyuk et al,, 2006). The following general observations could be made: outflow of youth from the rural "ethnic" settlements; reduced life expectancy (due to a high death rate, especially among young males); and gender imbalance (due to the higher male death rate and a higher level of migration among females).

It should be noted that considerable variation exists across the different regions of northern Russia, influenced by local geographic, ethnic, administrative and political factors. Furthermore, about a third of northern indigenous peoples now live in towns, with very different experiences as those described by researchers working mainly in the rural areas.

For a clearer insight into the demographic situation of the indigenous population of the Russian North as a whole, let us turn to the data of all-Russia and intermediate (local) censuses (Table 1.6). Since the late 1980s, the birth rate was cut in half and it continues to decrease. The death rate had increased substantially during 1988–1992 but began to decline in 1995. In 1999, the crude death rate among northern indigenous peoples had declined to a level comparable to the all-Russia rate, and in 2002, it was lower by 2 per 1,000.

According to the data of the North-Western Scientific Centre for Hygiene and Public Health (RF Ministry of Health), the life expectancy at birth in the numerically small peoples of the north averaged 45 years in males and 55 years in females (Northern Practical Dictionary, 2004). Apparently, these estimates were made using data from an interim census, but they can serve as a comparison with the all-Russia values, which in 2000 were 61 years for males and 74 years for females.

Our data from Berezovsky rayon of Khanty-Mansi AO in 1996–99 showed that the age of death averaged 48.0 years in males and 60.4 in females, with all ethnic groups combined. That was 13–14 years lower than the all-country averages. The indigenous Mansi and Khanty people fared much worse than their Slavic neighbours in the settlements and died on average 7–12 years earlier, and by 18–22 years earlier than all citizens of Russia as a

Table 1.6. Demographic indicators for 26 northern peoples combined (per 1000).

Period of time	Birth rate	Death rate	Natural increase
1984-1988	30.2	10.5	19.7
1989-1993	25.7	10.8	14.8
1994-1998	19.8	12.6	7.2
1999-2002	17.6	11.7	5.9

Source: Bogoyavlensky 2004

whole (Table 1.7). Chapter 6 further discusses the external causes of mortality. For now, it is important to note that mortality rates from accidents, homicide and suicide are very high in the northern parts of Russia and especially among the indigenous population. Violent deaths and alcohol abuse are the main causes of the shortened life expectancy in the North.

Table 1.7. Average age at death in Berezovo Rayon of KMAO, 1996-1999.

Ethnic group	Males	Females
Russians	49.69	63.07
Khanty	44.39	53.14
Mansi	42.55	51.59

Between 1988 and 1993, the natural increase among the indigenous population steadily declined, stabilizing at the level of +10 per 1,000, while in Russia as a whole, the natural increase in 1993 was already negative (i.e., deaths exceeding births) at -5 per 1,000. Since 1994, the natural increase has remained positive, unlike the all-country population. While this may give the impression that, demographically, northern indigenous peoples are better off than the rest of the country, northerners nevertheless have a higher rate of infant mortality (more on this in chapter 2), a considerably higher rate of overall mortality (especially from injuries) and a shorter life expectancy. The population gain among the indigenous peoples is driven by a higher birth rate. However, taking into account the spreading of modern contraceptive methods in the Russian north, we could expect family planning to have a more noticeable effect on the birth rate in the coming decades. The potential to increase the indigenous population by relying on those of mixed ancestry to change their status by claiming their indigenous identity has been done to the point of near exhaustion.

Clearly, the indigenous population of the north is not in any danger of dying out. However, they are far from enjoying demographic "prosperity." The northern peoples are a disadvantaged group, judging by all-Russia averages, even though the demographic situation in the Russian Federation as a whole itself is far from favourable.

CHAPTER 2

CHILD HEALTH, GROWTH AND DEVELOPMENT

Infant mortality in small populations

In addition to the various demographic characteristics of indigenous peoples in the North of Russia described in the last chapter, there is one other major indicator to consider: infant mortality. While referring specifically to children less than one year of age, infant mortality reflects the overall health of the population and is often used in international comparisons. For numerically small populations, such as those in northern Russia, certain cautions are needed when interpreting the data.

In medical statistics, infant mortality rate is defined as the number of deaths of infants less than one year of age per 1,000 live births in a given population and period. Changes in infant mortality are influenced by biological, social and economic factors. For small geographical areas where both the events and the base population are low in number, annual fluctuations resulting from random variation can be substantial. For meaningful interpretation, several years' observations need to be combined, which becomes a challenge when the research is carried out within a limited period. Misclassification of a few deaths by age and/or ethnicity could easily have resulted in significant changes in the rate. This issue was investigated by our team in the late 1980s among the Khanty and Mansi, and more extensively by N. Stolyarov (1993) among the Orochi, Chuvan, Saami and Chukchi populations.

More serious than the purely statistical issue of rates based on small numbers associated with wide confidence intervals is the unreliability of official statistics, a problem long recognized by experts in Russian demography. One source (N. Stolyarov, 1993) noted that in the early 1990s, official data on infant mortality rate in the Russian Federation were likely underestimated by approximately 15%

for the country on the whole, and even more significantly for its northern regions. In areas where living conditions have deteriorated, for example in Chukotka, overly optimistic official reports of a substantial decline in infant mortality among the indigenous populations must be viewed with caution (Nazarov et al., 2000).

Our opinion is that Russian society fails to provide trustworthy official information concerning the level of infant mortality of indigenous northerners. Unfortunately, it remains our basic source of information. Expert appraisals based on detailed local investigations, where available, provide alternative perspectives.

According to one study, from the mid-1960s to the late 1980s, the infant mortality rate in northern Russia decreased almost threefold, from 110–115 to 35–40 per 1,000 (Pika and Prokhorov 1994). Nevertheless, these rates remained above the all-Russia average. In 1990, the infant death rate in the most numerous indigenous groups of the North was 32 per 1,000 among the Nenets and 35 per 1,000 among the Khanty (Stolyarov, 1993). For all northern indigenous peoples, the average was close to 34 per 1,000, about twice that for Russia as a whole (Kvasha, 2003). This 2:1 ratio continued to be maintained. In 1999–2002, the infant mortality rate for all 26 numerically small peoples was estimated to be 28 per 1,000 (Bogoyavlensky, 2004), compared with the all-Russia average in 2001of 14.6 per 1,000.

The difference between the infant mortality rates for the native and non-native populations of the Russian North was also considerable. As an example, Table 2.1 provides data for the Taymyr (Dolgan-Nenets) AO in 1990–1992 (based on the authors' field research in 1993). It can be seen that rates for the indigenous Nenets, Enets and Nganasan were about half that of the non-native population.

The necessity of taking effective measures for health protection of mothers and children in the Russian North is obvious. Unfortunately, many public health specialists fail to understand that social programs should take into consideration medical and biological peculiarities of the inhabitants of the North. Studying the fitness of newborns belonging to different ethno-territorial groups should become one of first steps in this direction.

Table 2.1. Infant mortality in Taymyr (Dolgano-Nenets) AO in 1990-92.

Year	Infant mortality rate	
	Indigenous people	Non-indigenous people
1990	27.7	15.8
1991	29.2	19.9
1992	67.6	40.5

Note: Infant mortality rate expressed as per 1000 livebirths

Body dimensions of newborns

The available data suggest that body dimensions of indigenous newborns of the Russian Arctic areas tend to remain stable over time. The characteristics of two groups are discussed in some detail here – the Kola Saami and the indigenous population of Chukotka.

The anthropometric characteristics of newborn Saami girls are given in Table 2.2. The comparison of medical documentary data (birth histories) from the Lovozero district hospital for the years 1970–1977 and 1981–1989 showed that after 10 years the birth weight, length and circumference dimensions of newborns (both boys and girls) remained practically unchanged (Kozlov, Lisitsyn et al., 1997).

Data on indigenous newborns of Chukotka allowed changes over a 35-year period to be assessed (Table 2.3). We compared the results of the analysis of birth histories from the Anadyr area hospital carried out in 2004 with those from 1966–1970. The cohorts compared (irrespective of sex) included newborn Chukchi, Siberian Yupik, Chuvans and Enets. The body length of the babies remained the same, although the birthweight in the 2000–2003 cohort was significantly lower than in the 1960s ($p<0.01$).

Since birthweight is a sensitive indicator of the nutritional status during pregnancy, we may assume that the reduction in mean birthweight resulted from the worsening of the economic situation and related changes in the nutrition of Chukotka natives in the last years of the twentieth century (Kozlov and Zdor, 2003; Kozlov, 2004). Similar shifts in anthropometrical characteristics of newborns were registered by other researchers in the populations of small Russian cities and towns (Tretyak et al., 2005). However, changing socio-economic circumstances did not result in any change in the body length of indigenous newborns in Chukotka. We believe that this phenomenon requires further investigation.

Considerable geographical and ethnic variability in newborn body sizes is observed. Data obtained from processing the birth histories from local and regional hospitals are given in

Table 2.2. Anthropometric characteristics of newborn Kola Saami girls in 1970-77 and 1982-89.

Anthropometric characteristics	1970-77 (n=39) Mean	SD	1981-89 (n=30) Mean	SD
Body mass (g)	3028.8	522.4	3010.0	502.5
Body length (mm)	510.0	30.5	507.7	31.5
Head circumference (mm)	338.5	17.9	339.6	18.3
Chest circumference (mm)	332.7	21.8	330.0	24.5

Table 2.3. Body mass and length of indigenous Chukotka newborns in 1966-70 and 2000-2003.

Anthropometric characteristics	1966-70* (n=277) Mean	SD	2000-2003 (n=257) Mean	SD
Body mass (g)	3422.6	464.6	3241.25	558.8
Body length (mm)	517.5	20.6	517.8	27.6

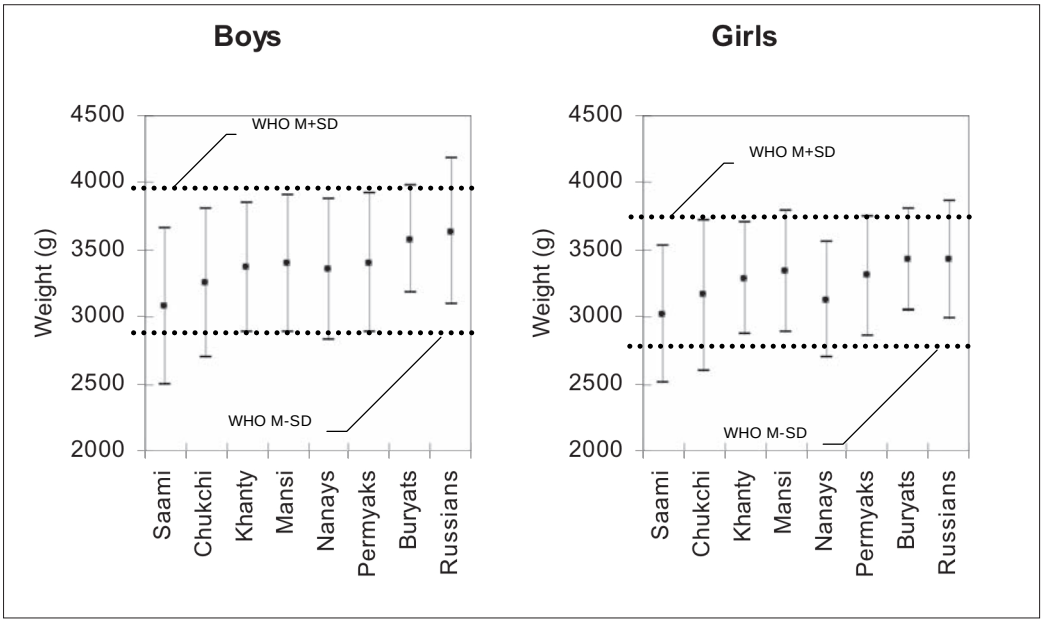

Fig. 2.1. Body weight at birth in different ethnic groups in comparison with WHO standards.

Appendix Table 1, with the Russian population of Western Siberia serving as the reference. Since the measurement of body length at birth in different hospitals in the Russian North is liable to wide interobserver variability, we shall confine ourselves to comparing the birthweight of babies who were born in different geographical areas (Fig. 2.1).

The lowest birthweight is observed among the indigenous inhabitants of the Arctic — the Saami and Chukchi. Next are the Nanais, indigenous to the Amur River monsoon zone. Indigenous newborns in subarctic Siberia (the Khanty and Mansi) and the northern Urals (the Komi-Permyaks) are characterized by a considerably higher mean birthweight. The highest birthweight is observed among the Buryats, the indigenous population deep in the continental zone. This ethnic variability in anthropometrical characteristics of newborns is likely influenced by ecological factors within their habitats (Kozlov et al., 1993; Vershubsky and Kozlov, 2002; Wells and Cole, 2002; Kozlov and Vershubsky, 2003).

Birthweight variability and adaptation

Does this ethnic variability in body size at birth have any adaptive significance? To answer this question, let us compare anthropometrical indices and morbidity among newborns of the Komi-Permyaks in the northern Urals, with similar data on the newborns in Moscow (Kurbatova et al., 1991).

The studies initiated in the middle of the twentieth century have demonstrated that natural selection in humans operates both at the early stages of embryonic development and after birth (Karn and Penrose, 1951; Carr, 1971; Sperling, 1984), in particular on the basis of body weight at birth and during the first month of life (Terrenato et al., 1981; Terrenato, 1983). The highest mortality rate during the first month of life is observed in babies whose birthweight deviate the most from the average in either direction. The elimination of the marked phenotypic deviations provides for the preservation and further reproduction of the most adapted genotypes, that is, the adaptive norm.

Among newborns deviating from the adaptive norm in terms of their birthweight (or body length or circumference dimensions), the morbidity risk is higher than in newborns whose parameters lie within the limits of one standard deviation from the mean for the given population. This holds true for different diseases such as sepsis, pneumonia, anemia, physiological jaundice, posthypoxic encephalopathy, malformations and so on (Altukhov and Kurbatova, 1990).

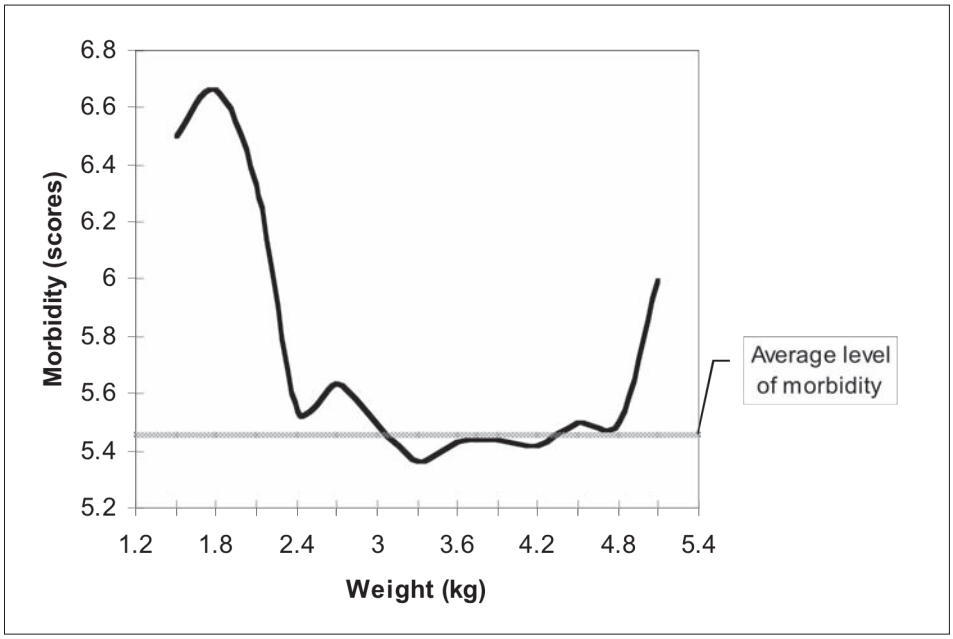

Fig. 2.2. Adaptive norm of body weight at birth for different ethnic groups.

It is recommended that the birthweight adaptive norm zone be defined within ±0.5SD from the mean value of healthy newborns (Altukhov et al., 1979). For Komi-Permyaks, the mean birthweight of healthy full-term babies (433 healthy babies selected from a sample of 657) was 3,355 grams, with a standard deviation of 452 grams (Fig. 2.2). Hence, the birthweight adaptive norm zone covers the range of 3,128 to 3,582 grams. About 43% of healthy newborns fall within this range, whereas 28% and 29% of healthy babies fall within the zones of extreme phenotypic variations (with lower and higher body weight, respectively).

The mean birthweight of healthy Komi-Permyaks is 49 grams less than that of healthy newborns in Moscow (Kurbatova et al., 1991). This difference is statistically significant ($p<0.05$). Accordingly, the birthweight adaptive norm zone of newborns in the northern Ural area shifted below that of newborn Muscovites.

The location of a newborn's birthweight relative to the adaptive norm zone is predictive of increased morbidity, while the adaptive norm itself, as we have just shown, varies in representatives of different ethnic groups. We believe that it is important to recognize population-specific anthropometrical characteristics such as the birthweight adaptive zone when developing health protection programs for northern neonates.

Patterns of child growth and fitness

In developmental anthropology, various approaches to studying child growth and fitness are used (Eveleth and Tanner, 1990; Mascie-Taylor, 1993). In the longitudinal approach, body measurements of each examined child are taken at regular intervals over several years. Such measurements provide the highest precision and accuracy of information; however, they are relatively expensive and difficult to implement, especially in remote Arctic populations.

More common are cross-sectional studies, which sample children of different ages at one point in time. Despite some weaknesses, its simplicity is particularly attractive for researchers. Most studies on child growth and fitness in northern Russia are of this variety (reviewed in Kozlov and Vershubsky, 1999). We present here our own data on the Saami, Komi (Izhems), Komi-Permyak and Buryat children, and also those on the Nenets from the Yamalo-Nenets AO, provided by A. Sokolov and V. Akhmatov (whose studies were conducted with the assistance of researchers from our laboratory). Only children residing in rural areas are considered.

Since most studies were carried out in 1988–1995, for comparison we used the all-Russia child fitness standards of the mid-1990s

(Serdyukovskaya, 1993). The data for estimating the percentiles for these standards were provided by Y. Yampolskaya.

We examined the Kola Saami and Komi-Izhem schoolchildren of Kola Peninsula in 1995–1997 (longitudinal study) and in 2005. The 2005 sample was assessed according to the World Health Organization criteria (Onis and Blössner, 2003; Onis et al., 2004; WHO, 1995, 2005).

The body height and weight by age in representatives of different ethnic groups of northern Russia (ages 6 to 17) are given in Appendix Tables 2 and 3. By their height, Nenets boys aged 8–14 and girls aged 9–14 differ significantly ($p<0.01$) from their Saami peers. The interethnic differences in body weight are not significant.

The body height and weight indices of the Saami (1995–1997 cohort), Komi-Permyak and Buryat children of school age are rather close to each other, although they are below the all-Russia standards (16-year-old Saami boys were excluded from the analysis because of the small sample size).

Figs. 2.3 and 2.4 compare Nenets and Komi-Permyak children. The body height and weight values in different age-sex groups are compared to the 3rd, 50th and 97th percentiles of the all-Russia standards.

The mean values of body height in Nenets boys and girls aged 8–15 coincide with the 3rd percentile of the standard, and in boys and girls aged 16–17 they drop even below this level (Fig. 2.3). In Komi-Permyaks, the mean body height in all age-sex groups is practically equal to the values of the 25th percentile. By their body weight, representatives of both male and female Nenets and Komi-Permyak samples appear in the zone close to the 25th percentile of the all-Russia standard (Fig. 2.4).

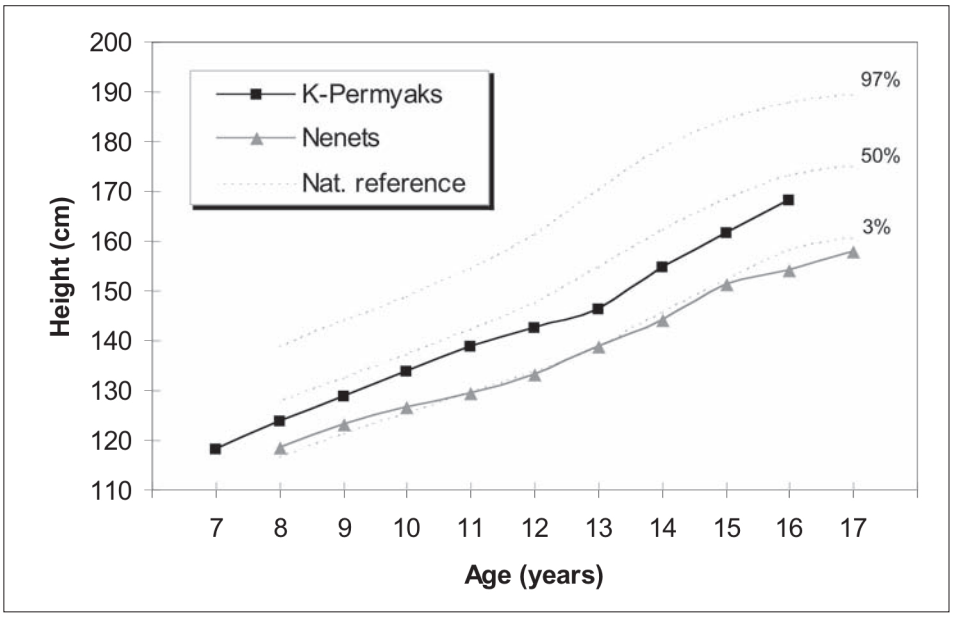

Fig. 2.3. Height by age in Nenets and Komi-Permyak schoolboys.

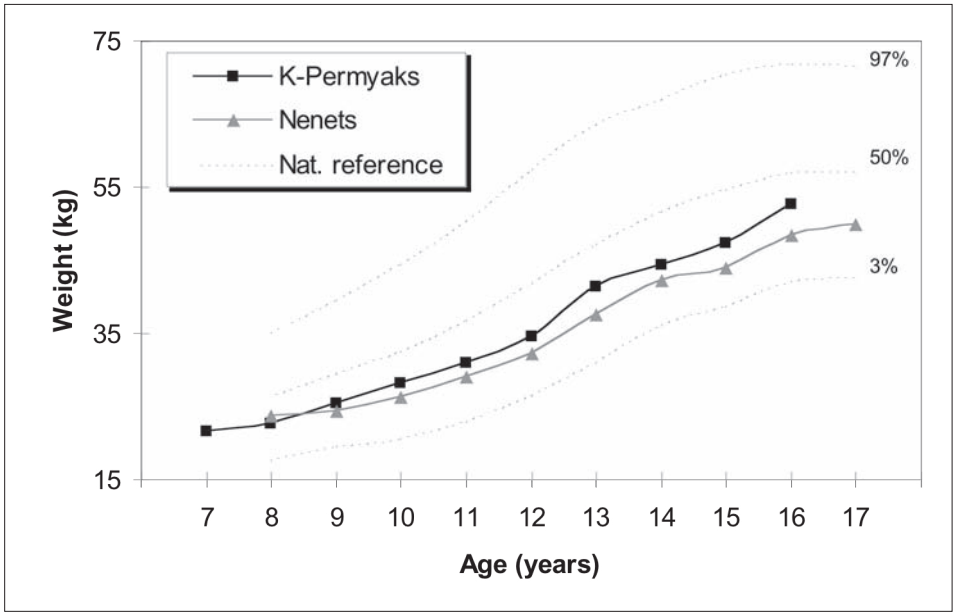

Fig. 2.4. Body weight by age in Nenets and Komi-Permyak schoolgirls.

The majority of the examined Komi-Izhem, Nenets and Saami children are characterized by a lower weight and height, compared with their age standards. At the same time those children who are below the 50th percentile on body height are also positioned below the average level on the body weight curves. Apparently, physically fit children of the indigenous peoples of the North are characterized by a consistent weight to height relationship, but they are appreciably more diminutive than their peers from other ethnic groups.

Our studies of the Kola Saami were carried out in 1995–1997 and in 2005, which enables us to assess secular trends over a 10-year period and to compare them with the non-Saami population of the area.

Children of all ethnic groups of the area showed an increase in body height (although the increase in growth related to acceleration processes in children had already stopped in Russia as a whole). In girls 7–15 years of age, the height increase was accompanied by a corresponding increase in weight. As the result, they did not differ from their peers of 10 years before in terms of the body mass index (BMI), chest circumference and triceps skinfold thickness.

In boys, the increase in body weight lagged behind the growth in height; so that they were thinner than their peers of the mid-1990s (the BMI values in almost all age groups were lower than 10 years before). In addition, no chest circumference increase was observed (with the exception of the 17 year-olds who surpassed their peers of the mid-1990s in both BMI and chest circumference).

The above trend is also observed among indigenous children. Compared with 1995–1997, Saami children in 2005 showed an

increase in height, but an adequate increase in weight was observed only in girls aged 10–13. In other age-sex groups (except for 15–17year-old boys), the body weight increase was less appreciable than the height increase, which resulted in lower BMI values. Boys aged 15–17 showed no changes in height, but their body weight, chest circumference and skinfold thickness increased (probably due to sports activities).

After 10 years, Komi-Izhem boys and girls of school age showed a slight increase in height, but the body weight, chest circumference and skinfold thickness remained the same. The height increases without increase in weight affected the BMI values: they decreased slightly in almost all age-sex groups.

On the whole, the gap in body height between Saami and Komi children and their Russian peers in 2005 remained the same as in 1995–1997. We may conclude that growth acceleration processes among northerners are comparable to that of Russian children residing in the area.

Growth processes are non-uniform for different body parts. After birth, the three periods of the most intensive growth are the first three years of life, the ages from 5–7, and the pubertal period, 11–14 years. Normal growth may be upset by chronic and prolonged illness, endocrine disorders, genetic conditions, chronic stress, malnutrition or an unbalanced diet. There is also variability according to ethnicity, socio-economic status and climatic/geographical factors (Brizzee and Dunlap, 1986; Eveleth and Tanner, 1990).

The growth patterns of children in the North, both indigenous inhabitants and migrants, are of interest not only to anthropologists but also to specialists in other fields: teachers, psychologists and obstetricians. Physical fitness combined with mental development of a child provide the necessary data input when establishing criteria for "school maturity" in children of different ethnic groups residing in different regions of the country. Not only teachers and psychologists but also anthropologists and ethnologists should take part in establishing these criteria. Early sexual activity that is more typical nowadays and the high frequency of teen pregnancies are compelling gynecologists to seek more precise information concerning the age of puberty in girls and to be more attentive to the criteria of morphological maturity of their young female patients.

For a tentative estimation of the growth processes in children, it is possible to compare their body height and weight with the height and weight standards for their age. However, in some cases, a more exact analysis is needed, which requires the knowledge of growth rate, that is, the increase of a parameter per unit time.

Some publications provide absolute values of height and weight by single years of age in children of various ethnic groups, including the indigenous peoples of the North (see, e.g., Rode and Shephard, 1994). By way of comparison, we have compiled data from Saami, Nenets and Komi-Permyak children (see Appendix Tables 4 and 5).

The growth rate of Nenets and Komi-Permyak children was estimated based on cross-sectional data. For Kola Saami children, the body height and weight increase was estimated based on three-year longitudinal

observations during 1995–1997. The cohort consisted of children who were examined two or more times at yearly intervals.

There are cases of negative values of body height and weight increases in Saami girls between 14–15 and 16–17 years of age. Given the small number of Saami children examined, the individual fluctuations of the parameters appeared more evident than the age differences. Similar negative values of yearly height increases in girls of the same age groups were also reported by A. Rode and R.J. Shephard (1994), who carried out semi-longitudinal studies of Inuit children from the Canadian Arctic regions.

The maximum body height and weight increase in Saami and Komi-Permyak boys occurs at ages 13–14 and in Nenets boys at ages 14–15. In Russian boys from Moscow, growth acceleration begins at a younger age, between 10 and 11, and the second, even more pronounced period of acceleration is observed at 13–14. This is also the age (13–14) when the most rapid weight increase occurs among young Muscovites (Miklashevskaya et al., 1989).

In Saami girls, the maximum absolute increase of height (6.8 centimetres) occurred between 11 and 12 years, and the maximum weight increase, by the age of 13. In Nenets girls, the maximum rate of both height and weight absolute increase is observed between 12 and 13 years. In Komi-Permyak girls, the first peak of acceleration occurs about the age of 10, and the second, between 12 and 13 years; the same age (12–13) is the period of the most rapid body weight increase. In Russian girls from Moscow, the period of accelerated increase in body height and weight begins at 10 and reaches its peak between 11 and 12 years of age (Miklashevskaya et al., 1989).

Thus, the periods of maximum increase of body height and weight in schoolchildren from various indigenous groups of northern areas of the Russian Federation occur approximately one year later than in their peers from the reference group (Russian children from Moscow).

The periods of the most rapid growth in children of the Russian North revealed by our study are very close to the data of Canadian researchers (Rode and Shephard, 1994; Shephard and Rode, 1996). According to their semi-longitudinal studies of 1989–1990, the greatest height and weight increase in Inuit boys occurred in the period of 12.9–13.9 years. In girls, the maximum height growth was registered between 11.4 and 12.8 years, and body weight increase between 11.4 and 14.9 years.

Growth processes and sexual maturation

Changes in anthropometrical indices in teenagers are closely associated with the sexual maturation processes (Bronson and Rissman, 1986). The data on menarche age in different ethnic groups of northern Russia which were compared with the representatives of reference groups — girls from Moscow and Tyumen cities, and also from the Tyumen Oblast villages — are given in Table 2.4.

Russian girls from Tyumen and Moscow are characterized by an earlier onset of menstruations than girls from our study populations from the Russian North (divergences from the data obtained from Russian girls of Tyumen are statistically significant, $p<0.01$). The samples of Nanai, Buryat and Nenets girls are exceptions.

The differences between the girls of Arctic and subarctic populations (Saami, Mansi, Khanty and Komi) on the one hand, and rural inhabitants of the Tyumen Oblast (Russians) and Trans-Baikal area (Buryats) on the other, are not statistically significant. In many cases, this may be accounted for by small sample sizes, since the absolute differences are considerable. Thus, the average age at the onset of menstruation in Mansi and Komi girls is 2.5 and 5 months, respectively, later than the menarche age in Russian girls from Western Siberian villages. Compared with the girls from rural regions of Buryatia, the lag in menarche age for Mansi girls is 5 months, while for Komi girls, it is 7 months on the average.

The representatives of Permian Finns — Komi and Komi-Permyak girls — make up a specific group with a rather late puberty age. This physiological specificity of Komi women was noted by researchers in the 1930s (Kokanin, 1929) and the 1980s (Sukhanov et al., 1990). Komi-Permyak girls have significantly ($p<0.01$) later menarche age than girls from all other study groups.

The beginning of menstrual function in girls is known to be conditioned by the total body dimensions, especially body weight (Frisch and

Table 2.4. Age of menarche (in years) in different ethnic groups.

Ethnic group	Number	Mean	SD
Saami	78	13.9	1.51
Mansi	114	14.0	1.43
Khanty	75	14.3	1.42
Nenets (Nenets AO)*	392	13.7	0.07
Komi (Nenets AO)*	222	14.2	0.07
Komi (Yamalo-Nenets AO)	25	14.2	1.00
Komi-Permyaks	204	14.9	1.56
Buryats	254	13.6	2.42
Nanays	53	13.3	1.52
Chukchi	233	13.2	1.31
Russians (Tyumen town)	1942	13.6	1.36
Russians (Tyumen Oblast)	229	13.8	1.37
Muscovites**	195	13.1	1.25

Notes:
* based on data from Sukhanov, 1990
** based on data from Yampolskaya, 1988

Revelle, 1971). The diagram of bodyweight increase rates in Nenets, Saami and Komi-Permyak girls and in the reference group of Russian girls from Moscow provides the mean values of menarche age for each group (Fig. 2.5). In all ethnic groups, the menarche age follows the period of the most intensive increase in height and weight. In Muscovite, Nenets and Saami girls, the beginning of menstrual function occurs approximately a year after the peak of the rapid increase in total body dimensions. In Komi-Permyak girls, the menarche age comes almost two years later than the growth peak.

In girls of the northern populations we have observed a more subtle relationship between body growth and sexual maturation. These observations showed that maturation is directly related not to body weight increase but to the moment of accumulation of a certain amount of "active" components in the bone and muscular tissues. The accelerated increase of the muscular and bone tissue mass in Nenets girls occurs between 11–12 and 15 years of age (Zhvavy et al., 1992). The menarche age falls in the second half of this period at 13.7 years (Table 2.4). The most pronounced increase of adipose tissue begins at the age of 16, that is, after the slowing down of the "active" body mass increase and after the beginning of menstruation (Fig. 2.5).

Hence, the relationship between the body growth rate and sexual maturation processes are similar in representatives of the "modernized" groups of the temperate climate (in particular, in Muscovites), and in girls of indigenous ethnic groups of the subarctic, Arctic and continental climate zones. However, the rates of development in representatives of different ethnic groups have certain peculiarities. Significant divergence of mean values of the menarche age (from several months to one or two years) in girls of different ethno-territorial groups is combined with variations in their fitness characteristics.

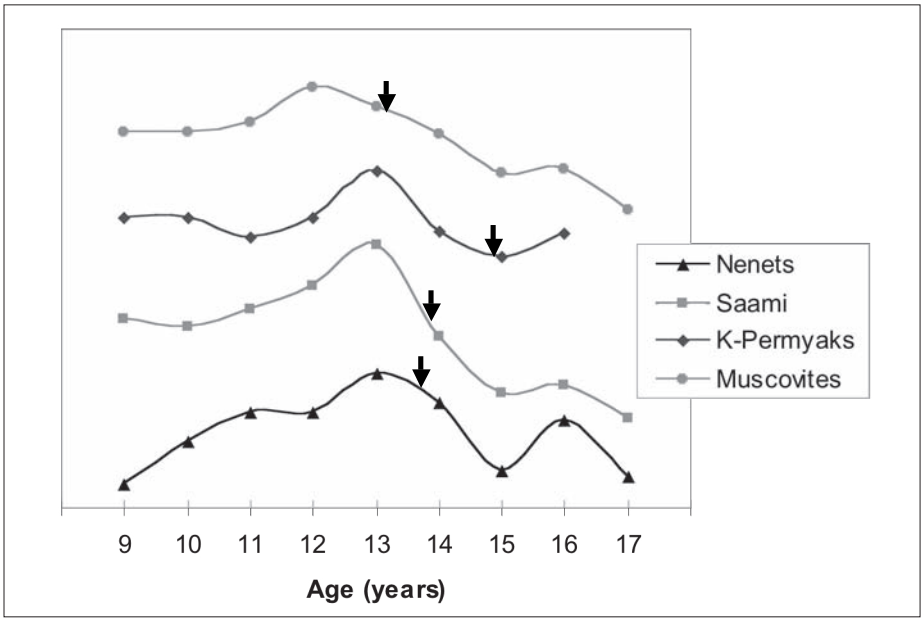

Fig. 2.5. Rate of body weight increase and menarche age for girls of different ethnic groups.

CHAPTER 3

ANTHROPOMETRICAL CHARACTERISTICS OF ADULTS

For millennia, human beings in the subarctic and Arctic have developed distinctive adaptations to the climatic and ecological complexes within which they live. These adaptations are reflected in a variety of anthropometrical and physiological characteristics that are the subject of this and subsequent chapters.

Body size and composition

Body size measurements such as height and weight are of interest to anthropologists and physicians and can be used both to characterize a population's or an individual's nutritional status, growth pattern, fitness level and metabolic processes.

The values of the total body dimensions in representatives of various ethnic groups (adults aged 18–25) are given in Appendix Tables 6 and 7. Most subarctic and Arctic populations are characterized by rather short stature (compared with reference groups such as Russians from the Urals and Western Siberia). The mean height in the natives of the continental areas of central Siberia, the Buryats and the Yakuts are closer to, but still below, the reference values.

Height alone is of no particular medical interest as it is rarely implicated as a risk factor of specific diseases. An index that combines height and weight, or weight relative to height, however, is much used in medico-anthropological and epidemiological analyses of the health and nutritional status of populations.

The most widespread parameter is the body

mass index (BMI), also called the Quetelet index. (BMI = weight in kilograms/[height in meters]^2) Most national and international health authorities (such as the World Health Organization, U.S. National Institutes of Health and the International Obesity Task Force) have concurred in defining a BMI of 25.0–29.9 as "overweight" and a BMI of 30 and higher as "obese" among adults. The desirable range of BMI ranges from below 25.0 down to 18.5, beyond which an individual is classified as "underweight." There are no separate criteria for men and women.

Like most other normative values, the "desired" BMI values were accepted by the WHO experts relying on data from studies of predominantly urban populations of the temperate zone. How do such data compare with the weight-height indices of the population of the North? Can the use of such "urban" norms be considered appropriate in clinical and health assessments of indigenous northerners?

As seen from our data (Figs. 3.1 and 3.2), the mean BMI values in healthy young adults (18–25 years) of all studied ethnic groups of the Russian North fall within the desirable range. These data are comparable to other published data on young adults under 30 years of age from the Evenki of Siberia, Sami of Scandinavia and the Inuit of the U.S.A. and Canada (Leonard, Crawford et al., 1994; Shephard and Rode, 1996). Higher mean BMI values, however, have been reported from Nganasan women of Taymyr (26.3) and in northwest Alaska Inuit (men 25.5, women 24.8: Shephard and Rode, 1996).

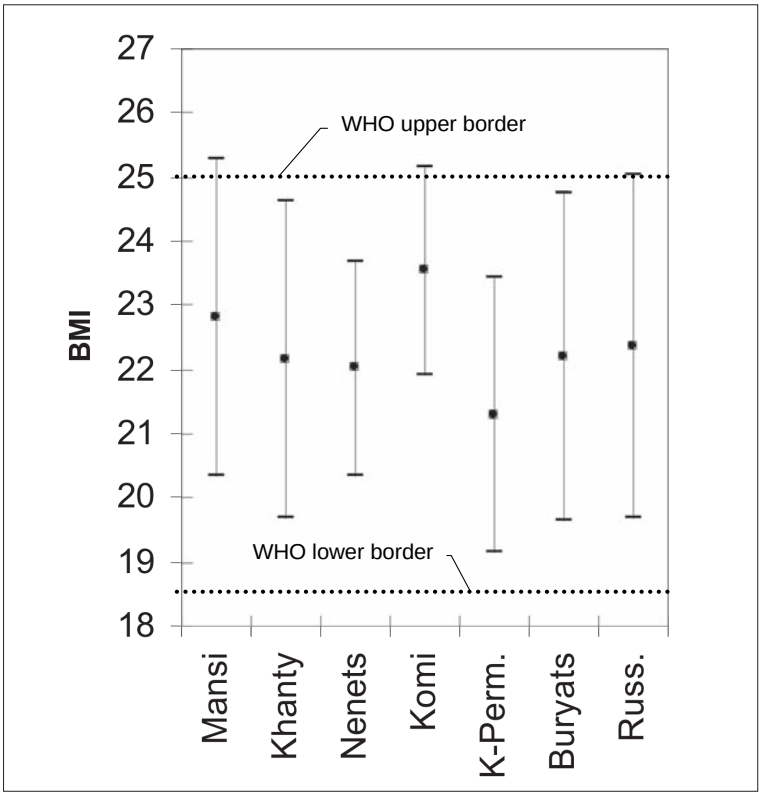

Fig. 3.1. Mean values of Body Mass Index (BMI) in different ethnic groups of young males.

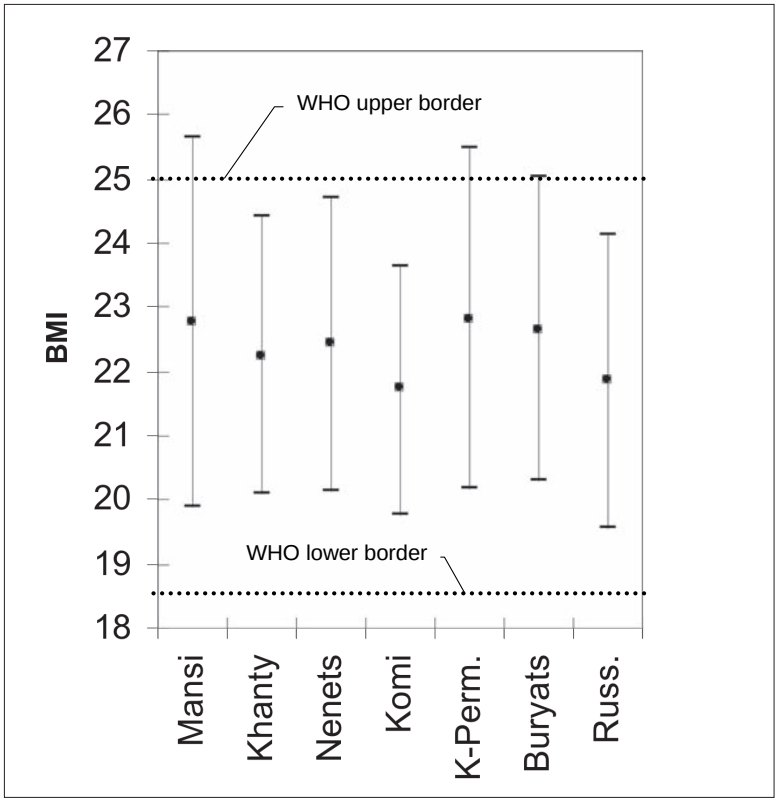

Fig. 3.2. Mean values of Body Mass Index (BMI) in different ethnic groups of young females.

However, after the age of 25–30, a rapid body weight increase begins in many indigenous northerners. Fig. 3.3 shows that the age-related increase in BMI in the populations of northern villages (Mansi and Komi-Izhems) is similar to that observed among Russian city-dwellers of the Urals and urban Buryats of Eastern Siberia. The men commonly cross the boundary into the overweight range after 36, but in women, this occurs earlier.

Many researchers emphasized a higher (compared with the temperate zone inhabitants) proportion of muscular tissue in indigenous inhabitants of the Arctic and subarctic (Shephard and Rode, 1973, 1996; Klevtsova, 1976; Alekseeva, 1998). This caused doubts as to the validity of BMI as a measure of obesity in northern indigenous populations, as their high values may well be influenced by the substantial development of muscular, and not adipose, tissue. (As an extreme example, high-performance athletes and body builders tend to have BMI values in the "obese" range.)

In individuals who are not engaged in such specific kinds of physical activity, the fluctuations of the weight-to-height ratio index are primarily caused by changes in adipose tissues. The correlation between percentage body fat and BMI lies within the range of $r=0.4$ to 0.5 in men and $r=0.4$ to 0.6 in women of various ethnic groups of Siberia ($p<0.05$), whereas there is no significant correlation between the BMI and the proportion of muscular tissue.

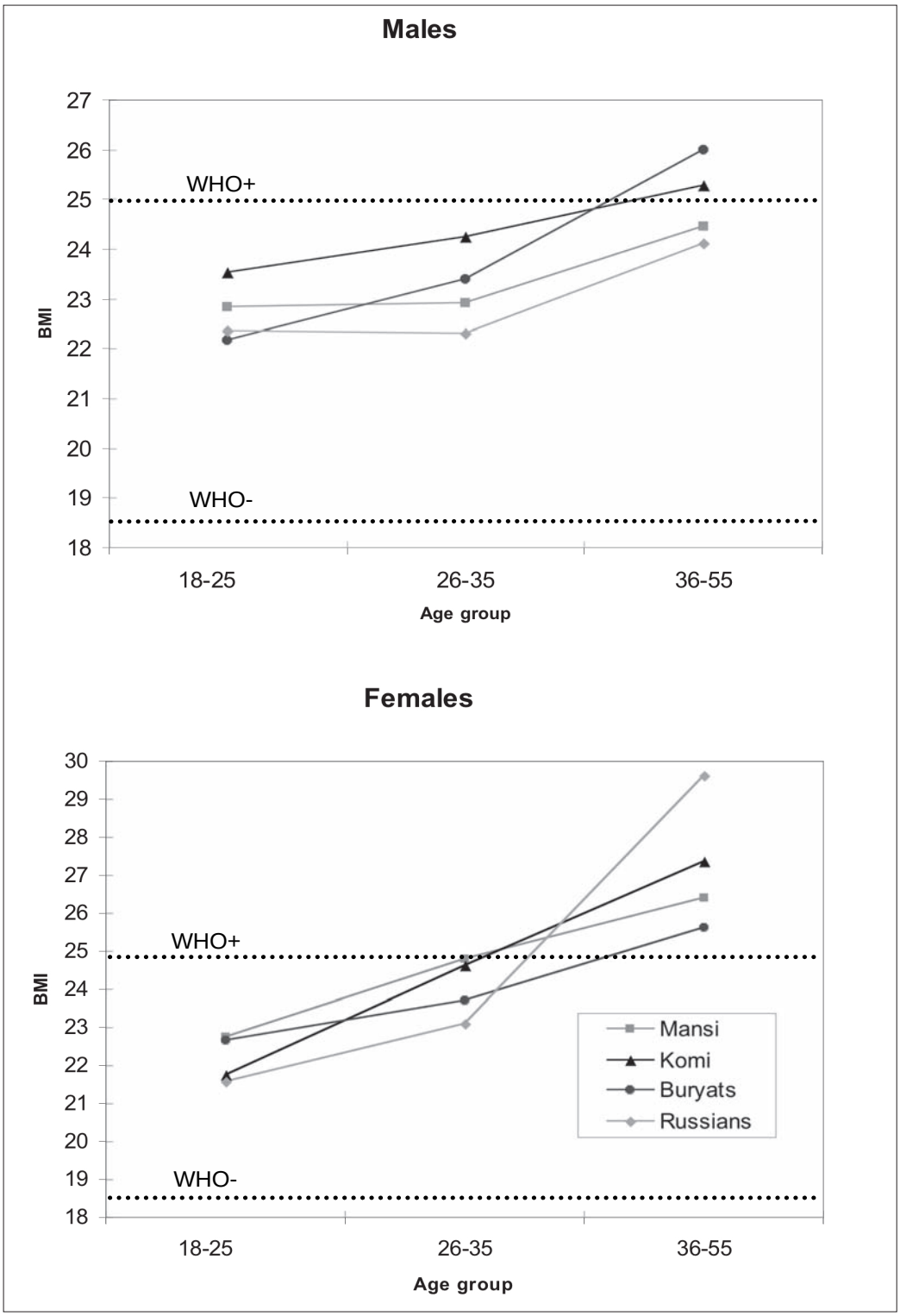

Fig. 3.3. Age-related change in Body Mass Index (BMI) in different ethnic groups.

The human body can be conceptualized as being composed of two compartments: adipose tissue and lean body mass, the latter comprising bones, skeletal muscles and other soft tissues. Many elaborate methods have been developed since the 1920s (Matiegka, 1921) to estimate these compartments, but anthropometry remains the most widely used technique in large surveys (see the review in Roche, 1987).

BMI is an overall index of overweight and obesity. It is an indirect measure of excessive fat in the body but does not indicate where that fat is located, that is, whether it is subcutaneous or visceral fat. The basic technique of calculating the subcutaneous and total body fat contents is based on skinfold thickness and requires the measurement of eight (in women, seven) skinfolds (Matiegka, 1921). The laboriousness of the method encouraged many attempts to develop simpler anthropometrical approaches to the estimation of fat mass and lean body mass ratios. The simplest of the developed methods are based on the height-to- weight ratio (Hume and Wyers, 1971; Black et al., 1983) and are recommended for epidemiological studies (Ulijaszek and Strickland, 1993).

However, in the study of population samples in the North of Russia, the formulas of Matiegka (1921) and Hume and Wyers (1971) yielded significantly differing results. The Hume-Wyers calculation appreciably overestimates the fatty tissue content, the maximum deviations being observed in the subarctic populations of Mansi and Komi-Izhems (Fig. 3.4).

Since Matiegka's formula (1921) takes into account not only body height and weight but also skinfold thicknesses, which are directly related to the extent of fatty tissue development, we are inclined to trust this latter technique more. All the data below on body composition were obtained using the Matiegka's formula (1921) or its modifications (Deryabin, 1987).

Body composition data from different ethnic groups of northern Russia compared with reference values are given in Appendix Table 8.

Our data do not corroborate the view that natives of the Arctic and continental zones are more "muscular" than inhabitants of the temperate zone (Fig. 3.5). The percentage of

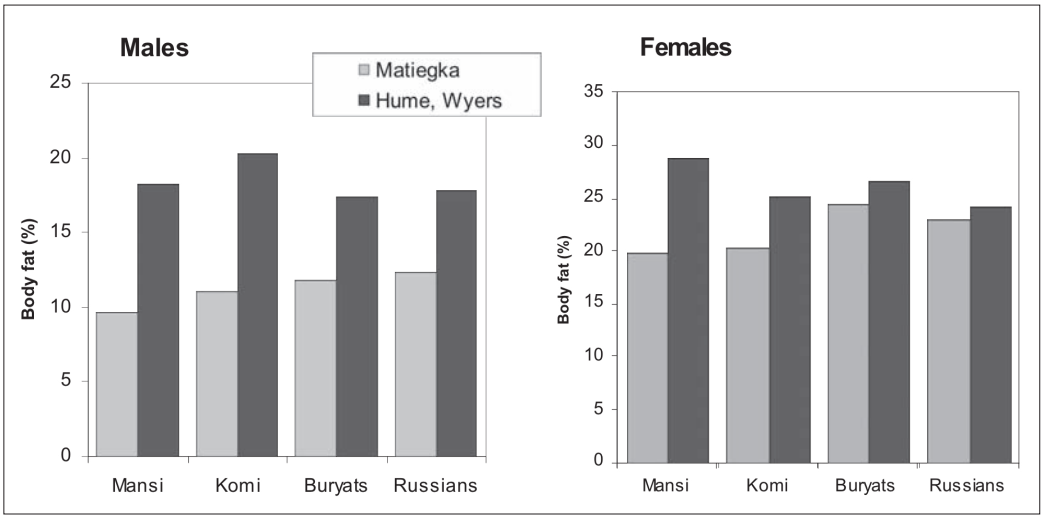

Fig. 3.4. Comparison of Matiegka (1925) and Hume-Wyers (1971) formulas fot body fat components.

muscular tissue (relative to body mass) is the same in Komi-Izhems and Russians, while the natives of the subarctic zone (Mansi) and continental Siberia (Buryat women), as well as Komi-Permyaks, have significantly smaller muscular mass than the Russians. The tendency of exceeding reference values is seen in representatives of subarctic and continental populations (Mansi and Komi-Izhem men and women, Buryat men) only when fat-free body mass are compared. However, these interpopulation differences are not statistically significant.

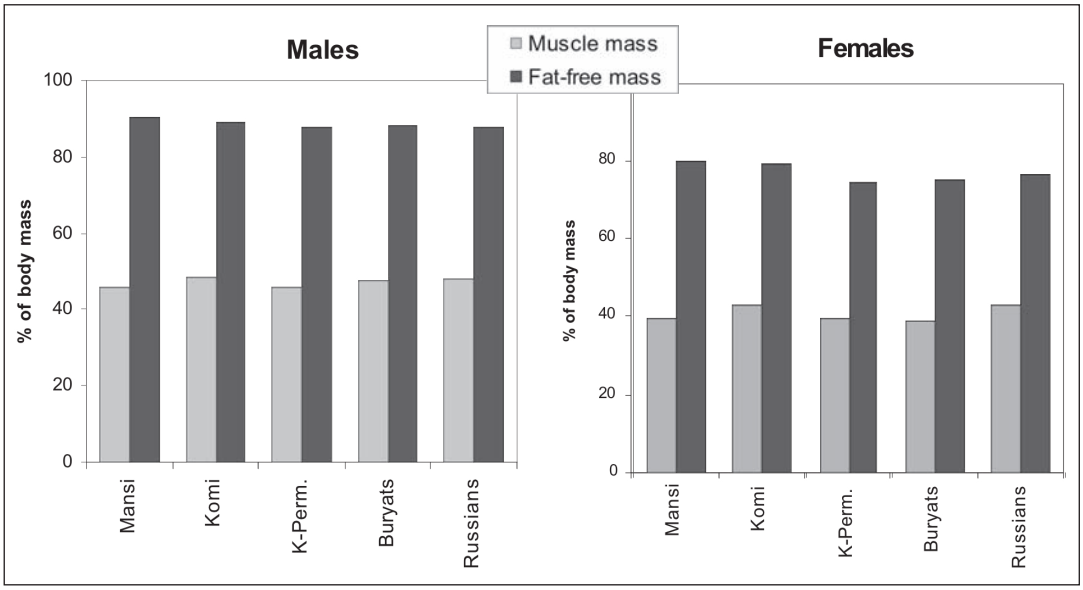

Fig. 3.5. Percentage of muscular tissue and fat-free body mass (relative to body mass) in different ethnic groups.

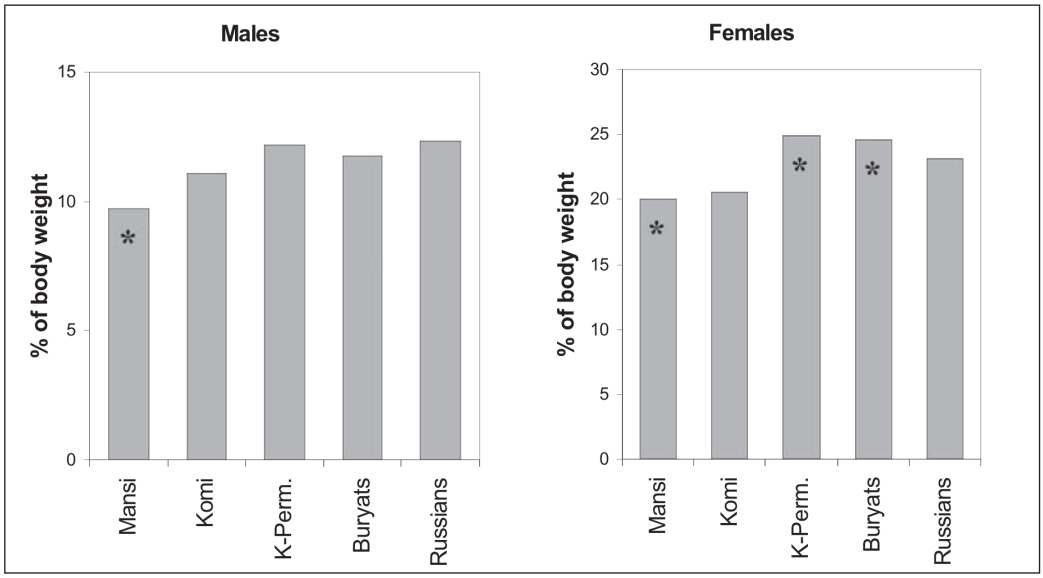

Fig. 3.6. Fat component of body composition in different ethnic groups. Note: * significantly different from Russians

Skinfold thickness measurements are often done to supplement height and weight data in the assessment of body fat distribution. It is recommended to take at least two measurements, those of the triceps and of the subscapular skinfolds (Rose et al., 1982). However, the prognostic value of these two skinfold thickness measurements is rather low (Forbes and Amirhakimi, 1970), compared to four sites: on the back (below the lower angle of the scapula); on the abdomen, to the right of the umbilicus; on the back surface of the shoulder; and on the calf. These measurements allow the calculation of subcutaneous and total body fat content using the Matiegka's method modified by Deryabin (1987) and also the analysis of the subcutaneous fat distribution (topography).

The data on skinfold thickness in representatives of different ethnic groups (men aged 18–25, women 18–22) are given in Appendix Table 9. As seen from Fig. 3.6, in Mansi (natives of the subarctic zone), the fat component of body composition is minimal compared with representatives of other ethnic groups. A tendency towards a lower fat tissue content compared with the reference population is also observed in Komi-Izhems.

According to anthropological studies, the natives of the continental zone of Siberia — Buryats and Yakuts — are characterized by high adipose tissue content compared with the inhabitants of both the Arctic and temperate zones (Klevtsova, 1976; Alekseeva, 1998). Our data corroborate this observation. In the samples we studied, the fat component is higher in Buryats than in the inhabitants of the subarctic zone — Mansi and Komi-Izhems (Fig. 3.6). The deviations from the representatives of reference groups (Russians of Siberia) are significant only in female samples.

Subcutaneous fat topography

It has long been known that the distribution (topography) of the subcutaneous fat is indicative of endocrine disorders (Haisman, 1970). The "male" (android, or truncal) type of adiposity is characterized by an increase of the fatty tissue on the trunk, above and below the waist, while the accrual of the fatty tissue on the extremities is not common. The "female" (gynecoid, or peripheral) type of adiposity refers to the marked increase of fatty tissues on the upper extremities, and also (to a lesser degree) on the trunk above the waist. The development of these forms of adiposity in members of the opposite sex is one of the signs of endocrine disorders.

Less attention has been given to subcutaneous fat topography and its characteristics in healthy individuals. Research in the 1960s and 1970s established that the type of subcutaneous fat distribution plays an important role in the ecological adaptation of humans (Frisancho, 1978). Hence, subcutaneous fat

topography in healthy native northerners deserves special attention by researchers. Are there well-marked differences between the fat tissue distribution in the natives of the Arctic and continental zones and in the inhabitants of the temperate climate zone? Are there pronounced age and sex differences?

To collect data on subcutaneous fat topography we used a relatively simple, but informative, method. It is based on the analysis of four skinfold thickness: subscapular, triceps, suprailiac and calf. The amount above the waist was defined as the sum of subscapular and triceps skinfolds; that below the waist as the sum of suprailiac and calf skinfolds; that of the trunk as subscapular and suprailiac skinfolds; and that of the extremities as triceps and calf skinfolds. The largest among these four sums in a given subject determines the type of this subject's subcutaneous fat topography. In population studies, the percentage of subjects with each fat deposition type is calculated: with predominance of fatty tissue above or below the waist, on the trunk or on the extremities.

Our studies revealed essential differences in subcutaneous fat distribution in representatives of different ethnic, sex and age groups of the Russian North (Kozlov and Vershubsky, 1997, 1998). The proportion of fat deposition types in young (age 18–30) men and women from various ethnic groups are shown as polygons (Figs. 3.7 and 3.8).

Among young Russian men living in the temperate continental climatic zone (Western Urals and agricultural regions of Western Siberia), the subcutaneous fat concentrates below the waist: in most cases (62%) on the trunk, less often (26%) on the lower extremities. Only in 12% of subjects was the predominant skinfold thickness above the waist: 7% on the trunk and 5% on the upper extremities (Fig. 3.7). Similar subcutaneous fat distribution is typical of young Komi-Permyaks, the native inhabitants of the North of European Urals.

The subcutaneous fat concentration patterns are somewhat different in the natives of the subarctic zone — Mansi, Khanty and Komi-Izhem young men. In all of them the predominant total skinfold thickness is on the trunk: above the waist in 60% of the subjects, and below the waist in 40%. The fatty tissue deposition on the extremities is ill-defined. On the contrary, in young Buryat men, the predominant fatty tissue accumulation occurs on the extremities, mainly below the waist (67%). Less common is subcutaneous fat below the waist on the trunk (21%), and in only 12% of the subjects, is it observed above the waist.

Subcutaneous fat distribution is different in young women (Fig. 3.8). In Russian women aged 18–24, the subcutaneous fat concentrates mainly below the waist, like in men, but instead of on the trunk (where it prevails in only 27% of subjects), it is accumulated on the extremities (47%). Before the age-related changes, the accumulation of fat above the waist is rather uncommon (we observed the prevalence of skinfold thickness on the upper part of the trunk in only 13% of subjects and on the upper extremities in 13%).

In young Komi-Permyak women the subcutaneous fat distribution pattern is relatively neutral. The subcutaneous fat in them is distributed homogeneously both in the lower (53% in all, including 27% on the trunk and 26% on the extremities), and in the upper part of a body (47%, including 31% mainly on the trunk and 16% on the extremities).

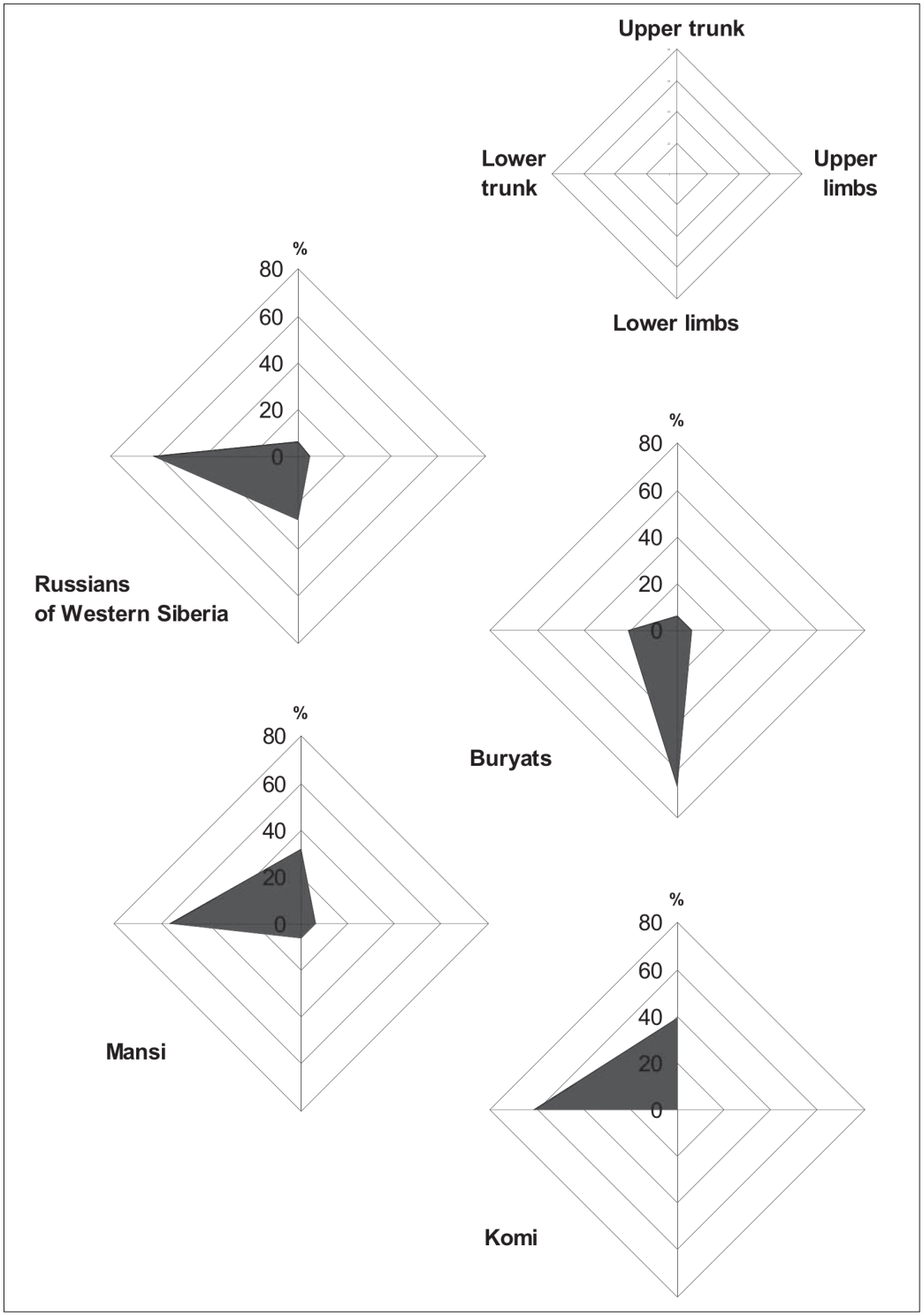

Fig. 3.7. Proportion of fat deposition types in young males from different ethnic groups.

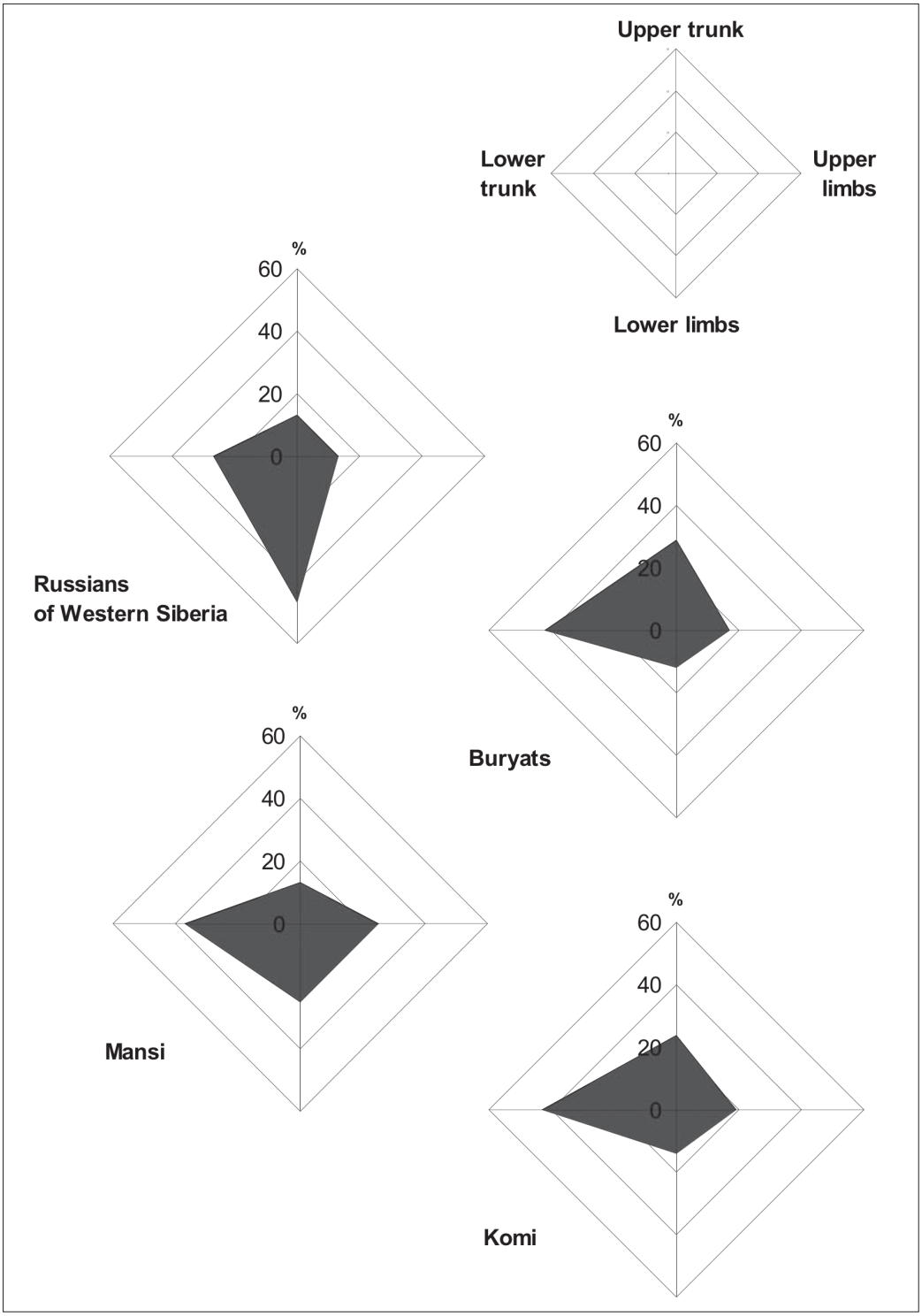

Fig. 3.8. Proportion of fat deposition types in young females from different ethnic groups.

In a majority of indigenous women of Western and Eastern Siberia the fat tissue is located below the waist (62% of Mansi and Komi-Izhems, 54% of young Buryats). In most cases (37–43% out of the above-mentioned 54–62%) the subcutaneous fat is predominant on the trunk — contrary to what we observed in Russian girls and young women.

To summarize, we conclude that the young adult inhabitants of the Russian North demonstrate a characteristic pattern of subcutaneous fat distribution that is most evident among men (Kozlov and Vershubsky, 1997, 1998). Subcutaneous fat topography varies among inhabitants of the temperate (Russians and Komi-Permyaks), subarctic (Mansi, Khanty and Komi-Izhems) and continental (Buryats) climatic zones.

The age changes in subcutaneous fat amount and distribution are similar in all our study samples. Mansi and Komi-Izhem men, whose life-style is close to a traditional one with high "background" physical activity levels, are characterized by reduced fat tissue accrual (Table 3.1). Age distinctions in skinfold thickness in the subarctic population are significant only in Mansi women ($p<0.01$). In more "modernized" Buryats, the age-related subcutaneous fat thickness is more pronounced (men $p<0.001$).

There are sex differences in age-related changes of subcutaneous fat topography. Among men, age-related changes in subcutaneous fat topography are very similar among ethnic groups. The fat tissue layer accrues on the trunk above and below the waist, whereas fat deposition on the extremities is not typical (androidal or truncal pattern).

Women of northern populations, irrespective of their ethnic group, are characterized by the growth in subcutaneous fat thickness above the waist, usually on the trunk. The accrual of total subcutaneous fat thickness on the extremities is insignificant. It thus differs from the typical gynecoid (or peripheral) type of subcutaneous fat distribution and resembles the male (truncal) type.

The subcutaneous fat distribution, similar to what we observed in Mansi, Komi and Buryat women of advanced ages, was described by Shephard and Rode (1996) for Nganasan, Leonard and Katzmarzyk (1994) for Evenki, and Beall and Goldstein (1992) for Mongolian women. Probably, such specific age-related changes in subcutaneous fat distribution are typical of all female representatives of subarctic and continental populations. Unfortunately, not enough attention is given to the detailed study of subcutaneous fat topography. Interpopulation comparisons are hampered by a lack of agreement among the study methods and an incompleteness of the published data.

This issue, however, is of practical importance. In European populations the truncal pattern of subcutaneous fat concentration is regarded as a risk factor for the develop-

Table 3.1. Total thickness of four skinfolds in young and middle-age adults.

		Komi-Izhems			Mansi			Buryats		
Sex	Age group (yr)	n	Mean	SD	n	Mean	SD	n	Mean	SD
Males	18 - 25	36	1.77	0.54	18	1.51	0.35	88	1.94	0.51
	36 - 55	13	1.84	0.69	16	1.62	0.51	25	2.51	0.70
Females	18 - 23	12	3.30	1.15	27	3.11	0.79	109	3.88	0.71
	36 - 50	24	3.42	1.10	13	3.91	0.86	17	4.36	1.28

Note: sum of skinfolds (subscapular, triceps, supraspinale, medial calf) expressed as a percentage of body length.

ment of cardiovascular diseases and cholelithiasis in women (Tatoń, 1981; Stallones et al., 1982; Larsson, 1988; Haffner et al., 1989). The interrelations between subcutaneous fat distribution and disease risk in the northern indigenous populations of Russia have been insufficiently studied.

There also some other issues that require further research. Do these peculiarities of subcutaneous fat distribution reflect the hormonal and metabolic status of native northerners? How profound is the influence of the long-term climatic adaptation factor on the formation of stable subcutaneous fat topography patterns? Such potential impact on health and disease should be recognized by health care providers working among the natives of high-latitude zones.

Physique and somatotype

There is an entire range of approaches to estimating body physique. The most common one in current use is the somatotype method of Heath and Carter, which provides a general or *gestalt* summary of body shape (Carter and Heath, 1990). The somatotype description is essentially an integrating characteristic of the weight to height ratio and the subject's body composition. Endomorphy is an estimate of an individual's relative fatness. Mesomorphy is an estimate of musculoskeletal robustness per unit of height. Ectomorphy serves as an index of relative "body elongation," also estimated based on the BMI values.

Tables 3.2 and 3.3 provide the mean values of somatotype components in representatives of our study populations, estimated by the Heath-Carter method. The mean somatotypes in male samples are very similar. The component of mesomorphy is predominant in young men of all study groups. In 81–85% of Buryats and Russians of Eastern Siberia, as well as in almost all young Komi-Permyaks, Komi and Mansi (89–100%), absolute values of the mesomorphy component dominate over endo- and ectomorphy.

The somatotypes of young women show more pronounced differences (Table 3.3). The somatochart below (Fig. 3.9) is a graphical representation of mean somatotypes distribution in samples of women aged 19–25. As seen on the chart, representatives of all examined population groups from the northern areas of Russia differ from their Russian peers in lower values of their component of ectomorphy. Mansi and Komi-Izhem women are characterized by a

Table 3.2. Average components of Heath-Carter somatotype in males of different ethnic groups.

Age group (yr)	Ethnic group	n	Endomorphy Mean	Endomorphy SD	Mesomorphy Mean	Mesomorphy SD	Ectomorphy Mean	Ectomorphy SD
19-25	Buryats	40	2.41	0.85	5.09	0.99	2.27	0.89
	Khanty	10	2.17	0.76	4.98	0.66	2.58	1.34
	Mansi	14	2.17	1.14	5.26	0.86	1.81	0.91
	Komi-Izhems	10	2.26	0.89	5.33	0.95	2.03	0.95
	Komi-Perm.	9	1.79	0.64	4.32	1.20	3.01	1.42
	Russians	121	2.59	1.05	4.88	1.33	2.68	1.21
26-55	Buryats	15	3.61	1.01	5.80	0.85	1.29	0.88
	Khanty	13	2.91	0.82	5.40	1.11	1.38	0.77
	Mansi	46	2.49	1.32	5.52	0.91	1.54	1.00
	Komi-Izhems	43	2.95	1.25	5.99	0.94	1.37	0.83
	Komi-Perm.	15	2.27	0.77	5.06	0.92	1.69	1.08

Table 3.3. Average components of Heath-Carter somatotype in females of different ethnic groups.

Age group (yr)	Ethnic group	n	Endomorphy Mean	Endomorphy SD	Mesomorphy Mean	Mesomorphy SD	Ectomorphy Mean	Ectomorphy SD
19-25	Buryats	66	5.10	1.02	4.32	0.92	1.77	0.93
	Khanty	16	4.28	1.04	4.22	0.88	1.65	0.98
	Mansi	32	4.24	1.35	4.58	0.93	1.22	0.94
	Komi-Izhems	13	4.22	1.38	5.09	1.10	1.35	0.77
	Komi-Perm.	41	5.31	1.19	4.55	1.14	1.67	0.97
	Russians	90	4.44	0.89	4.18	1.04	2.30	1.02
26-55	Buryats	52	5.35	1.40	4.89	1.39	1.57	1.29
	Khanty	35	5.17	1.62	5.20	1.57	1.01	1.12
	Mansi	61	5.31	1.52	5.06	1.32	0.87	0.97
	Komi-Izhems	46	5.28	1.94	5.87	1.73	1.05	1.12

stronger mesomorphy component, while Komi-Permyaks and Buryats are more endomorphic than the Russian women. On the whole, the representatives of the reference sample (Russian women) are closer to the "balanced" somatotype values (4-4-4) than their peers from other groups.

In general, mesomorphy in women is weaker than in men. In young Buryat and Komi-Permyak women, as well as in women from the Russian sample, more common are somatotypes in which the endomorphic component values dominate over ecto- and mesomorphy. But among northerners — Mansi and Komi-Izhem women — the "muscular" somatotype (with dominating mesomorphy) is very common. In 75–80% of these women, the mesomorphic component values dominate over endo- and ectomorphy (Fig. 3.10).

The senior age cohorts are characterized by a larger number of "obese physique" subjects with dominating endomorphic component values (Tables 3.2 and 3.3). The minimal age-related increase of the endomorphy component

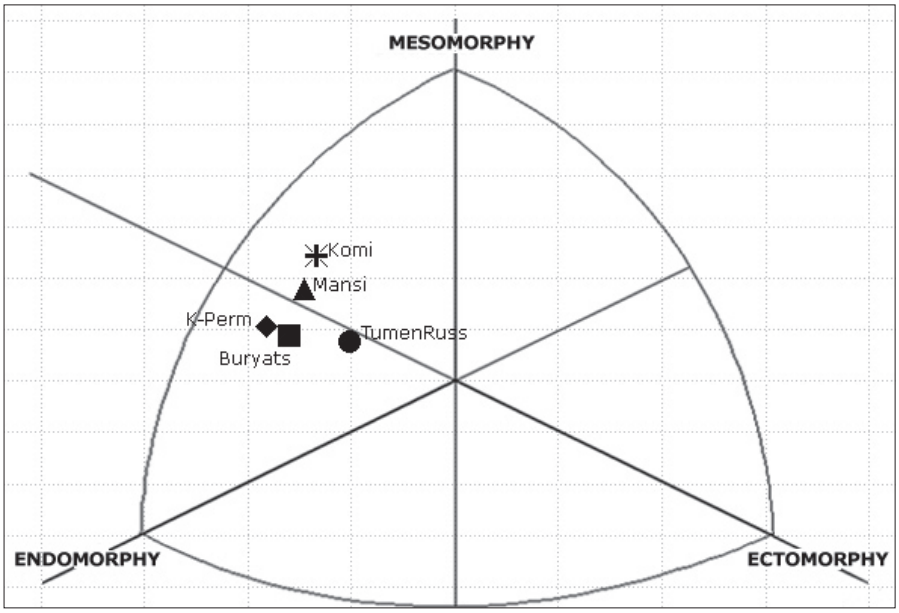

Fig. 3.9. Mean Heath-Carter somatotypes in females of different ethnic groups.

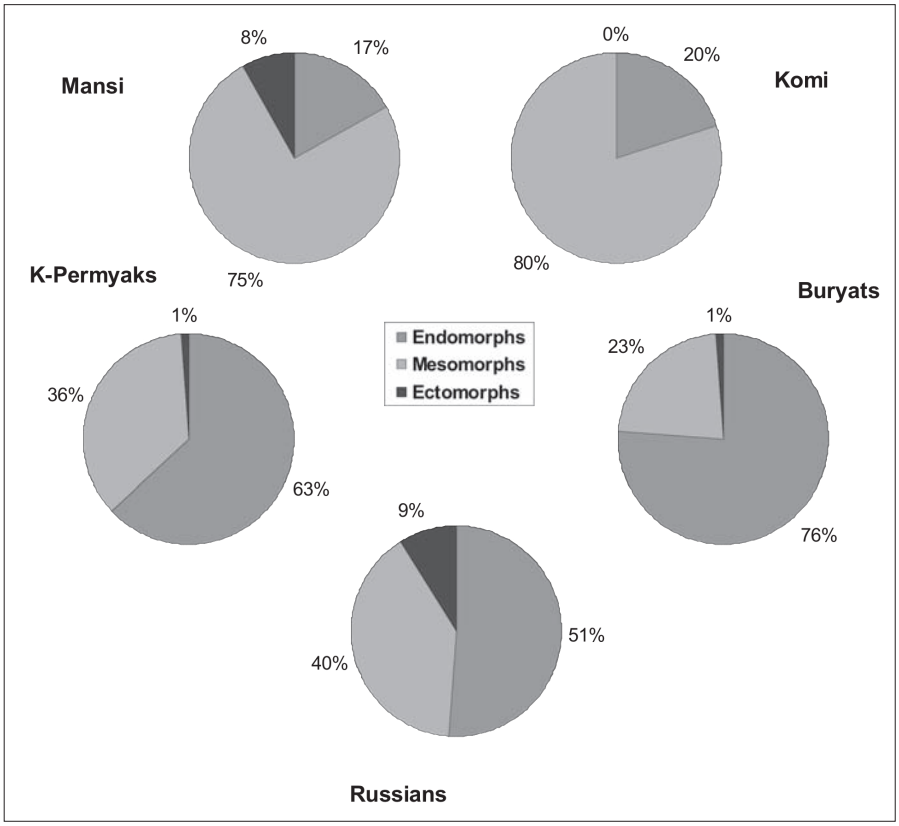

Fig. 3.10. Heath-Carter somatotype frequencies in young females of different ethnic groups.

is observed in Mansi and Komi-Izhem men and women, whose life-style is close to a traditional one and is associated with physically demanding daily tasks.

The intergroup differences in the increase of endomorphic component values are related to the changes in the fat component of body composition. It is, however, more difficult to interpret the age-related growth of mesomorphy component values. We are inclined to think that the age increase of mesomorphy that we observed in particular in women results, above all, from the method error. Certain specific features of the Heath-Carter approach are known to result in an overestimate of mesomorphy values. In particular, it can occur in cases where there is a considerable increase in the fat component of the body composition (Wilmore, 1970).

The set of measurements needed to calculate the mesomorphy values includes the biepicondylar breadths of the humerus and the femur; however, the adipose tissue thickness on the epiphyses of long bones of the extremities is not taken into account. With the fat layer accrual on the extremities, the mesomorphic component values are systematically overestimated. As a result, these values in the older age groups can grow not because of an increase in muscle mass but because of growing obesity.

As we have already noted, the natives of central Siberia (Buryats) are characterized by the peripheral type of subcutaneous fat distribution. Given such topography, the age-related increase of fatty tissue mass can have a most profound effect on the mesomorphic component values.

This again reminds us of the history of the Heath-Carter approach, which was developed on the basis of studying the physiques of American students of European origin (Carter and Heath, 1990). The same is true about the W.H. Sheldon's techniques that provided the basis for the Heath-Carter method. Thus, while interpreting somatotyping results for representatives of different ethnic groups, the researcher should remember that the physique of the Mansi, Inuit or Buryats is being estimated by the "European scale." On the one hand, one can challenge the universality of the Heath-Carter method, while on the other, it is yet another corroboration of the anthropological peculiarities of indigenous populations of the high-latitude regions.

Pelvic size, body proportions and the course of labour

The practice of obstetrics tends to be more conservative among the medical specialties. The most popular justification of the situation is that "Nature herself can take care of everything," and that there is no need to break traditions. With an uncomplicated course of labour, the need for medical intervention by a nurse midwife or physician is minimal. Their primary goal is to assist with, rather than take over, the delivery.

But does the modern practice of obstetrics really "follow nature"? In other words, does it take into account the medical and biological characteristics of the women in labour? Unfortunately, our observations and the analysis of records of prenatal care and deliveries show that the anthropological characteristics of pregnant women are practically ignored by doctors in the Russian Federation. Estimating the pelvic dimensions and identifying risk factors for complications during pregnancy and labour in women of Siberia, the Urals and the Far East is carried out based on the norms developed for women in European Russia, without taking into account the peculiar body dimensions and proportions of a particular ethnic group.

This section provides the obstetric pelvimetry results for women from different ethnoterritorial groups and reveals their interrelations with pelvic dimensions, infant body size and some functional characteristics of the women.

As it was shown in chapter 2, the probability of morbidity and even mortality in the newborn is higher if the infant's anthropometrical characteristics deviate from the average values. Similarly, infant death rate grows in cases where the infant's body weight and the obstetric dimensions of the mother's pelvis differ substantially from the values characteristic of a given ethnic group (Zak, 1967). Therefore, the correct estimation of a woman's pelvic size is of importance in planning prenatal care and in identifying potential risk factors that may lead to obstetric complications.

Our data corroborate the significance of interethnic variability of pelvic sizes. Appendix Table 10 provides the anthropometrical characteristics of pregnant women from these studied ethnic groups: Saami, Khanty and Mansi, Buryats and Komi-Permyaks. The anthropometrical indices of Khanty and Mansi women show no significant differences; therefore, they are incorporated into one group of Ob Ugrians. The data on the Russian women from the rural regions of Western Siberia serve as reference values.

The women of fertile age from all studied groups are characterized by a significantly shorter stature than the Russian women. The representatives of subarctic groups — Saami and Ob Ugrians — have significantly smaller absolute pelvic sizes than the women of the reference groups. However, it is the relative and not the absolute pelvic dimensions that are of vital importance for the outcome of labour. Recommendations to assess labour prognosis from relative (to body height) dimensions of the pelvis were made by some Russian researchers at least 40 years ago. The doctors

of Russia, however, continue to be guided by the so-called standard norms of absolute pelvic dimensions. Given the huge anthropological variety of the populations residing in Russia, this sometimes results in absurd diagnostic decisions. Thus, according to the staff of the Bilibino mobile medical group in Chukotka, in the course of preventive health examinations in the 1980s, they were instructed to identify women with "contracted pelvises" and to refer them for further assessment as "pathologic pregnancies." The decision was taken based on the absolute pelvic dimensions of a pregnant woman, not on those dimensions relation to the woman's body height.

The distribution of relative pelvic width values (*D.cristarum* percentage relative to body height) in the studied samples is different from that of absolute external pelvic dimensions (Appendix Table 10) Khanty and Mansi women have the largest relative pelvis width among northern indigenous groups, followed by Buryat and Komi-Permyak women. Rural Russian women of Siberia have a significantly smaller relative width of the pelvis. In Saami women, who have the smallest external pelvic dimensions, the relative pelvic width values are the same as in Russian rural women.

It should be emphasized that in Russian women from Western Siberian cities, the relative pelvic width values are even lower than in women from reference groups residing in villages. In Tyumen urban residents, *D.cristarum* amounts to 15.4% of the body height (SD=0.92; n=496), which is significantly ($p<0.001$) lower than the corresponding index values for both the Russian women from Tyumen Oblast villages and the Saami women.

Thus, we may conclude that the lower (relative to the norm) values of absolute pelvic dimensions, typical of women from native ethnic groups of the Russian North, do not necessarily imply a narrowness of the birth canal. With a harmonious physique, the so-called contracted pelvis may just correspond to the general diminutiveness of a woman.

The relative pelvic dimensions belong to the major characteristics of a woman's physique, defining the specificity of her body proportions. The importance of considering the woman's body proportions for obstetrical prognosis is illustrated below by an example of one stage of the labour course, the so-called second stage or stage of expulsion.

The time of the newborn's passing through the natural birth canal depends on the ratio of the fetus size and the mother's pelvic dimensions, as well as on the intensity of the muscular effort during uterine contractions. Barring the cases of labour augmentation, it can be said that the second stage of labour is most strongly influenced by the medical and biological characteristics of the pregnant woman.

Table 3.4 shows the average (for the population) duration of the expulsion stage in women of the studied groups. The shortest time of the baby's passing through the birth canal is observed in Buryat women. In women of other ethnic groups, the second stage lasts significantly ($p<0.01$) longer. It should be noted, that the absolute values of almost all external pelvic dimensions in Buryat women were the largest among the women of the studied ethnic groups (Appendix Table 10). Only the Ob Ugrians —Khanty and Mansi women — have larger absolute and relative pelvic width *(D.cristarum).*

Table 3.4. Duration of the second stage of delivery (in minutes) in females of different ethnic groups.

Ethnic group	Mean	SD
Saami	28.8	14.4
Mansi	20.9	13.7
Khanty	21.2	12.7
Komi-Permyaks	23.1	14.9
Buryats	16.8	14.2
Chukchi	17.0	8.2
Russians	21.0	11.2

However, this is only an indirect corroboration of interrelation between the relative pelvic dimensions and outcome of the course of labour. Eventually the shorter time of the fetus's passing through the birth canal in Buryat women may have many explanations. Therefore, it is more important to estimate the intragroup associations for these characteristics.

Of course, we may try to find out the individual relations between the relative pelvic dimensions of the woman and duration of the expulsion stage. We believe, however, that a more promising approach would be to define different variations of the women's physique and proportions. The interrelation between the women's physique and course of labour is rarely taken into consideration by doctors. Meanwhile, the somatotype and its major characteristic, the body proportions, are very informative measures.

The method of physique-type definition applied in our studies takes into account the range of within-population trait variability. Thus, the method is focused on defining the place of a particular subject (patient) within his/her age-sex and ethnic group. To estimate the women's body proportions within each ethnic group (*D.cristarum*, percentage of the body height) we divide the range of relative pelvic width values into intervals: less than the mean (m)-0.67 standard deviation (SD); m-0.67SD to m+0.67SD; and more than m+0.67SD. Women with values falling within the first, second and third intervals are defined, respectively, as dolichomorphic (longilineal individuals, whose body height predominates over width), mesomorphic (the height and width proportions are balanced) and brachimorphic (width predominates over height).

We have studied the dependence of expulsion stage duration on a woman's physique (body proportions) type, defined by the relative pelvic dimensions, in the samples of Komi-Permyak and Buryat women as well as in the reference group of Russian women. We have found that the time of the fetus's passing through the birth canal (the second stage of labour) is shorter the larger the relative width of the woman's pelvis is (Table 3.5). The application of the bootstrap procedure

Table 3.5. Duration of the second stage of delivery (in minutes) in females of different body proportions.

Ethnic group	Dolichomorphs		Mesomorphs		Brachimorphs	
	Mean	SD	Mean	SD	Mean	SD
Komi-Permyaks	23.1	14.0	23.0	15.1	20.9	13.6
Buryats	17.2	13.4	15.8	9.3	13.2	6.8
Russians	22.0	11.5	21.9	11.7	18.9	10.4

has shown that the differences between the dolichomorphic and brachimorphic women are significant ($p<0.05$) in all studied groups. In women with dolichomorphic proportions, the second stage of labour lasts three to four minutes longer than in brachimorphs.

Of course, modern medicine cannot be reduced to biological (anatomical and anthropometric) parameters only. Despite the above-mentioned reduction of relative pelvic sizes, in the 1980s the total labour duration in Saami women decreased by one-third (i.e., by 3 hours 25 minutes on the average) compared with the 1970s. The duration of the second stage of labour, the fetus's passing through the birth canal, also decreased from 28.6 to 14.0 minutes ($p<0.001$). This dynamics is obviously related to the changes in obstetric policy (e.g., wider use of labour induction) that took place in the Lovozero hospital during the decade.

Nevertheless, based on the data discussed in this section, we maintain that the values of the woman's absolute pelvic dimensions are not particularly informative for the doctor. Application of rigidly established norms of absolute pelvic dimensions in anthropologically different northern populations may result in diagnostic mistakes. An obstetrician, giving proper attention to the relative pelvic dimensions and the physique type (proportions) of the pregnant woman, can predict the labour course with much more accuracy.

Correlation between mother's and newborn's sizes

The course of labour and possible complications in the delivery and post-delivery periods are determined by the size of the fetus and the mother's anthropometrical characteristics, among other factors. In non-Arctic populations, the ratio of the mother's and baby's dimensions has been studied (Kaarma, 1981; Czajca-Narnis, Jung, 1986). However, we have no information of similar research in indigenous population groups of high-latitude regions that examine the correlation of the newborns' body size and pelvic dimensions of women in their fertile years.

We have calculated the correlation between the values of the mother's body height and external pelvic dimensions, on the one hand, and the infant's size for Mansi, Buryat and Russian groups. Separate procedures were carried out for newborn boys and girls.

The correlation between the mother's *D.trochanterica* and the baby's size appeared low in all the studied populations. There-

fore, it has been excluded from the tables. Appendix Tables 11 and 12 show significant ($p<0.05$) correlation coefficients between the mother's and baby's anthropometrical dimensions in various ethnic groups.

The mothers' external pelvic dimensions most closely related to the newborns' sizes are the *D.cristarum* (r=+0.31...+0.66) and the *C.externa* (r=+0.19...+0.74 in different ethnic groups). This result agrees with the data of H. Kaarma (1981), which was obtained from studying Estonian samples. Moreover, according to Appendix Tables 11 and 12, the correlation between the baby's size and the mother's pelvic dimensions also differs according to the newborn's sex, with a stronger correlation in the male newborn than in the female.

These observations have practical application. The ratio of anthropometrical dimensions of the mother and the newborn can be represented in tables showing the normal variation range for external pelvic dimensions (for particular values of the mother's height), as well as the baby's expected (estimated) birthweight corresponding to the mother's *C.externa* values.

We applied this principle when developing regional tables for the Tyumen Oblast and Khanty-Mansi AO, intended for the use in primary-care medical assistance stations (staffed with medical assistants and nurse midwives) in remote northern villages. With these tables, the medical assistants and nurse midwives are able to estimate the risk of labour complications for a particular woman, based on the characteristics of physique typical of a given population. This provides opportunities for developing individual medical approaches for each pregnant woman.

CHAPTER 4

PHYSICAL FITNESS AND METABOLIC HEALTH

Among the goals of this book are to show that the medical-anthropological characteristics of numerous population groups living in the northern regions of the Russian Federation are essentially different and to demonstrate the character of such "northern" deviations from the "universal norm." In the previous chapters, we discussed the ethnic peculiarities of child growth and development, adult body composition and other anthropometrical characteristics in different population groups..

In the former USSR, the need for studying the distinctive human physiology of indigenous northerners was traditionally rationalized based on the "national economic" perspective. It was presumed that the study of the natives' functional characteristics would be useful in helping to develop criteria for the recruitment and selection of individuals for the military and civilian workforce in high-latitude regions. After the collapse of the Soviet economic system, the medical and biological studies of indigenous populations of the North were abruptly curtailed. In the early 1990s, the state abandoned the policy of industrial expansion into remote Arctic regions and many scientific institutes, for whom the studies of medical peculiarities of indigenous peoples had been an extra burden, were quite happy to discontinue these labour-intensive and poorly financed research programs.

We have consistently opposed the merely "utilitarian" approach to studying medical-anthropological characteristics of the indigenous populations (Kozlov and Vershubsky, 1999). From our viewpoint, the potential applications of such studies are of minor importance. The pace and intensity of physical work associated with the traditional life-style are too different from what we find in industrial production. Similarly, the functional complexes that were selected throughout centuries and millennia of adaptation to Arctic conditions among the indigenous inhabitants are essentially different from those formed in the populations of the temperate climate zone.

Studies of northerners' physiological features have their own, non-economical value.

The results are important for health and education professionals who strive to improve the growth and development of children from ethnic communities and who want to adopt health care practices to enhance the health of northerners generally.

From this standpoint, we shall focus in this chapter on the basic physical performance characteristics among the indigenous populations of the Russian Arctic (Nenets) and subarctic (Mansi, Komi) and continental Siberia (Buryats).

Strength, endurance and dexterity

Measures on handgrip and back strength, static endurance and dynamic characteristics among the Mansi, Komi, Nenets and Buryat populations, compared with the reference group of Western Siberian Russians, are shown in Appendix Tables 13 and 14.

Muscle strength

Native northerners demonstrate rather low absolute handgrip strength (Fig. 4.1). Among the examined men aged 20–35, only Komi-Izhems have values comparable to those of the reference group, the Russians of Tyumen. The values in Mansi, Nenets and Buryats are significantly lower (all muscle strength values are given in newtons, N).

Our data are in agreement with findings of other researchers. For example, the average muscle strength was 456 N among Inuit men aged 20–30 in the Canadian village of Iglo-

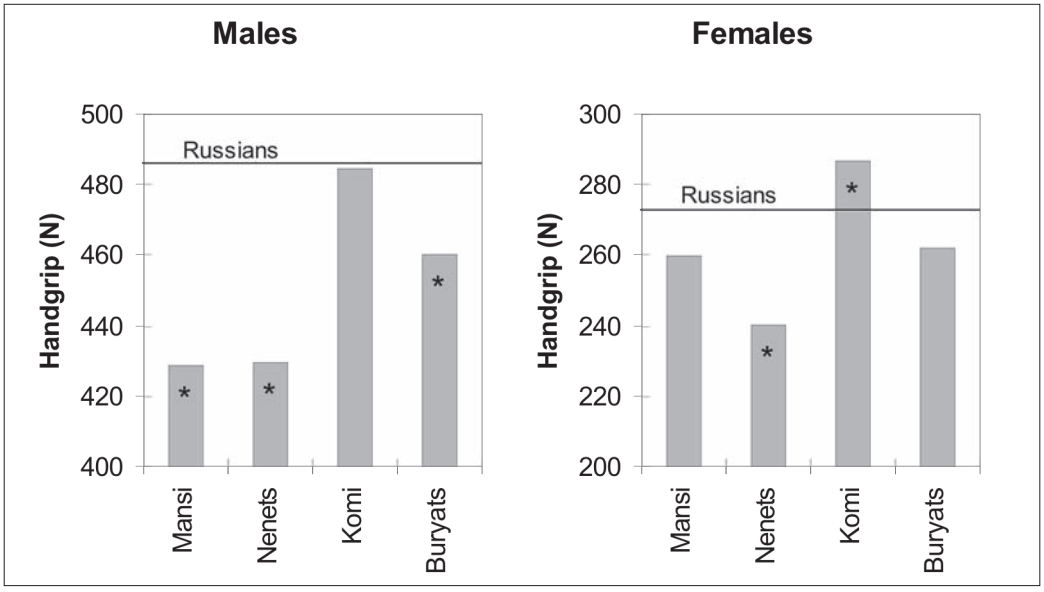

Fig. 4.1. Average handgrip strength in different ethnic groups. Note: *group significantly different from Russians

olik (Shephard and Rode, 1996). These values are lower than those obtained from Russians in Siberian cities in our study. The Nganasans of Taymyr also show values that are lower even when compared with those of representatives of subarctic groups in our study — 411 N, approximately 85% of the reference value (Rode and Shephard, 1994).

In samples of women 19–35 years of age, the general distribution of average strength values corresponds to that described for men (Fig. 4.1). As in men, female Nganasan of Taymyr and Canadian Inuit have lower forearm and hand muscle strength than their Siberian peers (Shephard and Rode, 1996).

In addition to handgrip tests, torso strength tests are important measures of muscle strength. Komi men and women show the highest absolute backlift values (Fig. 4.2), surpassing all other studied groups, including the Russians of Siberia.

In comparing populations, it should be recognized that an individual's physiological characteristics are influenced, among various factors, by his/her total body dimensions (Shephard, 1985). Since the body height and weight in representatives of the studied populations tend to differ (see chapter 3), we have calculated relative values of strength characteristics expressed as units per kilogram of body mass (see Appendix Table 13).

The results demonstrate that the highest relative strength values are observed in representatives of northern populations — the Komi-Izhems and Mansi. Using the relative backlift values as an indicator of muscle strength, they by far surpass representatives of the reference groups — the Western Siberian Russians (Fig. 4.3).

Interethnic differences in relative handgrip strength values are not pronounced. The highest values are found in both males and females of the Mansi samples, while the Buryat samples yielded the lowest indices.

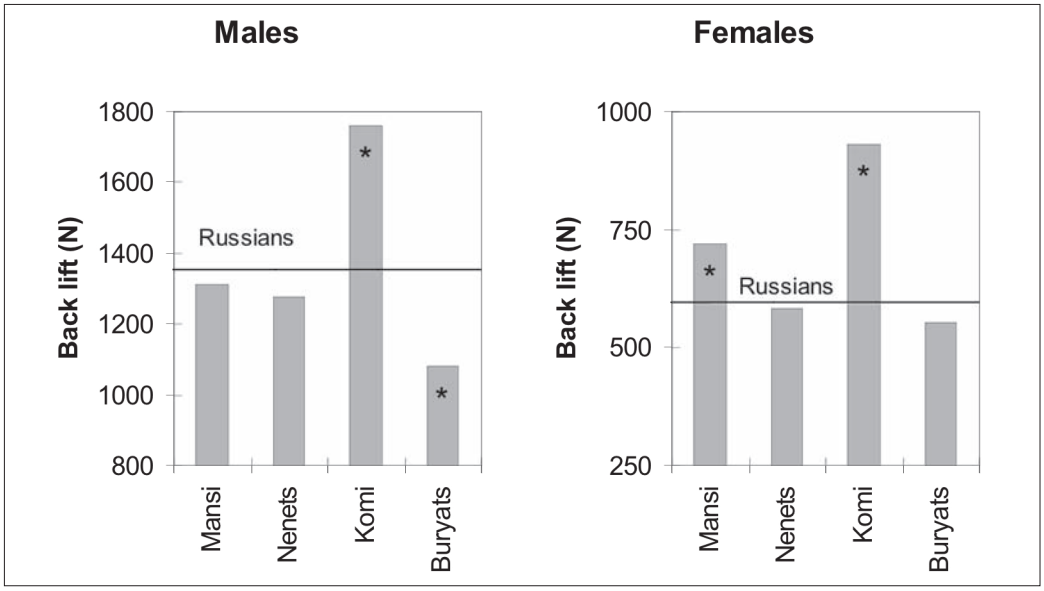

Fig. 4.2. Average back lift in different ethnic groups. Note: *group significantly different from Russians

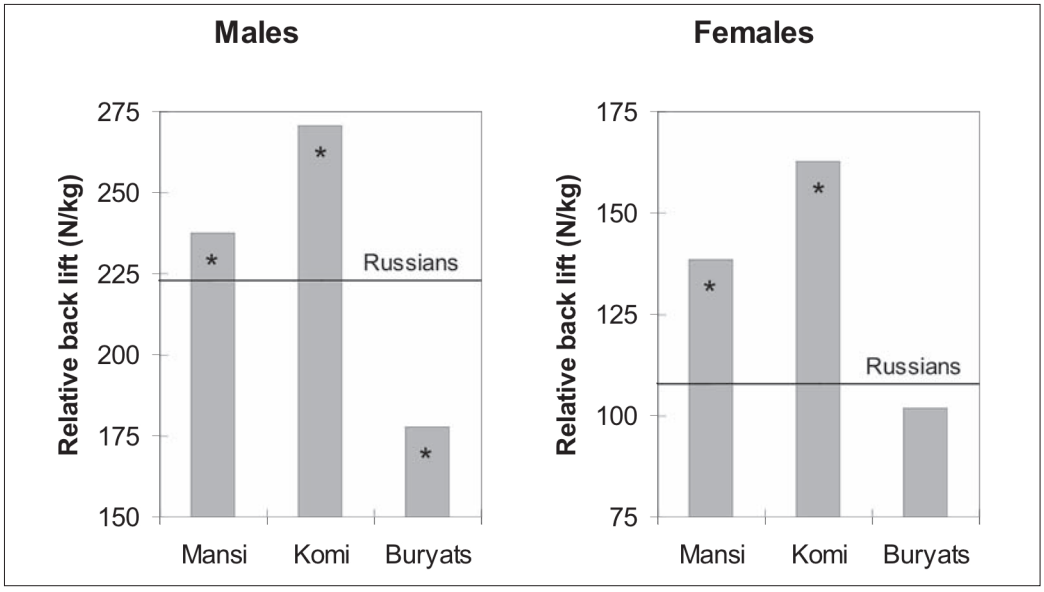

Fig. 4.3. Relative (to body mass) back lift in different ethnic groups. Note: *group significantly different from Russians

Static endurance

In addition to muscle strength, static endurance is another important measure of an individual's ability to perform physical work for extended periods. While developing our program of physiological studies and selecting methods to assess static endurance, we decided in favour of the modified Rosenblatt static endurance test for forearm and hand muscles. The method is based on defining the time (in seconds) during which a particular subject is able to maintain a muscle group in continuous effort equal to 75% of his/her potential maximum (Davidenko and Kaznacheev, 1980). This test proved to be effective in differentiating between individuals of endurance in response to varying physical loads (Kaznacheev and Kaznacheev, 1986).

The results of the static endurance tests are shown in Appendix Table 14 and Fig 4.4. Among men, the values fall within a range from 42.8 to 38.2 seconds; the interethnic differences are statistically insignificant. Among women, the highest values are observed in Komi-Izhems, who significantly ($p<0.01$) surpass representatives of the reference group (Russians). The Mansi and Buryat women also notably surpass the Russian women of Siberia in static endurance, but because of high individual variability, the interethnic differences are not significant.

Manual dexterity

Many kinds of work require accurate control and precision, which are often associated with relatively light physical workloads. We defined individual sensorimotor characteristics with the help of the two-plate test — a widely used tool in psychomotor studies (Gilford, 1958; Surkov, 1984). The subject's task is to touch alternately two 10x10 cm plates, placed at a distance of 5 cm from each other, with maximum speed. The total number of contacts

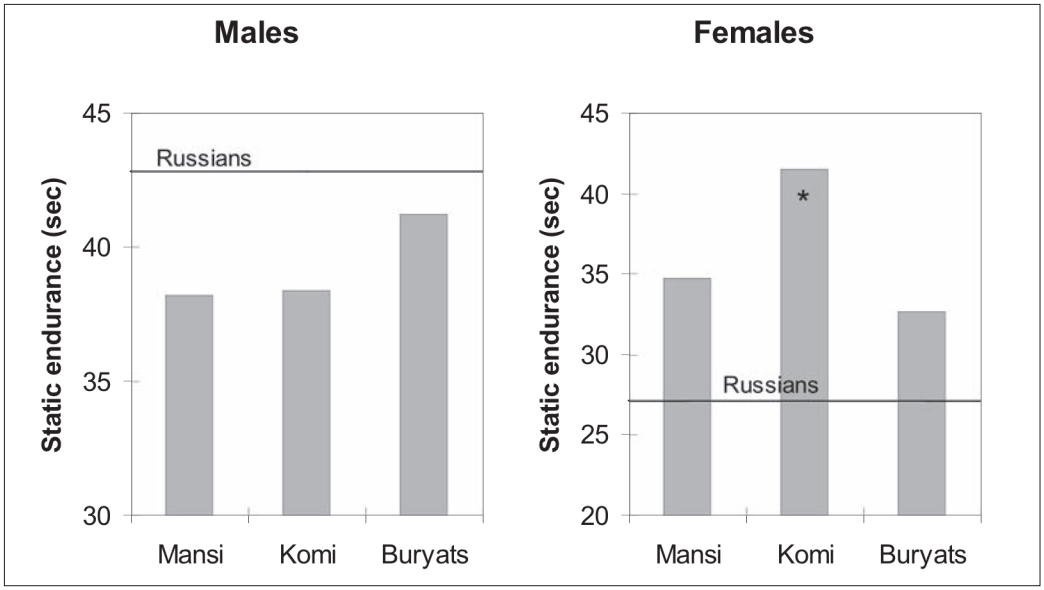

Fig. 4.4. Static endurance in different ethnic groups. Note: *group significantly different from Russians

within a 15-second interval is counted.

In our study, we administered the two-plate test separately for both the right and left hands, and calculated the arithmetical mean of these two values. The two-plate test values in representatives of the studied ethnic groups are given in Appendix Table 14 and in Fig 4.5.

Among men, the lowest speed in the manual dexterity task was observed in Mansi and Komi-Izhem samples. Buryats are character-

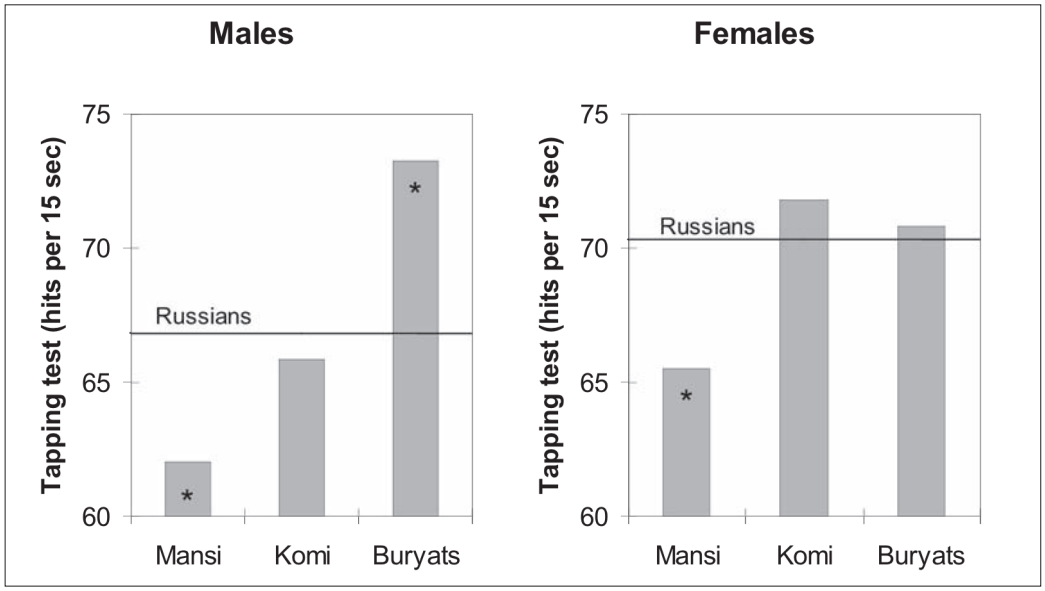

Fig. 4.5. Results of two-plate tapping test in different ethnic groups. Note: *group significantly different from Russians

ized by the highest sensorimotor performance in terms of speed in the manual dexterity task. Their performance markedly exceeds not only inhabitants of the subarctic regions but also representatives of the reference groups — the Russians of Siberia ($p<0.001$).

In female samples, the indices of Komi, Buryat and Russian women are practically identical and significantly ($p<0.05$) exceed the results of the Mansi.

Physical fitness in selected northern populations

An assessment of the strength of different muscle groups, using for example dynamometric measurements, allows us to estimate the population's physical efficiency characteristics. However, we should bear in mind that these results are influenced by the amount of habitual physical workloads. The "background" physical activities of rural people — hunters, fishermen or reindeer breeders — tend to be higher than urban dwellers, resulting in improved performance in some of the functional tests, in particular the higher dynamometrical values of muscle group testing (Shephard, 1985). It should be noted that the motivation level, that is, the subject's readiness to cooperate with the researcher, may also perceptibly affect testing results, especially if the testing procedures seem odd or obscure to the examinee. Therefore, in representatives of "traditional" or rural groups, who are participating for the first time in physiological examinations, the static endurance and two-plate testing results are likely to be underrated. Whenever possible we tried to reduce deviations caused by such influences by instructing the examinees.

In the reference group of urban Siberian Russians, the average relative strength is associated with low static endurance and an average level of sensorimotor performance compared with other populations in our study.

In the representatives of the subarctic groups — Mansi and Komi-Izhems — absolute handgrip and backlift muscle strength values may be average or even lower than average. However, calculated per a unit body mass (as well as relative to "lean," or "active," mass), their strength indices are higher than those of their Russian peers residing in cities. Native northerners also possess a good sensorimotor performance, which is evident from their low two-plate testing results.

In Buryats, a different combination of physical characteristics is observed: a low relative strength and a slightly lower endurance compared with reference values, but their sensorimotor performance is the highest among the studied groups.

Thus, we have seen specific combinations of functional characteristics in representatives of different ethnic groups. Their adaptive origin is confirmed by results of numerous studies (see reviews in Alekseeva, 1998; Alekseeva, Kozlov et al., 2001). Distinctions in physical efficiency, as well as in cardiorespiratory and metabolic characteristics, which will be discussed below, are the consequences of the populations' adaptation over many centuries to specific ecological, climatic and geographical conditions.

Respiratory function and health

The physical efficiency of an individual largely depends on pulmonary ventilation, on the erythrocytes' ability to transfer oxygen and on the oxygen uptake efficiency by the tissues. We shall discuss the features of external respiration and hemoglobin content typical of indigenous northerners in the Russian Arctic and subarctic.

Vital capacity

The respiratory function of indigenous peoples in the Russian North is insufficiently studied. The priority has been given to the studies of oxygen consumption patterns in migrants to high-latitude zones rather than to the study of indigenous populations (Kulikov and Kim, 1987; Khasnulin et al., 2004). The medical and anthropological literature also presents inconsistent data, which further confirms that information of the topic is scanty.

According to some publications, the external respiration values in native northerners exceed the norms accepted for inhabitants of a temperate climate zone. The expiratory volume in natives is slightly higher than the norm (105.9%), while the minute volume exceeds the normative value by 36% (Avtsyn and Marachev, 1975). However, similar (27–36%) hyperventilation is also characteristic of some older non-native residents of high-latitude areas (Grishin et al., 1990). The increase in the minute expiratory volume in northerners is combined with an increase in the expiratory reserve volume — the air that is left in the lungs after exhaling in normal breathing. As a result, oxygen consumption in inhabitants of high-latitude regions and of temperate climate zones is practically identical.

Of more importance are data suggesting a higher vital capacity in natives of the North. It has been found that the vital capacity in 20-year-old Nganasans of Taymyr and Inuit of Canada is higher than the norm values, accordingly, by 9.5% and 18% in men, and by 31.8% and 37.5% in women (Rode and Shephard, 1996).

However, not all researchers agree that vital capacity is larger in native northerners. According to a number of publications and our own data, in natives of high-latitude and continental regions of Siberia, vital capacity is rather small and the ethnic differences become evident at an early age. For example, in a 1960s study, the vital capacity in Dolgan children of the Arctic zone (Fetisov, 1968) was lower compared with our more recent data on school-aged Buryats and Russians of Transbaikal (Fig. 4.6). The 1960s study also found that the Dolgans demonstrated a lower pulmonary function compared with other ethnic groups.

Given that the Dolgan study was conducted in the mid-1960s and our data were obtained almost 20 years later, a natural question that arises is whether we should interpret these differences as a consequence of secular change. Data on samples of men aged 19–35 and women aged 18–35 obtained within practically the same period provide no support for this assumption (Table 4.1). As the table demonstrates, the intergroup differences are pronounced in samples of adult representa-

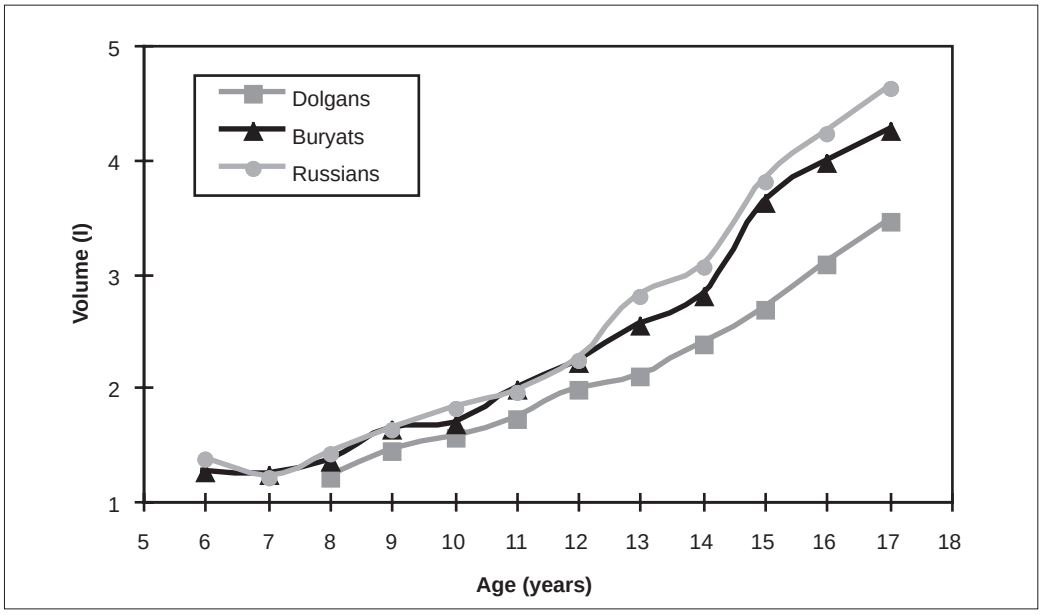

Fig. 4.6. Age-related lung vital capacity (boys).

tives of various Western and Eastern Siberian populations. Like in children, the largest vital capacity is observed in Russians, followed by Buryats, and the values registered in subarctic and Arctic natives are even lower.

Young Komi, Mansi and Buryat men have appreciably smaller lung capacity than the Russians of Western Siberia ($p<0.01$). For Buryat, Mansi and Komi men, the differences are not significant. In female samples, Komi and Mansi representatives show lower values than Buryats ($p<0.01$) and Russians ($p<0.001$).

Our findings concur with the data on absolute spirometric values obtained from northern Khanty and Nenets of the tundra zone of the Yamal-Nenets AO (Zhvavy and Sosin, 1986). The vital capacity in Khanty and Nenets is very close to values found in Mansi and Komi-Izhems of the same age, and it is considerably smaller than in representatives of Russian population of Siberia in our study (Table 4.1).

As we have repeatedly emphasized, in an interpopulation comparison of functional parameters, the researchers should always

Table 4.1. Lung forced vital capacity in different ethnic groups.

Ethnic group	Males			Females		
	n	Mean	SD	n	Mean	SD
Mansi	42	3519	574	66	2436	434
Khanty	na	3400	600	na	2400	600
Nenets	na	3900	500	na	2400	400
Komi	30	3630	502	38	2466	495
Buryats	75	3822	571	132	2798	443
Russians	170	4040	625	196	2884	493

Note: Khanty and Nenets data from Zhvavy and Sosin 1986

take into consideration total body dimensions typical of representatives of a particular ethnic group. In comparing external respiration, the vital capacity index (ml/kg) that relates pulmonary function to the subject's body mass should be used.

According to our data, urban Russians from Western Siberia demonstrate higher absolute and relative lung capacity compared with the rural Mansi and Komi (Fig. 4.7). In males, the data obtained from the Russians differ significantly ($p<0.001$) from Komi-Izhems, and in females, from Komi and Mansi ($p<0.05$). On their vital capacity index values, Buryat women exceed the Mansi and Komi-Izhems ($p<0.05$); while values for Buryat men exceed only that of Komi-Izhems ($p<0.01$).

Thus, we may conclude that there is an obvious disagreement as to the estimates of external respiration in northern natives, assuming that the discrepancies did not result from divergences in the used methods and instruments.

According to some researchers (Avtsyn and Marachev, 1975; Sosin and Koinosov, 1989; Rode and Shephard, 1996; Shephard and Rode, 1996), representatives of subarctic and Arctic indigenous populations have a larger lung capacity than inhabitants of the temperate climate zone. According to others (Fetisov, 1968; Kulikov and Kim, 1987), native northerners more often have lower absolute and relative vital capacity values than reference groups.

How can we account for such disagreement?

We believe that more attention should be given to dramatic (and non-uniform) age-related decreases of external respiration functions in northern indigenous populations. According to Canadian researchers, in young Inuit (under 25 years of age) vital capacity is identical to

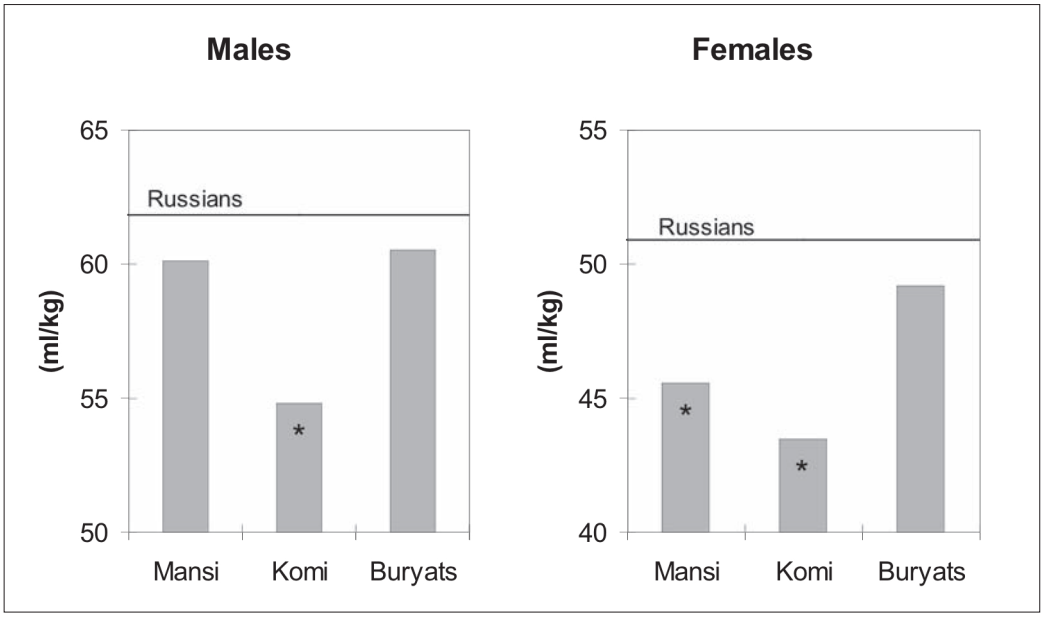

Fig. 4.7. Relative lung capacity (vitality index) in different ethnic groups. Note: *group significantly different from Russians

or even slightly exceeds the "normal" values; however, it appreciably decreases as they get older (Schaefer et al., 1980). Such age effects on vital capacity are also observed in inhabitants of the Russian North. Fig. 4.8 shows vital index values obtained from Mansi and Komi-Izhem males of various age cohorts.

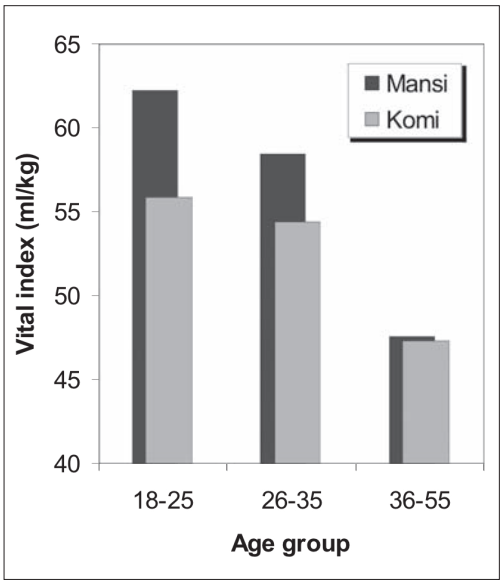

Fig. 4.8. Age-related change in relative lung capacity (vital index) in males.

The decrease in rates of external respiration with age differs considerably between the ethnic groups. For example, the lung capacity of the Inuit of northeastern Canadadrops to 50% of the norm by the age of 25–40, whereas the ventilatory indices for the Inuit elsewhere in the Northwest Territories are reduced to 50% only by the age of 65 (Schaefer et al., 1980; Kulikov and Kim, 1987). In Mansi men, by the age of 47, vital capacity drops to 77% of the values of the 22 year-olds, for the Komi-Izhems, their lung capacity is reduced by 15% between the ages 23 and 43 (Fig. 4.8).

If we compare these data with those presented in Table 4.1, we can see that age-related changes outweigh the interpopulation differences. The maximal differences in vital capacity between the studied groups (Mansi and Russian men) are about 13%, that is, less than between Komi of different age cohorts. Thus, geographical and age differences within the same ethnic group exceed the ethnic variability of the trait. In our opinion, this is associated with the high prevalence of smoking and respiratory diseases in native northerners.

Smoking and respiratory diseases

High prevalence of smoking is probably one of the most important causes of the decrease in respiratory function in native inhabitants of the North, for both adults and youth. Most northerners are introduced to tobacco in adolescence or even in childhood (this subject will be discussed more fully in chapter 6). The share of adult smokers in different native populations of the Russian North ranges between 50% and 80% (Khandy, 1997; Shephard and Rode, 1996).

Smoking of even one cigarette causes a short-term acute bronchospasm; habitual smokers suffer from bronchial obstruction caused by mucosal secretion and lung emphysema. The decrease of external respiratory function is proportional to the duration and intensity of smoking.

Smoking early in life and smoking in the family are responsible for a high prevalence of respiratory diseases in children and adults. According to official statistics, respiratory morbidity level in northern regions in the year 2001 was practically the same as across the Russian Federation as a whole: 296 per 1,000 in northerners, against 300

per 1,000 in Russia. However, independent researchers have estimated a 1.5 to 3 times higher morbidity level in northerners: 400 to 900 per 1,000 in different northern areas of the Russian Federation in 1995, against the all-Russia average of 168 per 1,000 during the same period (Kozlov and Vershubsky, 1999; Khasnulin et al., 2004).

Probably, one of the explanations for such discrepancies is the prevalence of lung lesions in the North. Furthermore, a feeble immune response may obscure their clinical manifestations (Avtsyn, 1972; Osipova et al., 1992). This complicates the diagnosis and results in inadequate treatment; as a consequence, the disease becomes chronic. If medical-anthropological or physiological studies are confined only to interviews without detailed medical examinations, cases of chronic lung lesions may remain unidentified, even though they affect the functional status of the individuals examined. Since the samples examined by different researchers very seldom match with the age of the subjects, the differences caused by accumulation of age-related pathology obscure the picture even further.

In our opinion, the differences in external respiration values in representatives of different native groups of the North are in many cases caused by the age-related increase of the frequency of lung lesions. We believe that the respiratory function of the native northerners requires careful additional research in different populations.

Oxygen transfer and hemoglobin content

The stage of gas exchange, or the transfer of oxygen to body tissues, is provided by the hemoglobin contained for the most part in erythrocytes. During the life of the erythrocyte, its ability to bind and transport oxygen declines. This is of special significance in conditions of chronic hypoxia, typical of high-latitude zones. The adaptive response of the Arctic indigenous population was an almost twofold reduction of the erythrocyte lifespan, compared with the values registered in inhabitants of the temperate climate zone (Avtsyn and Marachev, 1975). Due to the fast changes in erythrocyte pools, the share of young, functionally adequate erythrocytes remains high, which facilitate the oxygen transfer activity of red blood cells.

The fetal hemoglobin content increases up to 2 g/l in the Dolgans, natives of Taymyr, in the cohort of 20–40 year-olds, compared with the HbF concentration in inhabitants of the mid-latitudes, which ranges from 1.25 to 1.5 g/l (Kulikov and Kim, 1987).

The majority of Russian studies of Arctic and subarctic ethnic groups whose life-style is close to a traditional one demonstrate rather high blood hemoglobin content (Vasiliev et

al., 1987; Kulikov and Kim, 1987; Puzyrev, 1991; Alekseeva, 1998; Nikitin and Zhuravskaya, 2003). Table 4.2 presents the results of the Russian studies of 1980–1991. The data on Canadian Inuit cited for comparison are practically identical (Rode and Shephard, 1992).

Naturally, the hemoglobin content in the natives' blood is influenced by many factors. Available reports of seasonal variations are inconsistent (Kozlov and Vershubsky, 1999). Probably the seasonal changes in hemoglobin content reflect seasonal changes in the northern diet, although this subject requires further investigation. Moreover, there is no doubt that changes in the native populations' hemoglobin content did occur following the social and economic events of the 1990s, which affected the Russian North particularly severely.

To track these changes, we compared the results of studies in rural Khanty populations (Yamal-Nenets AO) in 1981–1985 (Vasiliev et al., 1987) and in 1990 (our study).

The erythrocyte hemoglobin level within the same rural samples differ dramatically ($p<0.001$). In 1990, the hemoglobin concentration decreased substantially in both men and women. In the early 1980s, the hemoglobin level in Khanty was approaching the upper boundary of the norm, whereas 10 years later it was below the minimal normal values — 130 g/l in men and 120 g/l in women (Fig. 4.9). Our subsequent studies provided more

Table 4.2. Levels of hemoglobin (g/l) in different age-sex groups of northern, indigenous people.

Ethnic group (source)	Sex	Age	Hb (g/l) Mean	SD
Dolgans				
(Kulikov, Kim, 1987)	? M	20-26	151.5	4.5
		27+	125-135	na
Northern Khanty				
(Vasilyev et al., 1987)	M	10-14	141.7	18.7
		15-17	147.6	19.3
		18-39	154.3	19.0
		40+	153.1	17.7
	F	10-14	142.0	15.5
		15-17	136.8	15.8
		18-39	136.1	17.0
		40+	145.5	20.4
Chukchi and Siberian Yupik				
(Shubnikov, 1991)	M	25-64	149.6	na
	F	25-64	139.1	na
Inuit of Canada				
(Rode, Shephard, 1992)	M	20-29	159.0	8.4
		30-39	149.9	8.2
		40-49	149.2	6.0
		50-59	153.4	10.1
		60-69	142.0	9.6
	F	20-29	139.0	8.6
		30-39	140.8	10.9
		40-49	143.6	10.0
		50-59	148.0	7.3
		60-69	139.5	2.1

evidence of the extremely low erythrocyte hemoglobin content in native populations of northern Western Siberia, especially Khanty and Mansi. We found no significant differences across corresponding ethnic and age-sex groups between the samples examined in August to September 1990 and in 1994–1995; this allowed us to combine the data. The diagram in Fig 4.9 reflects hemoglobin concentration reduction in the northern populations of Western Siberia, which is associated, in our opinion, with the general decline of the northerners' standard of living and changes in their nutrition during the early 1990s.

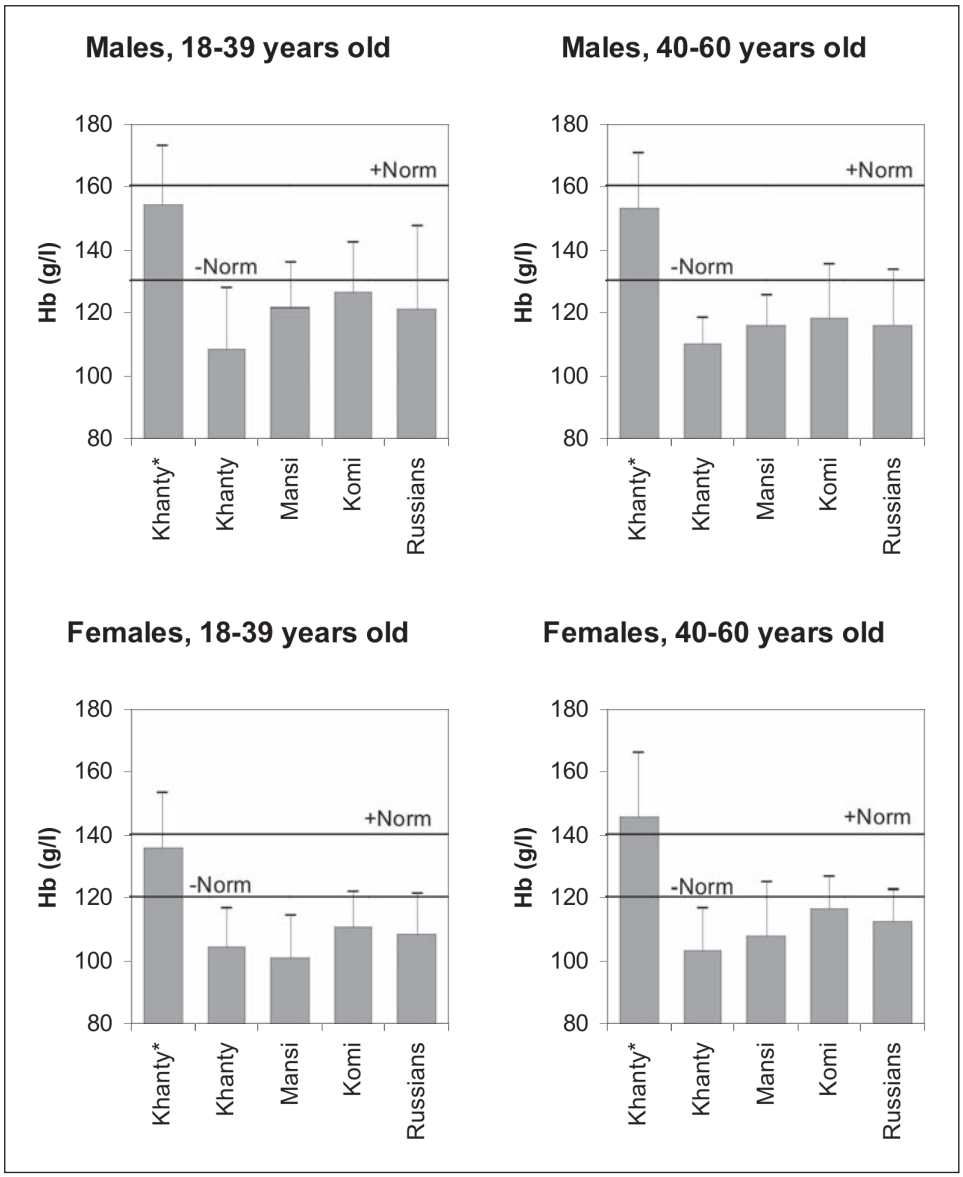

Figure 4.9. Average hemoglobin concentrations in different ethnic groups of Western Siberia according to sex and age. Note: * data from Vasiliev et al 1987

Nutritional changes experienced by native northerners of Russia in the last third of the twentieth century will be discussed more fully in chapter 5. Here, we will only analyse the hematological aspects of the issue. Within the studied native groups (Khanty and Mansi), the lowest hemoglobin level in women (101–102 g/l on the average) is observed in inhabitants of large villages (500–3,000 inhabitants) located along the Ob River and its tributaries (Table 4.3).

According to many researchers, the hemoglobin concentration in women of the most productive fertile age (18–39 years old) is lower than in those 40–60 years old. Under normal conditions, this is true for northern populations as well (Vasiliev et al., 1987; Rode and Shephard, 1996; Nikitin and Zhuravskaya, 2003). At the beginning of the 1990s, however, significant age differences were observed only in inhabitants of small (population less than 500 people) isolated villages (Table 4.3). The hemoglobin level in women from relatively large villages dropped to such an extent that age differences became imperceptible.

The population of larger villages appeared particularly subject to the influence of social and economic pressures. The delivery of products to local shops was reduced to a minimum, which entailed critical changes in the nutrition of the natives, especially women, who since the 1970s and 1980s had begun to be increasingly dependent on market foods.

In smaller indigenous villages with a basically traditional lifestyle, the changes in the population's employment and nutrition patterns were not so dramatic. Their preference for local food (fish, venison and berries) and a lower dependence on market food served as a kind of "regulator" during the social and economic crisis. Incidentally, the hemoglobin level decrease appeared less pronounced in women of the senior age group, who preferred more traditional nutrition patterns than younger women.

Table 4.3. Levels of hemoglobin (g/l) in Mansi and Khanty females according to place of living and age.

	18-38 yr			40-60 yr		
Settlement type	n	Mean	SD	n	Mean	SD
Large	63	102.02	12.94	23	101.23	13.12
Small	36	102.13	14.22	20	111.08	15.62

Anemias in native northerners

The results of our 1990–1995 studies attest to a high prevalence of hypochromic anemias in northern populations. This prevalance corresponds to the general morbidity level in Russia.

According to some researchers, in the early 1980s the frequency of anemias among adult Khanty, Chukchi and Siberian Yupik was no higher than in other populations of the Russian Federation and European countries (Petrov, 1982). Among Chukchi women aged 20–59, anemias were found in 5.6% of cases, among Siberian Yupik in 5.9–6.3% of cases. In women of the most productive fertile age (20–29), the frequency of anemias reached 8.4%, while in 40–49-year-old women, it was only 3.4% (Spitsyn, 1990; Nikitin and Zhuravskaya, 2003). Among Northern Khanty aged 10–65, the frequency of iron deficiency anemias (usually mild forms) within the same period in women was slightly higher: on the average, 10.0% of the population (in men, 9.2%). Anemias occurred more frequently in 18–19-year-old girls (14.6%). In women over 40, iron deficiency anemias were half as frequent at 6.3% (Vasiliev et al., 1987).

By the end of 1980s, the prevalence of anemias in Russia grew threefold. In 1985, 5.4% of pregnant women had anemias; in 1991 the share grew to 16.6% (Prokhorov, 2001). In the last decade of the twentieth century, the frequency of anemias continued to grow. By the mid-1990s, about 10% of women in Russia suffered from iron deficiency anemias; in 30% of women, a latent iron deficiency was observed, although in some regions of the country the share reached 5060% (Dvoretsky, 1997). In 1995–1999, general anemia morbidity grew from 0.94 to 1.4 cases per 1,000 per year, whereas in adolescents aged 15–17 in the decade since 1991 the growth was from 0.77 to 3.77 cases per 1,000 (Vishnevsky, 2001).

Epidemiologists associate the spread of anemias with a decrease in both the standard of living and the quality of nutrition throughout the country, as well as with an increase in overall morbidity (Prokhorov, 2001). In high-latitude populations, the situation is worsened by the adverse effect of some specific factors such as traditional long-term breastfeeding. Despite the advantages, breastfeeding may have negative consequences. The iron content in milk is practically zero; therefore, extended (more than two years) breastfeeding of a baby exclusively without supplementation puts the infant at risk of iron deficiency anemia.

Maternal factors should also be taken into consideration. If mothers suffer from iron deficiency anemias, their children will tend to have a lack of iron in their blood; and in women from northern native groups, iron deficiency anemias constitute almost 90% of all diseases of this group.

Anemias tend to accompany other illnesses. Among the Inuit of Alaska, in a study of children less than 1.5 years of age who experienced an illness episode within three months prior to the examination, the hemoglobin level was significantly lower than in their peers who remained healthy during the same period. Lower airway diseases, like bronchitis and pneumonia, are particularly detrimental on the

hemoglobin content of Inuit children (Cruz et al., 1990). A high prevalence of parasitic infections and, probably, *Helicobacter pylori* also raises the risk of anemia development in Arctic populations (Parkinson et al., 2000).

We believe that it has been the combined influence of all these factors that has resulted in the dramatic growth of anemias in both children and adult northerners.

Anemias and a lack of iron present a serious health threat to inhabitants of the North. The severe Arctic climate results in the depression of respiratory enzyme activity and the development of metabolic hypoxia (Khasnulin et al., 2004). Under such conditions, any further reduction of hemoglobin content may evoke a development of not only respiratory but also other diseases. In particular, iron deficiency states disrupt the hemoglobin formation mechanism, thus leading to a specific insufficiency of oxygen transfer to the cardiac muscle. This raises the risk of cardiac ischemia development and cardiac infarction (Puzyrev, 1991). Considering the prevalence of risk factors for ischemia and atherosclerosis in modern northern populations, this appears to be a serious danger.

The problem of iron deficiency anemias in children of the Arctic regions has a social aspect as well. Russian society is ill-informed of the fact that iron deficiency anemias may lead to mental deterioration in children and give rise to many problems in their school education. Native children often find it difficult to adapt to school requirements, especially when they are sent to boarding schools (Vakhtin and Lyarskaya, 2001; Kozlova, 2002). Additional difficulties caused by iron deficiency anemias make the process of their social adaptation to new conditions even more complicated.

Carbohydrate metabolism

Oxygen, obtained from external respiration and transported in the bound state to tissues, participates in the aerobic metabolic processes. However, the mechanisms of obtaining energy within the tissues and cells are different in groups adapted to Arctic and temperate climates.

In non-Arctic populations, the primary oxidation substrate and hence the basic energy suppliers are carbohydrates and, to a lesser degree, lipids. In native northerners adhering to traditional dietary habits, the energy for the organism is basically obtained from derivatives of fats and protein metabolism. These differences can be explained ecologically (Kozlov, 2002). The easily digestible carbohydrate food is not readily available in the Arctic, and its intestinal absorption is probably hampered. However, protein is abundant in high-latitude biota. Despite the restricted species diversity,

the total zoomass of wild land mammals in the subarctic and Arctic regions is able to provide theoretically 5.5 to 8 tonnes of biomass per person every year (which is four to six times more than the normal physiological needs). Migrations of waterfowl, fresh-water and sea fish and marine mammals account for additional seasonal zoomass increases. Besides, the northern fauna provides plenty of fats — the most concentrated foodstuff (when assimilating one gram of fat, an organism obtains 9.3 kcal of energy, whereas carbohydrates and proteins provide, on average, 4.1 kcal/g).

Therefore, the physiological evolution of the populations who came to settle in the subarctic and Arctic regions followed the path of adaptation to the "protein-lipid" diet. Gradually there emerged a specific variation of "polar metabolism," characterized by a larger share of lipids and proteins and a reduced contribution of carbohydrates in the supply of energy (Panin, 1978; Krylov, 1980).

It does not mean at all that in high-latitudes sugars are excluded from the natives' tissue metabolism, or that the role of sugars is minimized. In northerners, too, glucose serves as the unique substrate that nourishes the nerve cells and supports the glycolysis process, in which the ATP is synthesized (Bojko, 2005). Due to the limited availability of food carbohydrates, the value of glucose synthesized within the organism is increased substantially. But at the same time, modern changes in the northerners' nutrition and a shift towards the "European diet" creates the risk of introducing a growing imbalance between exogenous and endogenous sugars and impairing "metabolic health" (Kozlov, 2005; Kozlov et al., 2005).

Glucose metabolism

On the whole, representatives of northern populations maintaining a traditional way of life are characterized by a low level of blood glucose. The average values in the populations we studied (age 18–55, n=422, both sexes combined) are 4.47 mmol/l (SD=0.87). This coincides with the median of normal range of 3.3 to 5.5 mmol/l. The mean population value ranges from 4.38 mmol/l among the Saami to 4.62 mmol/l among the Mansi. Similar serum glucose concentrations were found by other researchers who examined Chukchi and Nenets males (Table 4.4).

Some researchers report seasonal fluctuations of glucose concentration in the northern natives of Russia. The serum glucose content is lowest towards the end of the Arctic winter in March and April. According to Bojko (2005), during this period hypoglycemia is observed in about 40% of Nenets men. The glucose

Table 4.4. Blood glucose in different ethnic groups of Russian North.

Ethnic group	Glucose (mmol/l)		Source
	Mean	SD	
Saami	4.38	0.81	Our data
Mansi	4.62	0.66	
Khanty	4.61	0.73	
Komi-Izhems	4.45	0.87	
Buryats	4.30	0.69	
Nenets (males)	4.51	0.24	Bojko 2005
Chukchi (males)	4.50	na	Kushnerova et al 1990

concentration in their blood is no more than 3.30 mmol/l, compared with the average of 3.96±0.17; this is significantly lower than the values characteristic of the late autumn period (see the October data in Table 4.4).

Such fluctuations of glucose concentration in the blood of the natives maintaining a traditional life-style may be accounted for by certain specific seasonal dietary changes (Kozlov, 2002); however, we have no research results to support this explanation.

A review of publications based on the studies of the 1970s and 1980s showed that disturbances of glucose metabolism (hyperglycemia, glucose intolerance and diabetes) are seldom reported from natives of the Russian North whose life-style is close to a traditional one (Kozlov and Vershubsky, 1999). During this period, studies among the Koryaks, Aleuts, Evens, Yukagirs and Itelmens revealed no cases of diabetes. Glucose intolerance was found in 4.9% of Chukchi and Siberian Yupik, which was one-third that of the migrant population of Chukotka. An epidemiological study (n=6090 Chukotka natives) revealed diabetes in 0.1% of the 25–44 year age group, and in 0.6% of the 45–64 year group. In Chukchi and Siberian Yupik older than 65 years of age, no cases of diabetes were revealed (Young et al., 1992).

Our own data obtained from studies conducted during 1995–2000 in other populations of the Russian North are very comparable to these results. In rural Khanty and Mansi aged 15–55 (n=216), diabetes was detected in 0.6%, and glucose intolerance in 8.6% of cases. On the whole, glucose intolerance was found in 4.9% and diabetes in 0.5% of the 422 Saami, Komi, Nenets, Khanty and Mansi participants whose life-style was close to a traditional one (Kozlov et al., 2005).

While disturbances of glucose metabolism seldom occur in native northerners of the Russian Federation maintaining a traditional way of life, serum glucose content increases as they withdraw from their traditional life-style and adopt an urban life-style (Young et al., 1990, 1992; Middaugh et al., 1991; Young and Harris, 1994; Waldram et al., 1995; Kozlov, Vershubsky and Kozlova, 2003). The influence of "modernization" and urbanization on the metabolic health of native northerners is considered in chapter 6.

There is one factor that is specific to the Russian North that can aggravate the course of diabetes. The factor in question is the widely distributed trematode *Opistorchis felineus* in Siberia and the European Urals. The helminth infestation, affecting human hepatic and pancreatic ducts, aggravates the course of endocrine diseases, including diabetes (Bodnya, 1993). Diabetes accompanied by opistorchiasis is more resistant to treatment: the level of serum glucose content in infested patients is higher by about one-third compared with non-infested subjects, and the glucose balance is hard to correct (Nalobin and Melnikov, 1981). Considering that 40% to 80% of the population residing along the Ob River and up to 100% of the natives in some parts of Western Siberia are affected by opistorchiasis (Bronshtein, 1986), the risk of diabetes complications associated with opistorchiasis should seriously alert endocrinologists.

Metabolism of lactose, trehalose and other sugars

The glucose discussed in the previous section serves as the basic substrate for tissue respiration. However, carbohydrate metabolism is reduced to utilization of this sugar only at the

final stages. In most cases, the organism does not receive from the environment glucose in the pure state, but rather starch and polysaccharides. These are furthur split into monosaccharides by corresponding enzymes in the gastrointestinal tract.

In numerous publications devoted to nutrition in northern indigenous peoples, researchers have pointed out widespread disorders in the assimilation of some dietary sugars (reviewed in Kozlov et al., 2005). Disaccharidase malfunction may actually arise as a result of diseases, as a consequence of a specific diet or as a result of being under the influence of other external factors. However, the main regulator of the functioning of disaccharidases in the digestive processes is gene control (Semenza et al., 1999).

Among the numerous variants of the primary (genetically determined) disaccharidase deficiency, the best known is low tolerance for milk sugar, or lactose (Flatz, 1987; Scrimshaw and Murray, 1988). Oddly enough, this problem remained practically unstudied in Russia, although in the world literature by the late 1970s there were already a multitude of scientific and popular publications devoted to the prevalence of low tolerance for lactose (hypolactasia). By the end of the 1980s, there were only a few studies in the USSR, and those practically excluded the northern regions of Russia from the focus of their attention. In fact, the epidemiology of hypolactasia in Arctic Russia began to be studied only in the early 1990s (Kozlov, 1996; Kozlov and Lisitsyn, 1997; Kozlov, 1998).

It should be pointed out that the term "low tolerance for lactose" covers several different phenomena, including the primary (genetically determined) and secondary (acquired) hypolactasia. The primary hypolactasia characteristic of the majority of northern peoples declares itself through an age-related decrease in the production of the enzyme lactase. This is not a disease but a genotype-determined variation of the norm (Isokoski et al., 1981; Sahi, 1994). The secondary (acquired) hypolactasia, on the contrary, is a pathological state and develops as a consequence of diseases of gastrointestinal tract organs.

Earlier studies based on clinical analyses with lactose load failed to provide an accurate picture of the distribution of the gene determining primary hypolactasia, previously called LAC*R, or lactase restriction (the modern designation is *LCT* gene). However, the differential diagnosis of primary and secondary hypolactasia presents a difficulty, especially under polyclinic or field conditions (Arola, 1994). Misdiagnosis has resulted in mistakes being made in calculating gene frequencies.

The molecular genetics data helped to clarify the picture of primary hypolactasia distribution. A Finnish study revealed an association of hypolactasia in adults with carriage of the *LCT* gene CC_{-13910} genotype (Enattah et al., 2002). Our studies undertaken jointly with researchers from the N. Vavilov Institute of General Genetics (Russian Academy of Sciences) have shown that in different populations of Russia, frequencies of the C/C genotype are close to the clinically established frequencies of hypolactasia (Borinskaya et al., 2006). This confirmed the assumption that the C/C genotype carriage may be regarded as the main cause for primary hypolactasia development not only in Finns but also in other peoples, including representatives of the Arctic groups.

By incorporating the data of clinical-epidemiological, population and molecular-genetic

studies, we were able to obtain more accurate data from earlier materials, thus getting a sufficiently full picture of primary hypolactasia distribution in the Russian North (Table 4.5).

The frequency of genetically determined lactase restriction in indigenous populations of northern Russia ranges from 48% (Saami) to 97% (Chukchi), whereas in various European populations it ranges from 2% to 37% and, in studied groups of Russians, from 37% to 49% (Flatz, 1987; Kozlov, 1996; Kozlov et al., 1998; Borinskaya et al., 2006). On the whole, the prevalence of primary hypolactasia among the natives of the Russian North is similar to that observed in the natives of Alaska, Canada, Scandinavia and Greenland.

In terms of anthropology and medicine, the primary hypolactasia problem may be described as follows. All healthy children under 1.5–2 years of age retain a high ability for splitting lactose. With age, and depending on the individual's genotype, the enzyme production may decrease. Given the lactase deficiency, the complex molecule of milk sugar fails to break down into glucose and galactose and cannot be digested by the organism. As a result, eating foods containing large amounts of lactose (e.g., whole milk) causes indigestion, nausea and diarrhea. The genetically determined lactase activity level is formed between 2 and 21 years of age and is retained afterwards. For most representatives of the Far North populations, an early (by the age of 4–6) and rapid decrease in enzyme production is a characteristic and normal feature of the physiology of digestion.

In evolutionary terms, primary hypolactasia is the basic norm not only in Homo sapiens but also in mammals as a whole. The enzyme deficiency forces the young at a certain age to reject the mother's milk and progress to an independent food search. This increases the mother's chances of successfully feeding the next set of offspring.

Due to the interwoven effects of various ecological and cultural factors, the selection pressure in some human populations has resulted in a strengthening of a genotype characterized by the retention in older age of the "infantile" ability to digest lactose (Durham,

Table 4.5. Hypolactasia, LAC*R gene and C/C genotype frequencies in different ethnic groups in the Russian North.

Ethnic group	n	Hypolactasia	*LCT* gene[1]	*C/C* genotype[2]
Saami	50	0.48	0.69	--
Komi-Permyaks	112	0.50	0.71	0.42
Komi-Izhems	56	0.63	0.79	--
Mansi	81	0.72	0.85	--
Khanty	115	0.71	0.84	--
Nenets	108	0.78	0.88	--
Buryats	20	0.47	0.69	--
Yakuts	41	0.46	0.68	--
Chukchi	35	0.97	0.98	0.89
Russians of				
Chukotka	26	--	--	0.46
Western Siberia	47	0.49	0.70	--
Moscow region	113	0.37	0.60	--

Notes: [1]data from clinical tests [2]data from molecular genetic analyses

1991; Kozlov and Lisitsyn, 2000). For most people, the age-related decrease in the lactase-activity level remains to be the prevalent norm. This being said, we cannot regard signs of hypolactasia in Arctic natives as signs of abnormal "metabolic health."

Lactose is not the only disaccharide, the maldigestion of which is more widespread in high-latitude groups than in non-Arctic populations. Trechalose and sucrose maldigestion in indigenous Arctic populations is five to ten times more frequent than in European populations (Table 4.6).

Table 4.6. Trehalose and sucrose maldigestion (per cent) in Arctic indigenous and European populations.

Disaccharide	Indigenous Arctic populations	European populations
Trehalose	10.5	0.25 – 2.0
Sucrose	5 - 6.9	0.5 (?)

A weakening of selection pressures to support diversity in disaccharidase enzymes is accounted for by the limited variety of natural exogenous sugars available in the Arctic and a small share of these sugars in the traditional northern diet. Given the "protein-lipid" metabolism variation formed due to the lack of carbohydrates, the endogenous glucose — synthesized in required amounts from food proteins (amino acids) in the liver — became the main participant in tissue respiration processes. The role of exogenous carbohydrates, in particular sugars, became of relatively minor importance, and mutations reducing the disaccharidases activities and/or production did not render any pronounced influence on the overall gene pool's ability to adapt.

At a certain stage, the influence of cultural and genetic co-evolution processes began to show in the Arctic populations. For example, many ethnic groups living in the tundra (Nenets, Yukagirs and Kola Saami of the nineteenth century) traditionally do not eat mushrooms. Their most common explanation is that "mushrooms are food for reindeer, not humans." But from the medical-genetic viewpoint, we could assume that the tradition of ignoring such protein-rich food as mushrooms (despite the overall scantiness of resources) actually results from a relatively high prevalence of trehalose maldigestion. Trehalose is a sugar contained in mushrooms, and trehalase deficiency is one of the causes of stomach aches that may ensue from eating mushrooms. The combination of genetic and cultural selection mechanisms probably speeded up the accumulation of corresponding mutations in the Arctic gene pools (Kozlov et al., 2005).

Thus, carbohydrate metabolism in northern natives is characterized by a whole number of special features formed under the influence of environmental conditions. The evolutionary solution to the problem of meeting glucose requirements under conditions of a low availability of dietary carbohydrates, in particular sugars, resulted in the formation of a balanced mechanism operating effectively in the Arctic ecosystems. However, a system based on the production of needed amounts of endogenous carbohydrates may become vulnerable due to certain external influences. The inflow of food sugars habitual for non-Arctic inhabitants may easily turn out to be excessive for northerners.

Lipid metabolism

Unlike research into the digestion of sugars, studies on lipid metabolism in the populations of northern Russia during the Soviet period paralleled those in the rest of the world. Although the priority was given to the study of cardiovascular problems in the migrant population of "new industrial areas" in the Arctic and subarctic, there were also quite a number of studies that focused on indigenous northern populations. One of the significant achievements in the research of that period was the "Arctic metabolic type" hypothesis, in which the physiological mechanisms were taken into consideration and which played a key part in switching the ways of energy being obtained from the "mid-latitude" carbohydrate pattern to the "Arctic" lipid-protein one (Panin, 1978).

On the whole, the data obtained from circumpolar populations in Russia and other countries do not contradict one another. However, the attempts to get a more detailed picture, to generalize the Russian materials of the 1970s and 1980s concerning features of lipid metabolism among Arctic natives and to compare them with the results of foreign research have encountered a number of difficulties (Kozlov and Vershubsky, 1999; Bojko, 2005).

First, it has been difficult to reduce the studied samples to common age categories. For example, some studies report data from a rather wide age group that encompasses individuals 18 to 55 years of age (Alekseeva, 1998), thus failing to delineate the effect of age on lipid metabolism (Vikhert et al., 1990). Another difficulty is the seasonal variations of lipid content in blood (caused, probably, by the changes in the natives' diet and physical activity during different seasons). This factor, however, was considered only by a few researchers; and, in many publications, the period of the survey is not specified. As a result, it is difficult to combine data from different studies for analysis.

The lipid pool in human blood is represented by cholesterol, triglycerides, free fatty acids and phospholipids, measured biochemically as total cholesterol. The total cholesterol content in adult natives of the North of Russia is subject to seasonal fluctuations (Bojko, 2005). However, the average values do not exceed the established clinical norm of 3.0 to 6.0 mmol/l. In the samples of tundra Nenets, Selkups, tundra and coastal Chukchi, Siberian Yupik and Evenki, the average total cholesterol concentrations fall within the limits of 3.61 to 5.26 mmol/l (reviewed in Kozlov and Vershubsky, 1999). Thus, these populations are characterized by an average or a low cholesterol content. The characteristics of various age-sex groups of subarctic (Khanty), Arctic (Nganasans, Nenets, Chukchi and Siberian Yupik) and continental Siberian populations (Buryats) are given in Appendix Table 15.

As it was shown in the review of Kozlov and Vershubsky (1999), the age-related total cholesterol increase is clearly seen in Nenets, Khanty, Selkup, Chukchi and Siberian Yupik samples. As shown in Fig. 4.10 and Fig. 4.11, these trends are similar to those observed in the reference sample of Muscovites (Vikhert et al., 1990).

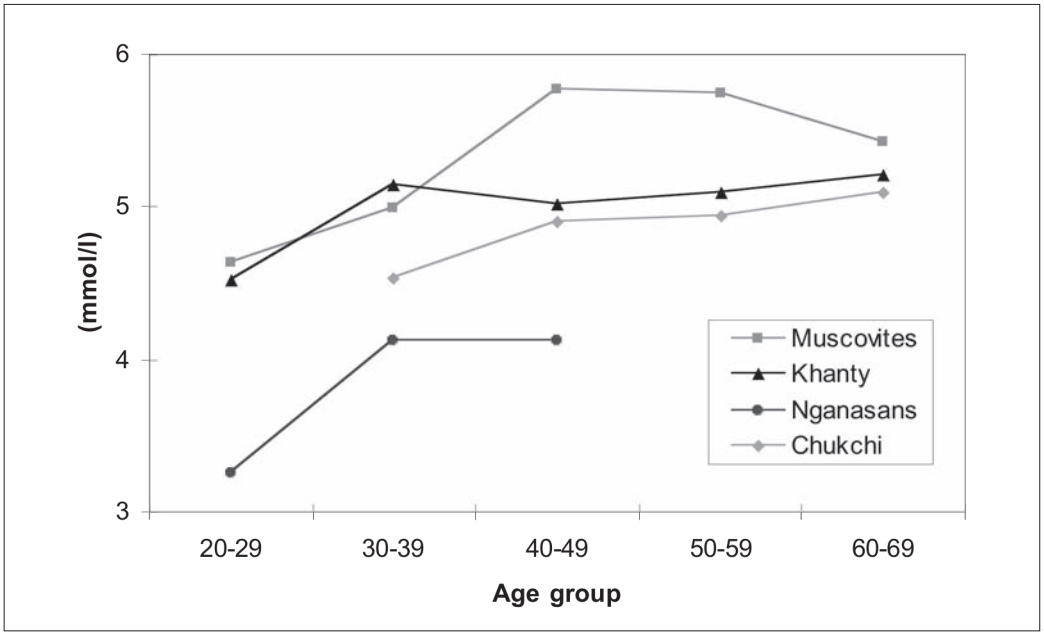

Fig. 4.10. Change of total cholesterol levels by age in males.

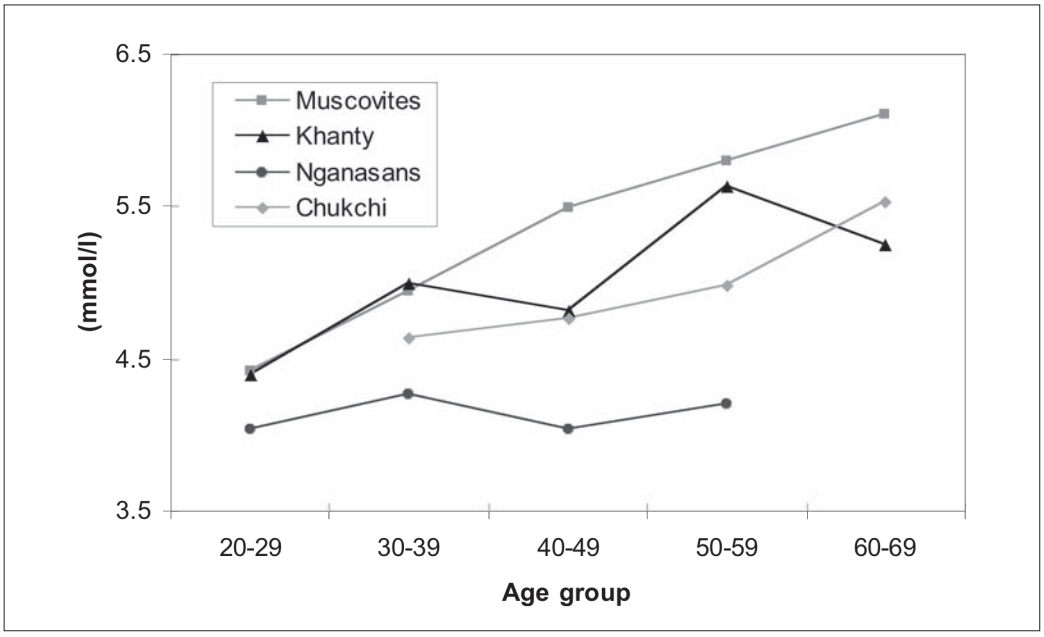

Fig. 4.11. Change of total cholesterol levels by age in females.

The age-related increase of serum cholesterol concentration in northern natives, especially men, occurs more gradually and is, on the whole, less pronounced than in Muscovites. It is quite possible that gender differences in the age-related increase in the total cholesterol can partly be accounted for by greater adherence of men to their traditional diet (see chapter 5); however, we have no information about any special studies undertaken in this area.

It should be noted that there are differences in cholesterol content among different indigenous ethnic groups adhering to different traditional life-styles (and, accordingly, having different dietary habits). In particular, reindeer breeders are reported to have a significantly higher level of total serum cholesterol than marine hunters.

We have considered food traditions of the subarctic and Arctic natives within the NUHIP Project: Nutrition and Health of Indigenous People of the North (Kozlov, 2004). Hunters-fishermen of the taiga zone (in particular, Khanty), tundra reindeer breeders (Chukchi) and marine hunters (Siberian Yupik) are characterized by very different nutritional backgrounds. The comparison of total cholesterol content in these groups shows that Chukchi have a significantly ($p<0.001$) higher total cholesterol level than Khanty and Siberian Yupik (Fig. 4.12). At the same time, the share of fish and marine hunting products in Khanty and Yupik diets is considerably higher than in Chukchi (Kozlov, 2005). We do not have enough data to positively relate the differences in serum cholesterol with the reduced share of "marine-type fats" in the diets of these groups, but we do believe that research into this matter may be of serious scientific interest.

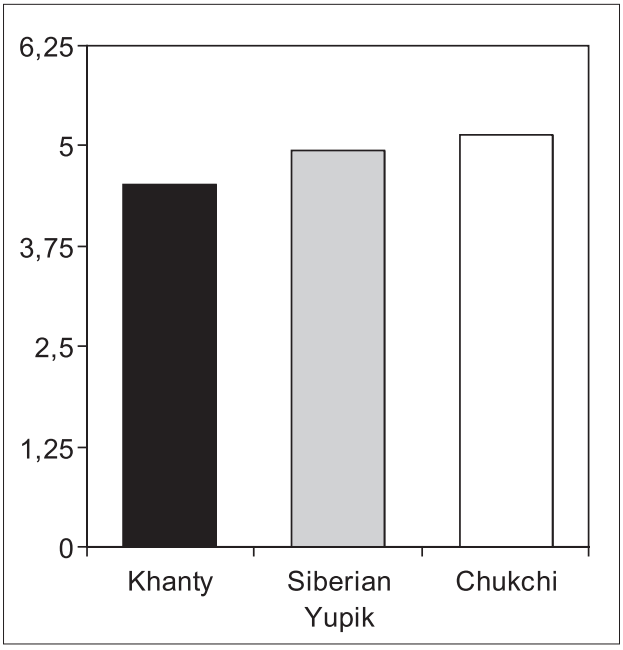

Fig. 4.12. Total cholesterol in the blood of aboriginal Russian Arctic males. Source: Vasiljev et al 1987; Gerasimova et al 1989

The content of another lipid class — triglycerides — in the blood of the natives is also subject to seasonal fluctuations (Bojko, 2005). The seasonal pattern observed among Nenets is different from the typical pattern of Russians residing in the Arctic regions (Fig. 4.13). Despite some fluctuations, the content of triglycerides in the blood of the natives remains considerably below the average normative values. In particular, Vlasova and co-authors (1975), and Volgarev and others (1989) reported low serum triglycerides levels among the Dolgans of Taymyr and Koryaks of Kamchatka.

To give us an idea of the triglycerides content in the natives of Arctic Russia examined within the same season (March–April), we compared data from indigenous males of Chukotka (Chukchi, Siberian Yupik) with Nenets of the European North (Shubnikov, 1991; Bojko, 2005) in Fig. 4.14. Unfortunately, the groups are not identical in their age range: the Chukchi sample includes men aged 25–64, whereas the Nenets and Siberian Yupik are younger (20–45). Nevertheless, the triglycerides content in all samples is essentially lower than 2.3 mmol/l, which was considered the upper boundary of the norm.

Both Fig 4.14 and Fig 4.12 indicate a lower lipid content (in this case triglycerides) in Siberian Yupik marine hunters than in reindeer breeders (Nenets and Chukchi samples). Unfortunately, here again we can only pose a question about the role of traditional "Arctic diets" in maintaining the specific profile of serum lipids: there seems to be no direct corroboration of this hypothesis.

By the middle of the twentieth century, based on research data of the populations of Europe, North America and the USSR, a

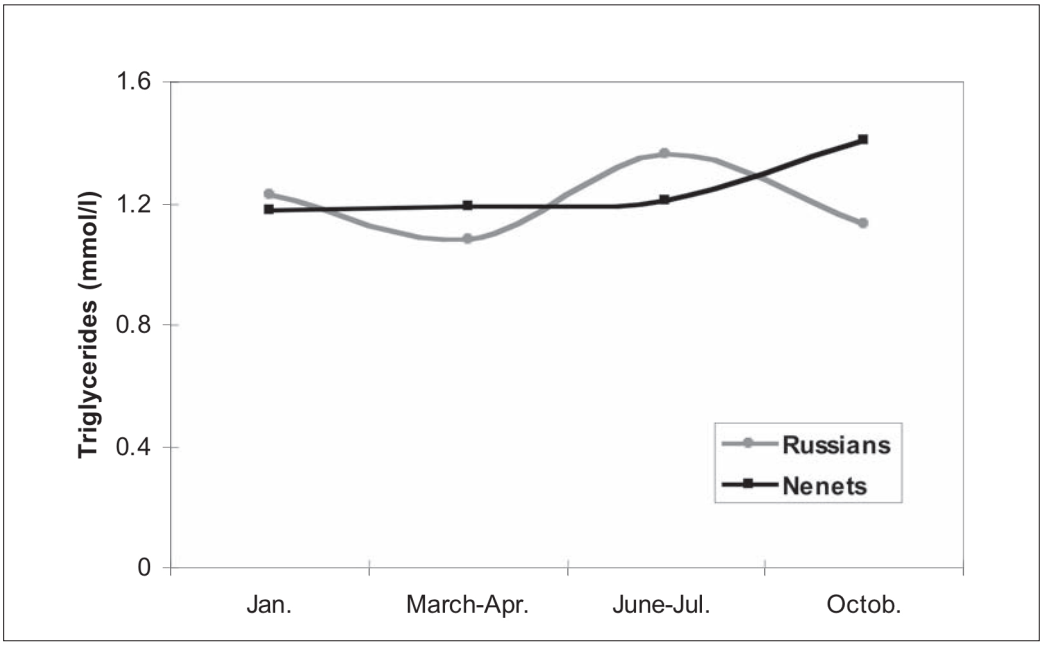

Fig. 4.13. Seasonal changes of blood triglyceride content in the groups of Nenets and Russians living in Arctic. Source: Bojko 2005.

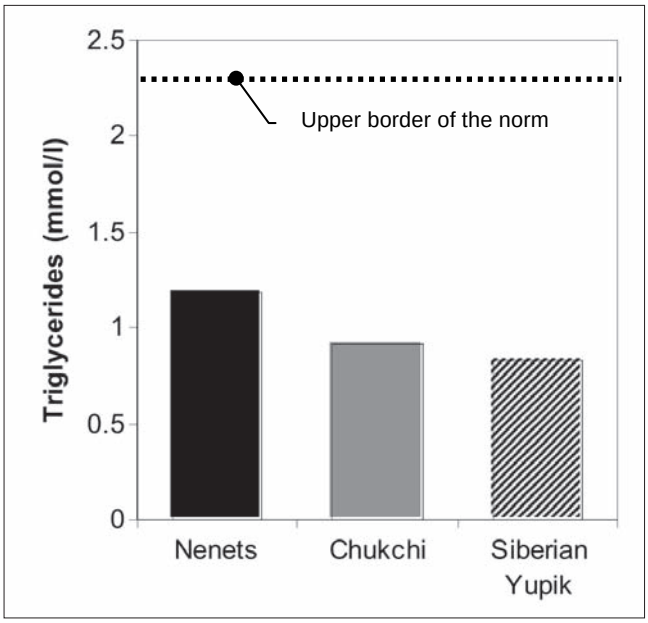

Fig. 4.14. Triglyceride content in the blood of native Russian Arctic males. Source: Shubnikov 1991; Bojko 2005

correlation was revealed between the consumption of animal fats, the lipid level of the blood serum and the frequency of atherosclerosis. However, the observations of anthropologists and physicians show that, despite large amounts of consumed animal fats, atherosclerotic lesions are rare in native northerners (Lederman et al., 1962). Thus, according to patho-anatomical data, the frequency of atherosclerotic changes in the coronary arteries in Evenks and Tofalars (indigenous groups of the Altai region) is equal to 102.5 cases per 1,000 people, whereas in village-dwellers of the Irkutsk Oblast, it amounts to 113.5, and in residents of Irkutsk city,to 135.8 per 1,000 (Gandzha and Furkalo, 1978).

As a result, in scientific, and later in popular literature, the idea about the "natural" or "genetic" protection enjoyed by northern natives against the development of atherosclerosis and other "diseases of civilization" became widespread. Despite active research in this area, to date this hypothesis has been neither confirmed nor disproved (Voevoda et al., 1991; Hegele et al., 1997; Ebbesson, Risica et al., 2005).

One of the well-investigated genes participating in lipid metabolism regulation is *APOE*. This gene codes the activity of the apolipoproteid E, which plays a central role in binding fats, forming lipoproteins and facilitating lipid transport within tissues. There are three common *APOE* gene alleles: e2, e3 and e4. The frequency of the *APOE*e4* allele in the "modernized" populations ranges within 8–15%; however, in hunters-gatherers it is much higher and reaches 20–40% (the share of *APOE*e3* allele carriers is accordingly lower in these groups). Equally high (21–31%) is the frequency of *APOE*e4* allele in the Arctic populations of Greenland and Alaska Inuit, Saami and Khanty of Western Siberia (Gerdes et al., 1996; Corbo and Scacchi, 1999; Ebbesson, Adler et al., 2004; Khasnulin et al., 2004).

Studies in the populations of Europe, the U.S., Japan and other countries have shown that *APOE*e4* allele carriage is a risk factor in the development of coronary artery disease and Alzheimer's disease, but in the hunter-gatherer communities, no harmful effects of *APOE*e4* have been revealed (Jaramillo-Correa et al., 2001).

Such differences between representatives of "modernized" and "traditional" communities could have been interpreted in favour of the idea that natives are "naturally protected" against the "diseases of civilization," but for one reservation: in physically active representatives of the modern urban population, the lipid profile does not depend on the apoE genotype (Bernstein et al., 2002). In other words, the individual's high level of physical activity balances the negative action of protein APOE. Based on these and similar considerations, we are inclined to think that the resistance of native northerners to cardiovascular diseases depends mainly on environmental and life-style factors, especially diet and level of physical activity.

Accordingly, the withdrawal from a traditional life-style in the native northerners of Russia, the U.S., Canada, Greenland and Scandinavia has been accompanied by a higher serum lipid level. In nomadic Evenki reindeer breeders, the cholesterol content is lower than in Evenki living in villages: 3.68 versus 3.88 mmol/l, accordingly (Leonard et al., 1994). In the inhabitants of small isolated villages of Chukotka, the content of total cholesterol and high density lipoprotein cholesterol is lower than in native northerners living in larger settlements (Voevoda et al., 1987). These data are in agreement with the results of research undertaken in Alaska (Maynard, 1976). In Saami of Finland, one of the most "westernized" groups of northern natives, a very high total cholesterol content is observed — on average, 6.65 and 6.78 mmol/l in men and women, accordingly (Bjorkstene et al., 1975).

Which of the "modernization" factors should be regarded as the most significant ones? Most researchers assign the most important part to the diet. One of the major factors preventing the development of hyperlipidemia is the intake of ω-3 polyunsaturated fatty acids (ω-3 PUFA). They are contained mainly in the fat and meat of marine fish and mammals. The consumption of "marine-type fats" leads to a lowering of blood triglyceride levels and to a change in the balance of cholesterol fractions in favour of high density lipoproteins, which produce a considerably less damaging effect on vascular walls than the low density lipoproteins (Simonopulos, 1991).

The low level of cholesterol in Inuit and coastal Chukchi has been attributed to the high intake of ω-3 PUFA in their diet (Bang and Dyerberg, 1981). However, as it was justly noted by Ebbesson, Adler and others (2005), in the pioneer research of Bang and Dyerberg no screenings were done. Subsequent studies have shown that in some Inuit groups, coronary heart disease is widespread despite the high consumption of ω-3 PUFA (Ebbesson, Risica, et al., 2005). Thus, the role of "marine-type fats" should not be overemphasized, although it should not be ignored either. The studies in Chukotka have shown that when the share of meat and fat of marine mammals in the diet of Chukchi and Siberian Yupik decreases, the favourable balance of fatty acids in the serum lipid

structure becomes disturbed (Korf & Khotimchenko, 1990).

The decline in the consumption of traditional foods and the growing share of market products have resulted in an increase of the serum cholesterol level in native inhabitants of the Arctic coast (Shephard and Rode, 1996). Lipid metabolism is also subject to the influence of social conditions, environmental stressors and the level of physical activity. Observations conducted in various circumpolar countries, including Russia, confirm that the natives are subject to the pressure of such adverse changes in their life-styles. These factors can essentially influence the lipid profile of northerners, increasing the risk of atherosclerosis development.

Another factor contributing to the development of atherosclerotic lesions is the *Helicobacter pylori* infection (Glynn, 1994). Studies in groups of northern Khanty and Komi-Izhems, Chukotka and Alaska Natives and Finland Saami have confirmed that *H. pylori* infection is widespread in native northerners (Laurila et al., 1997; Kozlov and Vershubsky, 1999; Parkinson et al., 2000; Reshetnikov et al., 2001). Although the *H. pylori* epidemiology in the Arctic populations of Russia is insufficiently investigated, there is no doubt that the infection factor combined with the life-style changes may also exert a substantial influence on the atherosclerosis epidemiology in the North.

In conclusion, the abrupt changes in the social structure, labour conditions, physical activity and the type of physical workloads, the orientation towards commercial market foods and the giving up of historically developed and ecologically conditioned food traditions in modern northern native populations have all resulted in gross disturbances of northerners' "metabolic health."

Hemodynamics and hypertension

Discussions about variations of blood pressure values in representatives of different ethnic and geographical groups have been persistent in the Russian scientific literature for some decades. The data provided by different publications are, however, inconsistent. For example, the blood pressure in the Siberian Yupik was described as relatively low (Astakhova et al., 1991), whereas in the Nganasans of Taymyr it was reported to be high (Shephard and Rode, 1996). Such contradictions are largely caused by different approaches to sampling. In our studies, we used as a reference group only the systolic and diastolic blood pressure values in healthy young representatives of various northern groups of Russia. For interpopulation comparisons we used samples including individuals aged 18–25.

Fig. 4.15 provides a comparison of blood pressure values in the samples of Mansi, Komi-Izhems and Buryats (our data), as well as Khanty, Nenetses and Nganasans (Zhvavy and Sosin, 1986; Shephard and Rode, 1996). The reference group in our study included

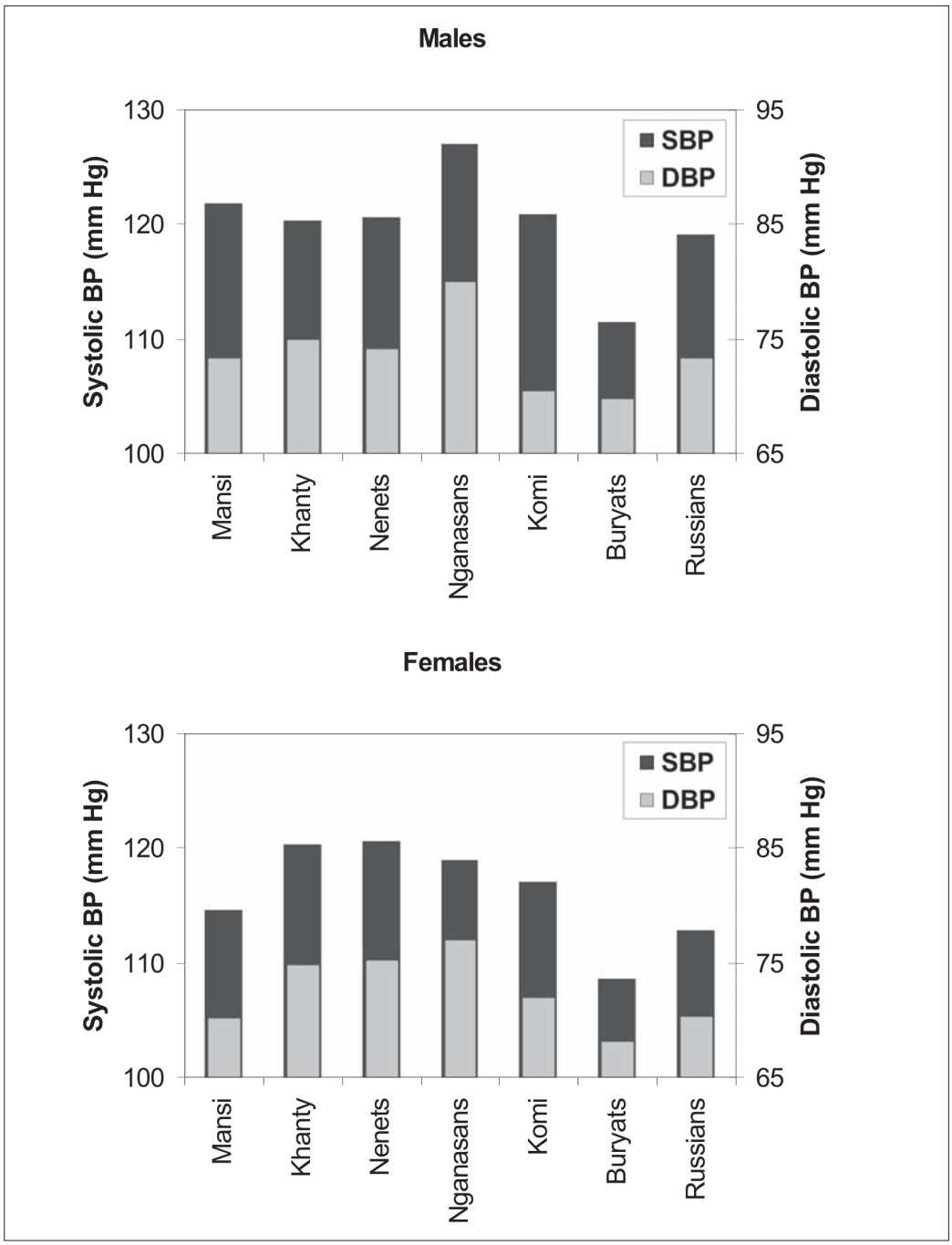

Fig. 4.15. Systolic (SBP) and diastolic (DBP) blood pressure in different ethnic groups.

Russians of Tyumen, born and residing in this city. In Buryats — a population living in the continental climate zone — systolic and diastolic pressure was found to be significantly lower than the reference values ($p<0.01$ in male sample, $p<0.05$ in female one). In the Nganasans of Taymyr samples (both male and female), and in Khanty and Nenets females, on the contrary, the diastolic pressure values were significantly ($p<0.05$) higher than in the urban Russians.

In the mid-1960s, cardiologists and epidemiologists attempted to classify various population groups residing in different parts of the world depending on the relationship between blood pressure and age. The popular belief was that among indigenous peoples, blood pressure remained practically unchanged with increasing age. Studies since then have demonstrated that the age-related increase of systolic and diastolic pressure is observed in the majority of populations around the world. The northern natives present no exception. Quite typical in this respect is the blood pressure pattern in the Khanty and Nenets populations of Western Siberia (Fig. 4.16 — data cited from Zhvavy and Sosin, 1986). With age, and as a result of a decreased level in physical activity, increased smoking and use of alcohol, dietary changes and the prevalence of obesity, cardiovascular pathology accumulates. These factors, as well as social and economic stressors, influence the blood pressure values (see also chapter 6). This is seen in the majority of modern communities in the North of Russia.

The accumulation of associated diseases in northerners usually begins at a rather early age. In particular, it is important to consider the risk of nephrogenic arterial hypertension development in native populations (Puzyrev, 1991). In the early 1980s, studies showed that the annual rates of kidney and urinary diseases in the Russian North were 0.6–0.8 per 1,000, whereas in some native groups the rates were much higher — 1.23 among Siberian Yupik, 2.65 among Dolgans, 3.89 among Evenks and 4.02 among Nenets (Orekhov et al., 1981). Kidney and urinary diseases are well-known causes of arterial hypertension.

Arterial hypertension is rapidly spreading among the indigenous populations of northern Russia, although in the mid-1980s some authors emphasized the "extreme rarity of arterial hypertension in the natives of the Far North" (Panin et al., 1986). Such statements were based on earlier data obtained in the 1960s and 1970s. In fact, according to publications of that period, arterial hypertension frequency in native northern populations did not exceed 7% (Kozlov and Vershubsky, 1999).

However, by the end of the twentieth century, the situation had changed distinctly. First of all, the typical age-related increase seen in other populations became evident in northern populations. Thus, in the middle of the 1980s, arterial hypertension frequency in schoolchildren of the northern Khanty population remained low — 0.9%, that is only about one-third to one-tenth of that in schoolchildren of European Russia (Vasiliev et al., 1987). At the same time, the prevalence of arterial hypertension in the 20–29 and 40–49 age groups was rapidly growing. As a result, the age and sex standardized prevalence reached 24%, which was higher than the all-Russia average.

Fig. 4.17 provides the data of studies conducted before 1975 and by the beginning of the 1990s (for references see Kozlov and Vershubsky, 1999). The arterial hypertension frequency in the natives of the Russian North

in the early 1990s is compared with that in men of Novosibirsk, whose arterial hypertension frequency was close to the all-USSR average: 22% in men and 18% in women aged 20–69. The data on arterial hypertension frequency in Canadian Inuit of the Keewatin region are cited for comparison (Young et al., 1993). Evidently, by 1990, arterial hypertension in native populations of Siberia, the subarctic and Arctic regions was as prevalent as among the urban populations of Russia and the natives of northern Canada.

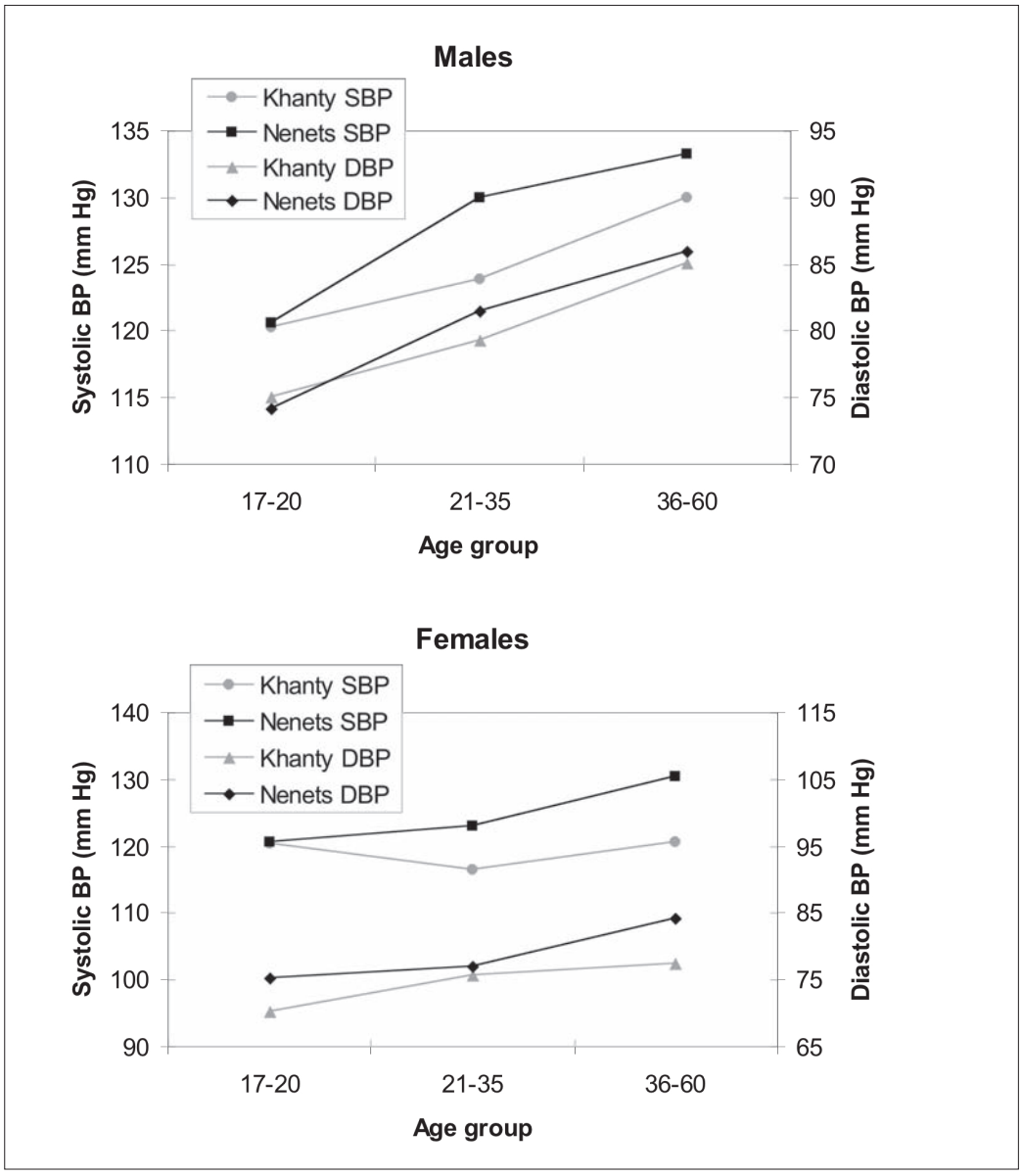

Fig. 4.16. Changes in systolic (SBP) and diastolic (DBP) blood pressure by age in different ethnic groups.

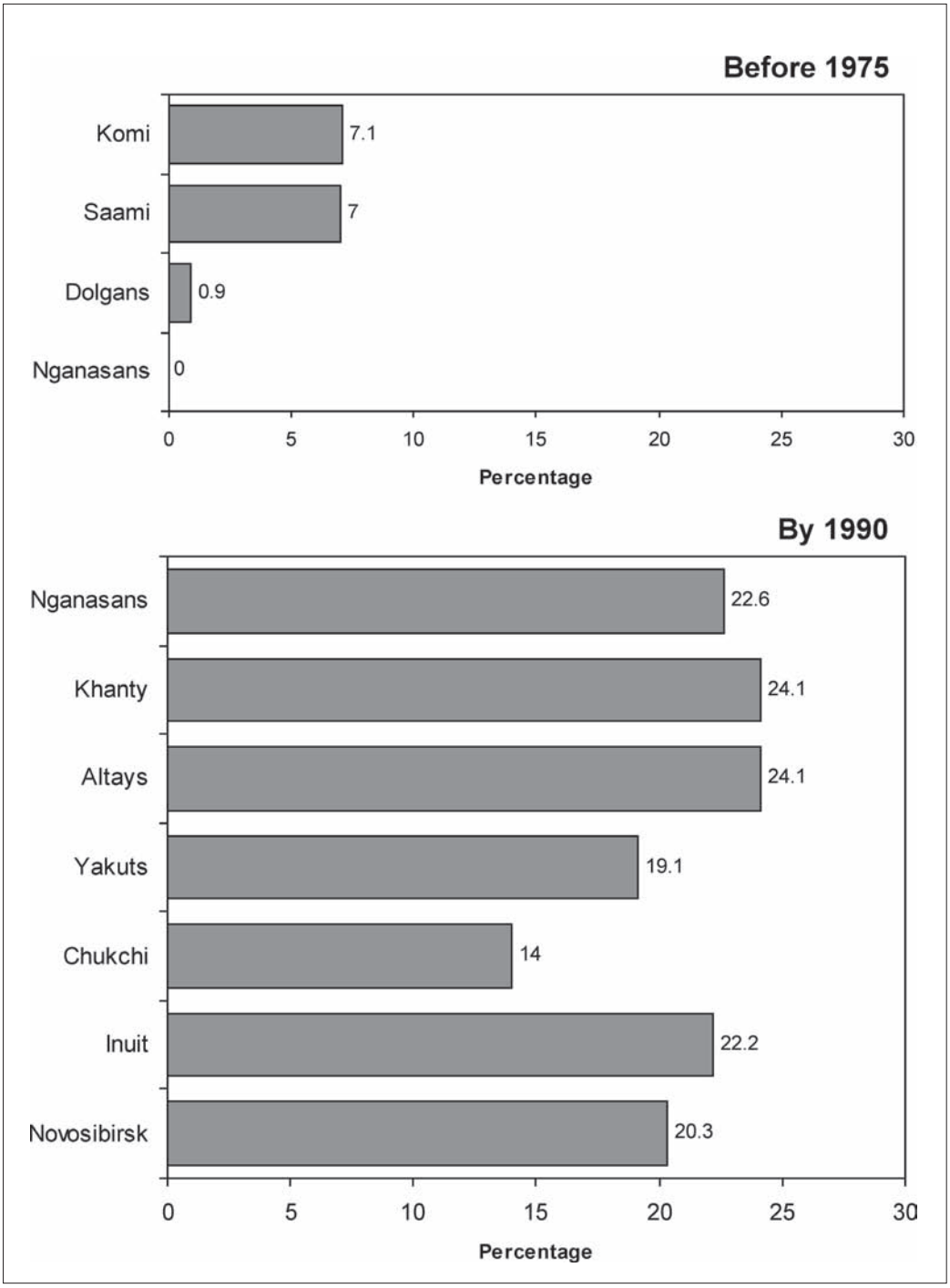

Fig. 4.17. Frequencies of arterial hypertension in different groups.

The rapid growth in the prevalence of arterial hypertension among northern natives is corroborated by the data obtained from the Nganasan population of Volochanka village (Taymyr Peninsula). The blood pressure level and hypertension frequency in this group were studied in the 1970s and at the beginning of the 1990s (Turchinsky, 1980; Shephard and Rode, 1996). In the 1970s not a single case of arterial hypertension in Nganasans was detected, whereas 15–20 years later, systolic blood pressure higher than 160 mm Hg, and/or diastolic blood pressure exceeding 90 mm Hg, was found in 23% of subjects.

Especially alarming is the "explosive" character of ischemic heart disease and hypertension among indigenous northerners of Russia. By the mid-1980s, signs of ischemic heart disease were revealed in one-third of examined men and almost one-quarter of women in the groups of northern Khanty, Altaians and coastal Chukchi (review in Vasiliev et al., 1987).

In recent years, the rate of arterial hypertension mortality in natives of separate regions has increased almost twofold (Khasnulin et al., 2005; Popov et al., 2005). According to Khasnulin and co-authors (2005), the arterial hypertension problem is becoming as pressing for the northern natives of Russia as it is for the migrant population of the North.

Prospects for metabolic health

The transition of the indigenous Arctic population from a "traditional" to a "modernized" way of life is accompanied by wider shifts in carbohydrate and lipid metabolism. Currently, in native northern populations, several adverse factors act concurrently to disrupt the interconnected carbohydrate and lipid metabolism, culminating in the development of metabolic syndrome (also called metabolic syndrome X in the early literature).

Owing to changes in the diet, the intake of ω-3 PUFA by native northerners has decreased (especially in coastal populations). As a result, the ratio of various serum lipid fractions has changed. The hyperlipidemia results in shifts in tissue oxygen balance. The tissue hypoxia is aggravated by the rather high oxygen demand (the northerners are characterized by a high level of basal metabolism), at the same time the functional capacities of the lungs are reduced due to the prevalence of smoking and lung diseases. The combined action of relative anoxia and iron deficiency (anemias, probably the influence of *H. pylori*), as well as lipid metabolism disturbances, speed up the development of the atherosclerotic process.

At the same time, a decrease in the level of physical activity and changes in life-style

and food habits of northern natives result in a prevalence of overweight and obesity. Particularly alarming is the frequency of truncal type obesity in northern women, a condition that favours the development of cardiovascular diseases (Larsson, 1988).

The high level of basal metabolism and increased "background" daily energy expenditures in northerners (compared with city-dwellers) still demand a substantial intake of substrates for oxidation — lipids and/or carbohydrates. The shift of the energy balance towards carbohydrates, especially food sugars, caused by a growing importance of commercial market foods, upsets a balance between the endogenous and exogenous glucose share and raises the risk of developing diabetes. Diabetes, in turn, is one of the major risk factors in the development of atherosclerosis (Dilman, 1981; Stern, 1996).

Owing to the interpopulation mixtures within the native northern communities, the *LCT* gene CT genotype concentration rapidly increases (Kozlov and Lisitsyn, 1997). Phenotypically, its action shows itself in retaining the lactase activity in adults. In itself, this character is neutral or even favourable, but milk sugar (lactose) contributes to the increase of cholesterol level in the blood (Kliorin, 1981). These and similar genetic processes can aggravate "metabolic health" disturbances in northern populations.

CHAPTER 5

NUTRITIONAL STATUS AND DIETARY TRANSITIONS

The traditional diets of indigenous peoples

The nutritional ecology and the anthropology of high-latitude populations have been the subject of much research. Historically, the cultural, technological and economic adaptation of northern native populations were influenced by climatic conditions, the rather poor species diversity of Arctic flora and fauna, microelements in the soil composition and the low potential for agriculture (and hence an inability to produce carbohydrate foods). The taiga, tundra and coastal inhabitants developed their own types of nature management, which, in turn, defined the diversity of their nutrition types (Krupnik, 1993; Funk and Sillanpää, 1999; Kozlov, 2002, 2005).

Unfortunately, researchers often disregard interpopulation differences in traditional diets that are characteristic of the peoples of the circumpolar zone. As a result, the diet of marine hunters (to whom only a few groups of the Arctic natives belong) began to be perceived as the "typically Arctic" nutrition type. In reality, the coastal subsistence based on marine hunting is typical mainly of the indigenous populations of Greenland and North America. In Arctic Russia, it is one of the more uncommon subsistence patterns. In its pure form, it is found only among the Siberian Inuit, coastal Chukchi and Aleuts — that is, groups whose total numbers today are fewer than 4,000 people. The main strategy of their traditional nature management involves the use of the highly productive coastal grounds and waters that contain a high seasonal concentration of several animal and plant species (Krupnik, 1993). According to our estimations, the traditional diet of settled marine hunters was more diverse in terms of foodstuffs than that of other Arctic and subarctic subsistence types, involving about 100 species

of animals and plants, almost twice as many as in the tundra reindeer-herders' diet.

Since blubber and fat-rich marine mammal meat made up the basis of marine-hunters' diet of the coastal zone, their food traditionally had the highest fat content, compared with the diet of other northerners. The settled life of marine hunters allowed them to stock provisions and to use relatively long-term methods of raw-food processing. For example, pieces of bowhead whale and/or walrus were processed in a special way by being put into "meat pits" dug in the ground and allowed to slowly ferment. In this way, many traditional dishes were prepared, which were called "sour" or "fermented foods" by the ethnographers. Importantly, this method of relatively long-term food storage considerably eased the problem of these foods' seasonal availability for the marine-hunters' communities.

Slightly less varied than in settled coastal inhabitants was the nutrition of the taiga and tundra nomadic or semi-settled hunters and fishermen (in Siberia these were Evenks, Kets, Yukagirs, Dolgans and Nganasans). Their main food sources were obtained from hunting in the taiga and/or forest zones, fresh-water fishing and gathering. For some groups, such as Khanty and Mansi in Western Siberia and the Nanais and Nivkhis on the Amur River, the basic sources of food were fresh-water or migratory fish — the ethnographers of the nineteenth century even characterized these peoples as "ichthyophages." Unlike the hunters of the circumpolar zone in America, almost all Siberian hunters-fishermen practised reindeer herding in varying degrees, but only as a subsidiary kind of activity. The reindeer were used either for riding (in Evens and Evenks) or as draught animals (in the majority of other peoples), but none of these peoples considered their relatively small herds to be their primary food source. Skins, meat and fat were provided by hunting wild reindeer.

The most widespread form of subsistence among indigenous Arctic groups of Russia was tundra reindeer herding, which was quite uncharacteristic of the native populations of Greenland and America. Beginning in the second half of the nineteenth century, the tundra reindeer herders (their most typical representatives being the "Reindeer/Tundra Chukchi" and the Nenets of Western Siberia and the Arctic regions of European North) lived mainly by using what they could produce from their own herds: venison, fat and edible intestines. In addition, they added to their diet foods from hunting, river or lake fishing, gathering and, sometimes, marine mammal hunting (before the nineteenth century, when large-scale reindeer herding began to prevail, the contribution of hunting and gathering to providing food supplies had been considerably higher). The Evens, Evenks, Khanty, Koryaks, Tundra Chukchi and some Saami groups also used reindeer milk; however, its consumption was irregular and the amount consumed insignificant. Accordingly, the "milk behaviour" in circumpolar populations failed to become a selection factor in favour of lactase persistent phenotypes (Kozlov and Lisitsyn, 1997; Kozlov, 1998).

The nomadic life-style of reindeer herders prevented them from storing appreciable amounts of food. The change in seasonal nutrition patterns was determined by the seasonal availability of particular foods. In general, the traditional reindeer-herders' diet could be described as one of the scantiest in terms of its plant and animal species diversity. One typical example is the Kola Saami diet. Their "summer" and "winter" nutrition patterns were very different, but in both cases were marked

by lack of variety. Here is a typical description provided by Kharuzin (1890: p. 90): "In winter the Lapps almost always have venison, eaten fresh, salty, or dried. In summer, venison is out of the question, since reindeer are slaughtered only in winter, and the main food is fresh fish; which, in turn, is very seldom eaten in winter and is replaced by either salty or dried fish." Our analysis of ethnographic records has shown that by the end of the nineteenth century, the Kola Saami diet included no more than 30 local and about 20 imported foods.

Even from this brief review, we can see that the food composition in peoples practising various ways of traditional subsistence in the Arctic and subarctic regions of the Old World differed in important respects. This applied to both vitamin/microelement composition and to the ratio of basic nutrients — proteins, fats and carbohydrates. The diets of hunters-fishermen and especially reindeer herders contained appreciably less animal fats than the marine-hunters' diet, because the terrestrial mammals of the Arctic regions, including the reindeer, provided very lean meat compared with such blubbery animals as seal, walrus and whale (Speth and Spielmann, 1983). Thus, we can assume that venison, which was the basis of the reindeer-herders' diet, provided for them only the necessary minimum of animal fats. The need for additional fats was made up by hunting and fishing and, in a few groups, by bartering with marine hunters.

The steady traditions of barter between settled inhabitants of coastal villages and nomads of the tundra were probably expressed only in Chukotka. Bartering relationships linked certain clans of Chukchi and Siberian Yupik and could last for several generations. The tradition was still prevalent in the 1920s and 1930s, and some of its elements can still be observed up to the present day. However, the intensity of exchanging marine-hunting and reindeer-herding foodstuffs was never very high. Once or at the most twice a year (as a rule, in autumn), a family of reindeer herders delivered 100–200 kg of venison to a coastal village family, receiving in return 50–70 kg of marine mammal meat and fat (Krupnik, 2000). Although the barter provided a certain intake of "marine type fats" for the tundra zone population, it could hardly have substantially affected their dietary composition. As for their own subsidiary hunting for marine mammals (mainly various seals and beluga whales), the reindeer herders could only do it occasionally.

Unfortunately, there were only a few known attempts to estimate the balance of basic nutrients in the traditional northerners' diet in the late nineteenth and early twentieth centuries. As an example, we provide below the diet characteristics for marine hunters (Greenland Inuit) and reindeer herders (Kola Saami). The data in Table 5.1 give some idea of the nutrition structure in these two types of traditional subsistence.

Table 5.1. The ratio of basic nutrients in two Arctic traditional subsistence diets.

Ethnic group	Subsistence type	Nutrients (% daily energy)		
		Proteins	Fats	Carbohydrates
Inuit (Greenland)	Marine hunters	44	47	8
Saami (Kola Peninsula)	Reindeer herders	27	15	58

Source: Greenland data from Krogh and Krogh 1913; Saami data from Ivanov-Djatlov 1928

As seen from Table5.1, the diets of the marine hunters and reindeer herders dramatically differed in terms of the contribution of basic nutrients to the production of energy. The share of animal proteins in the Inuit diet was about twice the amount and the share of fats, three times as much as in the Saami diet. Extremely large differences in terms of carbohydrate content might be explained by the higher "westernization" level of the Saami diet in the early twentieth century; however, we believe that the differences in the protein and fat consumption resulted from the peculiarities of two different subsistence systems.

The nutrition patterns characteristic of the basic types of the Old World traditional nature management (marine hunters; hunters-fishermen of the taiga and tundra; tundra reindeer herders) described here by no means cover the diversity of the natives' diets of the circumpolar region. There also existed local variations (some of them have partially held out up to this day), as well as numerous intermediate forms. In the following sections we shall see the different changes that took place in the nutrition patterns of various indigenous groups in northern Russia during the Soviet and post-Soviet periods.

Nutritional status and food composition in the Soviet period

As early as the sixteenth century (and for many groups even earlier), the northern peoples of Eurasia began to be increasingly involved in active trading and cultural relations with representatives of the Russian culture. As one of the consequences of these contacts, the Arctic natives began including imported foodstuffs — flour, sugar, tea and alcohol — in their diet. The eating habits of native northerners gradually changed; however, up until the 1930s these changes were mostly voluntary adoptions on the part of the natives. It was only after the Second World War that the first active, and later openly aggressive, intrusion of European dietary elements (or rather the "Soviet" version of it) began.

In Russia, the "Soviet diet" began to develop in the early twentieth century, incorporating elements of Russian, Ukrainian, Caucasian and Moslem traditional cuisines. However, despite the variety of basic foods and dishes, by the 1920s and 1930s one of the most typical features of Soviet cookery became apparent: its uniformity and monotony. These were accounted for by the chronic lack of food in a country exhausted by almost a decade of continuous fighting (from the beginning of the First World War through the end of the civil war) and the subsequent food catastrophes of the 1920s and 1930s. A significant role was played by the numerous "public catering establishments" of the industrialization period — canteens and

"kitchen-factories" that produced semi-finished and finished foods and dishes (their mission was "to relieve women of domestic work and engage them in industrial production"). These centres provided specifications for the quality, composition and caloric content of dishes and granted "official status" to certain diets. First in kindergartens, and later in schools, children became accustomed to the stereotypes of Soviet cuisine, which was then established as a typical diet in the army and factory dining halls.

The Soviet diet began to take hold in the "new industrial development regions," including the "settlement areas of the numerically small peoples of the North." The process of getting the natives accustomed to a new diet was regarded as "imparting basic hygienic skills." No wonder that a teacher, doctor or nurse who was used to Soviet cookery considered indigenous "sour foods" (reindeer blood fermented in a leather bag, stomach or paunch; "sour fish"; mattak) to be not just "queer" but harmful. Such "savage" ways of processing foods were deliberately condemned, ridiculed and sometimes even persecuted. The workers of the Khabarovsk Museum of Local Studies told us that in the late 1920s and early 1930s many Nanais and Nivkhs engaged in providing food supplies for the construction workers of the City of Komsomolsk-on-Amur were accused of "sabotage" and subject to repressions. According to official documents, they "deliberately spoiled fish," although in reality the Amur natives simply applied their traditional salting ways, which were unfamiliar to migrants from European Russia.

These were, of course, the extremes (although we don't know how many lives these extremes cut short). Here is a typical citation taken from a 1937 speech by the chair of the Inspection Commission of a Dolgan *kolkhoz* (collective farm) which shows the naivety of overzealous *kulturtragers* of the time. The *kulturtragers* were striving to transform the dietary structure of the tundra's inhabitants and habituate them to the "gifts of civilization": "Before, we used to eat only reindeer meat, fish, flour, bread, and dried bread. Now, the *Red Choom* [mobile propaganda group — *author's note*] has taught us to eat various tinned foods and to cook good porridges. When a housewife throws noodles into the meat caldron, it tastes at once much better — you've eaten just a little, and the belly is full" (Khazanovich, 1986:42). It seems that tinned goods, porridges, noodles — typical elements of Soviet cuisine — symbolized the transition from a "backward" way of life to a "modern" one.

However, until the second half of the 1940s, the changes to traditional diets in the North did not affect large population groups. The mass changes to the diets of native northerners occurred between 1945 and 1985, when the indigenous population began to be actively involved in the cultural, political and economic spheres of the Soviet state. During that time, not only was the native northerners' diet changing but so was their life-style.

From October to May, that is about eight months of the year, all children of northern natives lived in boarding schools (the "closed schools" system in the Russian North held out till the end of the 1980s) and were fed in the traditions of Soviet cuisine. The officially authorized diets for northern boarding schools were practically identical to those adopted for central Russia. The regional differences concerned mainly caloric and vitamin content and sometimes allowed for wider use of local foods, but the ways of processing foods were

standardized. The specificity of traditional northern diets was not taken into account. Schoolchildren were continuously taught that only "modern" cooking methods testified to a person's "culture" and "education," while traditional sources of nutrition and local foods were signs of "low prestige." So, traditional venison was considered to be "ordinary foodstuff," while marketed beef was praised as "high prestige food." During our research in the late 1980s, we repeatedly observed the consequences of such "education" in the national villages of the Khanty-Mansi and Yamal-Nenets AO. Despite the abundance of and low prices for venison, it was always imported beef that was proudly offered to guests in the villages of the Northern Ob area; the attitude of the Mansi and Khant villagers to venison appearing to be rather scornful.

Boarding schools played an essential role in the formation of new gustatory preferences, too. The specific feature of the traditional "Arctic" cookery, as opposed to the "European" one, is the absence of flavourful additives like salt and spices. Boarding school students had to get used to entirely new taste sensations, which very soon became habitual and later served as an essential factor influencing the ways of cooking even local foods. In Chukotka and Taymyr, this resulted in the growing popularity of using salt to preserve fish and caviar, which was typical of the Soviet cuisine but had never been practised by the Chukchi, Siberian Yupik and Nganasans before the beginning of the twentieth century.

As well, boarding school children got used to carbohydrate foods with a high sugar content. They were invariably offered sweet tea, sweets, jams, pastry and one of the favourite delicacies of the Soviet era — tinned condensed milk with sugar. Influenced by these habits acquired in childhood, the consumption of sugars and a variety of sweets grew steadily throughout the indigenous population.

Of course, boarding schools alone did not cause all the nutritional changes in the diets of indigenous inhabitants of the Russian North. The process was also immensely influenced by some specific features of the Soviet state machine, with its penchant for imposing from above "solutions for social problems." For example, forced resettlement of indigenous peoples from numerous small villages to large "integrated" populated areas led to essential changes in the availability of local foods. Here are just a few facts that give us some idea of the scope of this resettlement. Within the period from the first half of the 1950s to the beginning of the 1960s, the inhabitants of 650 traditional indigenous villages of the Khanty-Mansi AO were concentrated in 76 populated areas. Out of 16 Eskimo villages that existed in the late nineteenth to early twentieth centuries in the south-east of Chukotka Peninsula, only three were left — Uelkal, Sireniki and New Chaplino. Note that New Chaplino was a new village: it was founded in Tkachen Bay at the end of the 1950s, and in 1958–1959 the Eskimos from Chaplin Cape and several nearby villages were moved there (Krupnik, 1983). In the Katanga District of Irkutsk Oblast, between 1961 and 1970, the number of Evenk villages was reduced from 34 to 18 (Sirina, 2002).

The "village integration" process involved all regions of the Russian North. Its aims were to facilitate administration and delivery of imported goods and foods, to raise the formal employment of indigenous northerners and to provide more medical and social services for the population. These were, undoubtedly, good intentions; however, the solutions were

carried out without taking into consideration the habits, traditions and needs of the native populations. As a result, many hunters and/or fishermen who were now residing in several large villages were unable to reach their traditional hunting and fishing grounds. The burden on the limited amount of land became too high and its productivity declined. Even when the hunters/fishermen were successful, their entire catch was concentrated within one village and bartering with inhabitants of other villages was almost impossible because of long distances and lack of a transportation network.

In speaking about traditional nutrition, we should not forget about the significant share of food provided by the individual fishing, gathering and "subsidiary" hunting of birds and small ground mammals. In the historically formed settlements, these kinds of activities provided a substantial addition to the native northerners' diet while at the same time diversifying it considerably. The hunting and fishing within this pattern was evenly distributed across vast land and water areas. When the population became more concentrated in big villages, these local foods became less available and the demand on the land and water areas around the large villages became excessive. Accordingly, the amount of birds' eggs, seaweeds and seafoods, edible plants and so on in the indigenous diet was reduced. Thus, the "integration" of villages, which seemed to be a purely administrative measure at the time, ultimately exerted an unanticipated negative influence on the availability of local foods.

In addition to the "integration" of populated areas, the authorities took parallel measures to involve the indigenous population in industrial agricultural production. With that end in view, and also in order "to provide employment for the indigenous population" and to make livestock products more widely available, poultry farms that focused on the production of eggs and chicken meat began to appear in villages. As well, pig, cattle,and dairy farms were set up for the production of meat and milk.

Milk was not popular among the indigenous population and, as a result, there was a large surplus. By the mid-1980s, even Soviet officials were compelled to admit it was being overproduced in the indigenous settlement areas, although at the state level plans for an increase in the number of dairy farms in the North continued to be made (Kozlov and Vershubsky, 1999). The inefficiency of developing and maintaining farms assigned to the production of such perishable products as milk in remote isolated villages was not taken into account. As a result, in the late 1980s, milk was delivered from farms located in national Mansi villages on the northern Sosva River to the milk plant in the town of Berezovo (Khanty-Mansi AO) by tankers when the river was navigable. In the villages, surplus milk was sometimes used for feeding foxes and Arctic foxes on fur farms, or simply poured out. Because of the lack of roads, transportation of this perishable food even to the nearest villages was practically impossible.

However, meat from the farms located in large villages began to rival venison produced by reindeer herders and the harvest of marine mammals. By 1985, marketed beef, pork and tinned foods made up almost a half (45%) of all the meat consumed by the inhabitants of the coastal villages of Chukotka —Yupik and Coastal Chukchi, who had been traditionally engaged in marine mammal hunting (Volfson et al., 1985). State officials regarded marine mammal hunting as a subsidiary activity and

as a source of food for feeding animals on the fur farms. Hunting for whales, walruses and seals was not considered to be a necessary food source for inhabitants of coastal villages.

Another important factor stimulating a shift in native northerners' nutrition during the Soviet period was the process of involving the natives in the Soviet "planned national economy." The members of *kolkhozes* (producers' cooperatives that existed in the Arctic until 1960) were obliged to hand over a good share of their reindeer herding, fishing and hunting products to the state. From 1930 to 1966, the labour expenditure of *kolkhoz* farmers and, hence, their individual share of distributed income was measured in "workday units" accrued with the performance of a certain number of planned workdays. The payment corresponding to these workday units was extremely low, and only part of it was paid out in cash: the larger portion was paid in kind, mostly in produce from the same *kolkhoz*. The situation was rather absurd, when reindeer herders received part of their "workdays" in reindeer skins and venison and fishermen in fish from their own catch.

The most valuable and expensive *kolkhoz* products, however, went to the state. These were not only furs (which were regarded as an important source of monetary income of the USSR), but also valuable kinds of fish, among other products. Thus, in the Soviet period fishermen working in *kolkhozes* and their families often could not use the fish they caught, which had always been the basis of the northerners' traditional diets. In Western Siberia this led to fundamental changes in the epidemiologic situation.

The basin of the Ob and Irtysh Rivers is the world distribution centre of the parasitic helminth, *Opistorchis felineus* (a trematode). The larval form of the helminth at the last stage of development lives under the skin and in the muscles of fish. In the digestive tract of the final host (dog, cat or human) the larva develops into a mature helminth affecting the hepatic and pancreatic ducts.

The extent of helminth contamination of the Western Siberian population is very high. By our data, in 1988–1989, 62% of Mansi, Khanty and Komi-Izhems were infested with at least one species of parasitic helminth. In 1994–1995, judging by the results of fecal inspection alone, helminth affected some 53% of Khanty and Mansi, this figure is undoubtedly underestimated (Kozlov and Vershubsky, 1999). According to the results of epidemiological surveys, the opisthorchosis infection of the population of the Surgut District of Tyumen Oblast in the mid-1980s was 70–90% (Krivenko et al., 1989).

However, not all fish species are *Opistorchis* intermediate hosts. For example, whitefish (white salmon, sisco muksun) are relatively safe, and the sturgeons are completely free of *O. felineus* larvae. The most dangerous fish is carp (ide, dace, bream), and slightly less dangerous is pike. In Khanty, Mansi and Nenets who had resided in the opisthorchosis centre for centuries, the high risk for invasion led to customs restricting the use of "dangerous" fish (Kozlov and Vershubsky, 1999; Kozlov, 2005). For example, the ide, which was dried in spring or in early summer, was considered to be inedible for humans and was used only for feeding dogs (parasitological research has shown that long term freezing kills *O. felineus* larvae). The pike was traditionally regarded as "weed fish" by most Siberian peoples or it was "forbidden" for religious reasons; only a few native groups used it for food.

When in the 1960s the plans for catching valuable whitefish for the needs of the state were implemented, the lack of white salmon and muksun in the Khanty and Mansi diet caused the natives to substitute them with the traditionally "low prestige" carp and "forbidden" pike. A withdrawal from the traditional nutritional culture — when the natives, in particular, had to include in their diet some fish species they had never used before — led to a deterioration of the epidemic situation in the native populations of Western Siberia. The disparity in the opisthorchosis prevalence among native and migrant populations of the Khanty-Mansi AO became striking: by the end of the 1980s, 84% of the natives and 11% of the migrant population were affected by helminthiasis. In the Surgut District (the zone with the highest risk of invasion), at least 59% of the population were invaded, the overwhelming majority of them (83%) being indigenous northerners (Krivenko et al., 1989; Feschbach, 1995).

There was one final factor that exerted considerable influence on the life of indigenous northerners of the USSR, including their access to local food resources. This was the interrelations of indigenous Arctic population with military organizations, made up of military units and frontier guards. As the border regions of Chukotka, Kamchatka and the Kola Peninsula (territories located in immediate proximity to the "probable enemy," the U.S. and NATO) became highly restricted, it became more and more difficult for the indigenous northerners to practise traditional fishing and hunting. In particular, each time they wanted to go to sea, the marine hunters of Chukotka were obligated to apply for permission from frontier guards. Although they were seldom refused, the very procedure of application and waiting for an answer took time. With rapid weather changes and the fast migration of sea mammals (typical, in particular, of walrus herds in the waters around Sireniki village), the hunting often became disrupted. Examples of the negative influence of the military presence on the Kola Saami reindeer herding and fishing are cited by Konstantinov (1996) and Robinson and Kassam (2000).

Additional difficulties in providing local foods for the traditional northern diet were created when vast territories, previously used for traditional nature management, were appropriated for industrial needs. As well, industrial pollution of the environment and often unproven "nature protection" measures, that is, introduction of fishing restrictions, marine mammal hunting quotas and exclusion of some territories from fishing and hunting, contributed to traditional food restrictions.

In the second half of the twentieth century, the influence of the above factors on the nutrition of the natives of the Soviet North became more pronounced. Naturally, there were specific features in each region, but the changes affected all native groups irrespective of their territory of residence and type of economy.

Especially fundamental were changes in nutrition experienced by the most sensitive and vulnerable native group — the children. As it was already mentioned, nutrition in the "organized children's collectives" (kindergartens and boarding schools) in the Russian North was organized without considering the medical-anthropological specificity of indigenous populations. The imposed diets included plenty of carbohydrates. Even in the late 1980s and early 1990s, the period of especially acute food shortages in the country, the administra-

tors of boarding schools from national Mansi and Khanty villages proudly informed us that they still "managed to provide the needed fresh and condensed milk and tinned meat for the children."

In a monograph devoted to the nutritional peculiarities of the Nenets of Western Siberia, A. Yoshida (1997) cited some menu samples from a boarding school dining hall in Tazovsky village (Yamal-Nenets Okrug). The diet of Nenets schoolchildren was typical of all Arctic and Siberian boarding schools. In 1986–1997, we found similar menus in boarding schools for Buryat children (Boarding School No.1 of Ulan-Ude); Mansi and Komi children (boarding schools of Nyaksimvol, Saranpaul and Vanzetur villages of Berezovo Rayon, Khanty-Mansi AO); and Saami, Komi and Nenets children (Secondary Boarding School of Lovozero village, Murmansk Oblast). All these menus included typical dishes from Soviet cuisine: vegetable, meat or fish soups, porridges, vegetables (mainly potatoes and cabbages), macaroni, cooked or stewed meat, kissels and fruit compotes, as well as bread, pastry, sweet tea and cocoa. Milk, too, was always on the menu.

The regulations for boarding-school catering services did not even mention the high prevalence of genetically caused malabsorption of milk sugar (lactose) and, accordingly, of whole milk among the native northerners; this situation has not changed up to this day. Meanwhile, primary hypolactasia is characteristic of 50–90% of the population of northern and continental areas of Russia. The transition to "adult" (i.e., reduced) enzyme lactase production and, hence, lactose malabsorption in children of native peoples of the North occurs early, often by 4–7 years of age (see the review in Kozlov, 1996). As a result, after using milk which was "compulsory" in boarding schools, lactase-restriction children often had diarrhea. These intestinal dysfunctions were usually regarded by the medical personnel as manifestations of intestinal infection, and the patients were prescribed unnecessary antibiotic treatments; this frequently caused dysbacteriosis development, which, in turn, paved the way for the development of chronic diseases in the digestive organs.

The situation was often aggravated by the fact that, in many boarding schools, the children's diets included reconstituted rather than fresh milk, since dairy farms were concentrated in a rather small number of villages. But the dried milk and milk formulae contained two to five times more lactose than human breast milk and three to eight times more than cow's whole milk (Scrimshaw and Murray, 1988). Accordingly, the reaction of children with lactase restriction phenotype to dried milk was especially intense. We repeatedly heard complaints from northern boarding-school personnel that their students were "so unused to civilized food that they just rebel[ed] when they [were] forced to drink milk." Our explanations were perceived rather sceptically, and in any case it was impossible to change the situation: the observance of the approved diets was strictly enforced.

Nutrition standards established for kindergartens and boarding schools often turned out to be insufficient for northerners in terms of the intake of vitamins (especially fat-soluble vitamins). This resulted in A and D hypovitaminosis manifestations: oral mucosal lesions, vision disorders (reduced adaptation to the dark) and clinical rickets. Kamchatka and Yakutia native children, after their transition

to the typical boarding-school "carbohydrate diet," were registered with hypovitaminoses two three times more often than their peers of Slavic origin (Prakhin, 1987; Prakhin and Tepper, 1990).

Similarly, no proper attention was given to the fact that changes in the rhythm, and not only in the composition, of nutrition could influence the children's health. As our observations in the Yamalo-Nenets AO have shown, the daily activity rhythm of digestive organs in native northerners differs from the rhythms observed in city-dwellers of the temperate climatic zone.

The change from the traditional foods eaten at home to the entirely different boarding-school diet occurred abruptly, and after a several hours' helicopter flight. A child raised in the tundra suddenly encountered an unfamiliar nutritional culture. Children were not allowed to bring traditional foods with them (it was strictly forbidden to store "unhygienic" local foods in boarding schools), and as a consequence they were deprived of choice and could not explain why they felt unwell after eating a meal of the new foods.

The switch to new nutrition patterns was especially abrupt because, in the traditional "Arctic diet," the intermediate stage of transition from the "infantile" to "adult" type is not pronounced. For example, studies conducted in the villages of northern Yakutia have shown that the range of foods in the children's and adults' diets is almost the same. In native families that maintain traditional kinds of activities (hunting, fishing, reindeer herding), the same livestock produce as well as the hunting and fishing harvests formed the basis of the diet both for children and adults among Evens, Evenks and Yakuts (Khandy, 1997). In the boarding schools, however, children accustomed to a protein-lipid diet were "switched" to the "European children's diet" containing many flour-based and vegetable dishes.

The native children's intestinal systems were exposed to this kind of stress two, four or even eight times a year — depending on how often they went to visit their parents and then came back to their schools again. For most students it occurred twice a year, in summer and in winter (and children from remote villages came back to the tundra only for summer vacations). However, children from nearby villages had a chance to visit their families also during the autumn and spring vacations. Accordingly, within one year, their internal systems had to adapt four times to the traditional food at home and four times to the standard boarding-school diet. These switches from one type of nutrition to the other were a serious challenge to the children's health: in one-third of the children, the adaptive reorganization of their stomachs' secretory activity could take about a month (Orekhov, 1987).

We can only admire the extremely high compensatory abilities of the children's systems for being capable of switching over to different metabolism variants with each change of diet. There is no doubt, however, that these changes were rather painful and had grave consequences.

Judging by the publications based on the studies of the late 1980s, unbalanced diets were also quite common in children living with their families (Prakhin and Tepper, 1990). Thus, a whole range of unbalanced nutritional varieties was registered in children from Yakutia and Kamchatka villages. The most common were diets with the predominance of carbohydrates; in some children, however, the deficiency of all basic nutrients was observed. The

researchers also revealed cases of protein-component domination combined with a lack of fats; sometimes the domination of the lipid component was accompanied by the relative shortage of proteins. Considering that the children's nutrition in native northern populations is traditionally close to that of adults in terms of food composition and ways of food processing, we may assume that the described unbalanced diets were just a reflection of the general situation.

In fact, in the last third of the twentieth century, the nutrition of native northerners, even those engaged in hunting, fishing and reindeer herding, was often equally remote from both "European" and traditional patterns. The share of carbohydrate food (which was cheap, provided a quick sense of fullness and caused habituation) in native northerners' diet was steadily growing. The imported flour and bread had long ago supplemented their diet and occupied an important place in it. But by the late twentieth century, the increase in the carbohydrate share became the common trend in indigenous nutrition.

According to some publications, the contribution of carbohydrates to the total energy expenditure in the food of native northerners remained lower than in representatives of the non-native population, first of all because of differences in the consumption of refined sugar. But the consumption of sugars by the natives grew quickly (Kozlov et al., 2005). One example is the situation in Chukotka. In 1920, natives engaged in marine mammal hunting did not use marketed sugar or eat sweets. In 1937, the daily per capita consumption of sweets by the Siberian Eskimos still remained low: 40 grams on the average, including 30 grams of table sugar. By 1989, the differences in sugar and sweets consumption between the natives of Chukotka and "the average all-Russian consumer" practically disappeared (the overall consumption was 58 grams and 65 grams of sugar and 125 grams and 129 grams of sweets, respectively).

But the growth of carbohydrate consumption did not yet indicate a transition to "European" nutrition. This is confirmed by the data of food composition research (mainly by standard 24-hour dietary recalls) conducted in the late 1980s and early1990s (Table 5.2).

In terms of carbohydrates content, the diet of reindeer herders (Evenks and Tundra Chukchi) and marine hunters (Yupik and Coastal Chukchi) was actually close to the typical diet of the European population of the Soviet Union. The small amount of total fat in the Evenk diet may be accounted for by seasonal variations, as well as by the error due to the small sample size (26 men and 10 women: Leonard and Katzmarzyk, 1994). However, the total protein contribution to the caloric content of the diets of all groups of northern natives remained (1.6 to 2.7 times) higher than in the "Soviet type

Table 5.2. Nutrients in the diet of Northern Natives and Russians of the USSR in the 1980s and 1990s.

	Nutrients (% daily energy)			Source
	Proteins	Fats	Carbohydrates	
Evenki	33	19	48	Leonard and Katzmarzyk 1994
Tundra Chukchi	30	32	38	Klochkova et al 1990
Yupik and Coastal Chukchi	19	30	51	Volfson et al 1985
Yupik and Coastal Chukchi	20	36	44	Shubnikov 1991
Russians (USSR, 1980s)	12	36	52	Martinchik et al 2002

diet." The share of animal proteins in the northerners' diet remained very high as well — three to four times higher than the share of vegetable proteins (Shubnikov, 1991).

Although the share of animal and vegetable proteins and fats in the indigenous diet was still higher than the average diet across the USSR, appreciable changes were nonetheless evident. As it was already mentioned, by the end of the Soviet era, 45% of meat consumed by the natives of the coastal areas of Chukotka were derived from the products of stock farms (Volfson et al., 1985), that is, the share of meat and fat from sea, land mammals and reindeer in their diet had been reduced by half. As livestock products contain three to eleven times more saturated fatty acids (SFA) than whaling products (Table 5.3), such a shift in nutrition resulted in deviations in biochemical composition of food, even while the proportions of proteins, fats and carbohydrates in the northerners' diet remained the same. It should be noted that the problem was not confined to the balance of polyunsaturated/saturated fatty acids (PUFA/SFA), on which most researchers quite reasonably place high emphasis. The meat and fat of domestic and wild animals differ in a variety of ways, in particular, in their mineral and vitamin content. For example, the vitamin A content in beef is one-fifth of that of white whale meat (Nutrient Data Laboratory, 2004), which increases the risk of hypovitaminosis development within the "transitional" diet.

Table 5.3. Ratio of polyunsaturated (PUFA) and saturated (SFA) fatty acids in livestock and whaling products.

Edible tissue	PUFA/SFA	
	Pig	Gray whale
Fat	0.41	1.14
Tongue	0.27	1.11
Meat	0.31	0.86

Source: Bogoslovskaya et al 1997

Changes in the way of life and economy affecting a particular group of northerners also influenced the nutrition of nearby populations.In Chukotka in particular, during the Soviet era, some of the products from marine mammal hunting began to be used for feeding animals on fur farms organized in coastal villages. This reduced the intensity of traditional barter between the reindeer herders and marine mammal hunters of Chukotka discussed earlier in this chapter. As a result, the share of polyunsaturated fatty acids was reduced not only in the marine hunters' diet but also in the reindeer herders' as well, since the tundra inhabitants began to make up for the lack of marine products by using venison, sugar, sweets and flour. The medical consequences of this change were seen in the prevalence of being overweight among reindeer herders and the increase of low-density lipoprotein concentration in their blood (Klochkova et al., 1990).

To find out to what extent the nutritional changes affected the northerners' health, we are going to consider the data of anthropometrical studies, which is the most common way to estimate the group's nutritional state (Frisancho, 1990; Ulijaszek and Strickland, 1993).

Undernourishment was revealed in the indigenous children of Yakutia and Kamchatka (Prakhin and Tepper, 1990). The BMI values in Yakut, Dolgan and Even schoolchildren were significantly lower than in their Russian peers living in the Polar city of Norilsk (Ponomarenko et al., 1987). On the whole, however, an expressed lack of protein and energy intake was uncommon in children of the North. Among rural inhabitants, whose diets approached the traditional northern protein-lipid variation in

their basic components, the great majority of children had normal fitness levels (Prakhin and Tepper, 1990). The highest percentage of physically fit children was found in the families of Evenk and Even reindeer herders who were maintaining a traditional nomadic way of life (Belousova et al., 1987; Leonard et al., 1994).

In our own field studies during 1987–1995, we recorded BMI values for Saami, Nenets, Komi-Permyak and Buryat children (Tables 5.4 and 5.5, and Fig. 5.1 and 5.2) and compared them with the anthropometric standards used in the assessment of nutritional status (Frisancho, 1990). All anthropometrircal measurements were taken by one researcher (AK), thus minimizing interobserver error.

The highest BMI values were found in Nenets children, which were close to the 50th percentile of the standard. The Saami and Komi-Permyaks, who approached them in BMI values, ranged within the 50th to 25th percentiles, taking the second position. Thus, the nutritional state of children of the Arctic and subarctic groups we studied in the second half of the 1980s should be estimated as average. The lowest BMI values were found in the rural Buryat sample living in the conti-

Table 5.4. Body mass index by age in rural boys of different ethnic groups.

Age	Saami			Nenets			Komi-Permyaks			Buryats		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
6	-	-	-	-	-	-	-	-	-	17	14.9	1.3
7	7	15.9	1.6	-	-	-	41	15.3	1.6	11	14.7	0.9
8	20	15.8	1.6	52	16.8	1.3	35	15.7	0.8	23	14.9	1.5
9	20	15.9	2.0	51	16.8	1.2	34	15.8	1.2	8	15.3	1.3
10	21	16.7	1.5	54	17.1	1.2	43	16.3	1.3	19	15.9	1.6
11	22	17.0	1.4	46	17.5	1.4	39	16.8	1.2	17	16.0	1.6
12	20	17.1	1.5	40	18.0	2.0	39	17.3	1.7	22	15.4	0.8
13	16	18.1	1.9	51	18.5	2.3	34	17.2	2.4	18	16.1	1.5
14	13	18.5	1.9	58	18.6	1.7	33	18.8	2.4	8	15.7	1.5
15	8	18.7	1.8	44	19.6	1.6	27	19.5	2.4	8	17.2	1.2
16	2	-	-	44	20.6	1.7	25	19.9	1.9	5	17.7	0.7
17	5	19.3	1.7	42	21.5	1.9	-	-	-	-	-	-

Table 5.5. Body mass index by age in rural girls of different ethnic groups.

Age	Saami			Nenets			Komi-Permyaks			Buryats		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
6	-	-	-	-	-	-	11	15.4	0.9	13	14.9	1.0
7	-	-	-	-	-	-	31	15.5	1.3	-	-	-
8	36	15.3	1.3	51	17.1	2.5	45	15.2	1.3	-	-	-
9	54	15.4	1.4	49	16.7	1.3	45	15.6	1.7	9	15.1	1.9
10	48	15.9	1.5	42	16.9	1.4	59	15.8	1.8	12	15.0	1.0
11	34	16.1	1.6	57	17.2	1.3	47	16.0	1.4	8	15.6	2.1
12	30	16.8	1.4	60	17.6	1.5	47	16.7	1.7	18	15.6	1.7
13	28	18.6	2.2	45	18.7	1.9	28	18.1	2.2	10	16.8	1.6
14	28	19.4	1.4	61	20.0	2.1	36	18.8	2.0	14	18.4	1.8
15	30	19.8	1.5	46	20.6	2.4	45	19.7	2.1	15	19.3	2.4
16	22	20.1	2.1	50	22.0	2.3	27	20.7	2.4	12	19.9	2.0
17	12	20.1	2.6	40	22.4	2.5	-	-	-	-	-	-

nental climate of Siberia. They fell within the interval between 15 and 25 percentiles; accordingly, the nutritional state of this group should be classified as "below average." On the whole, height-weight index values testify to a good or satisfactory nutritional state of the children of studied populations.

Important information about the group's nutritional state was provided by studying the degree of subcutaneous fat development. The

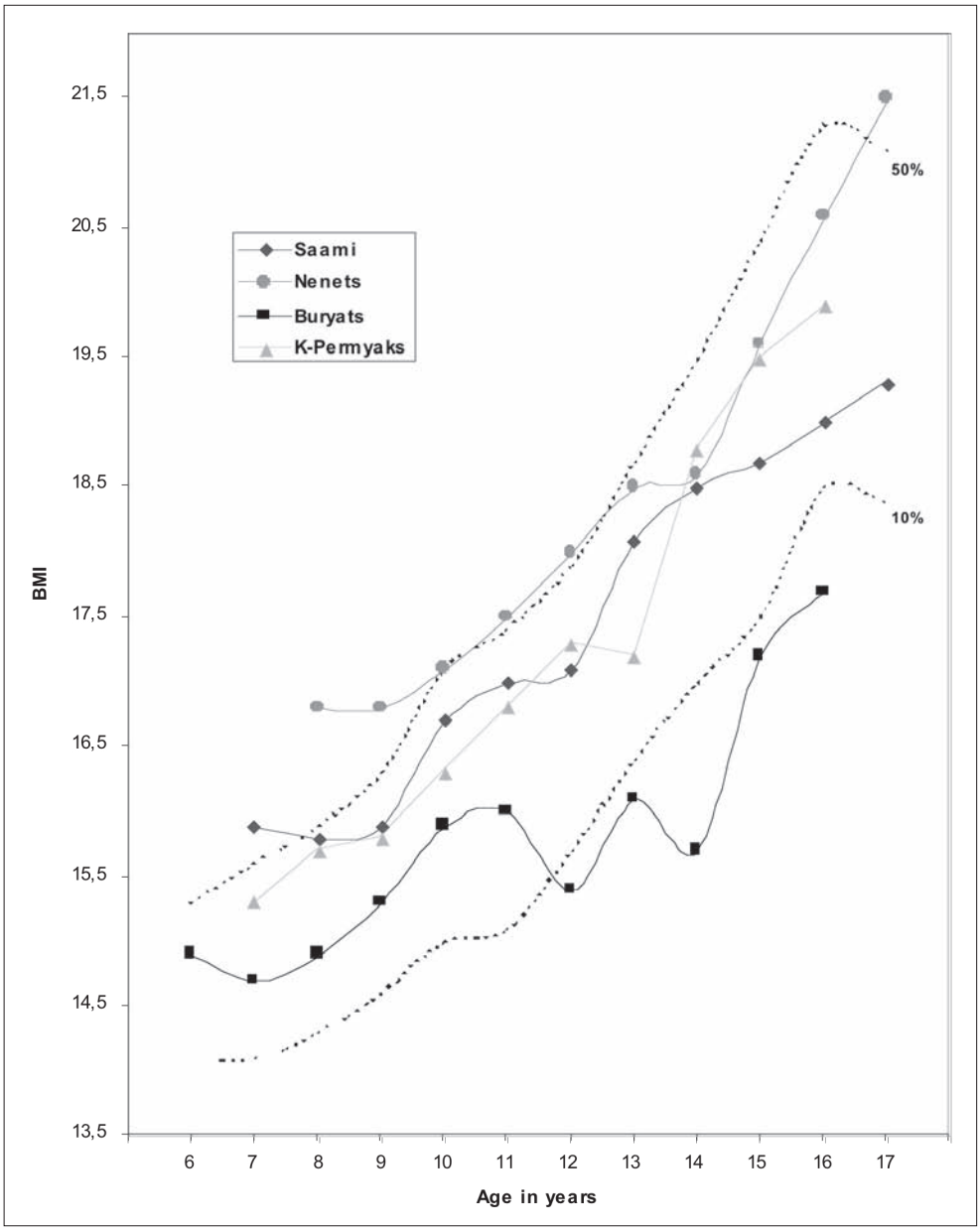

Fig. 5.1. BMI by age in rural boys of different ethnic groups.

triceps skinfold thicknesses were practically identical in Saami children and their peers — Komi and Russian children of the Kola Polar areas (Table 5.6). The only significant distinction was between the Saami and Komi girls from the age cohort of 9–10 year olds ($p<0.05$). All skinfold thickness means ranged within the 25–50 percentile of the standard, which testified to a satisfactory nutritional state (Frisancho, 1990).

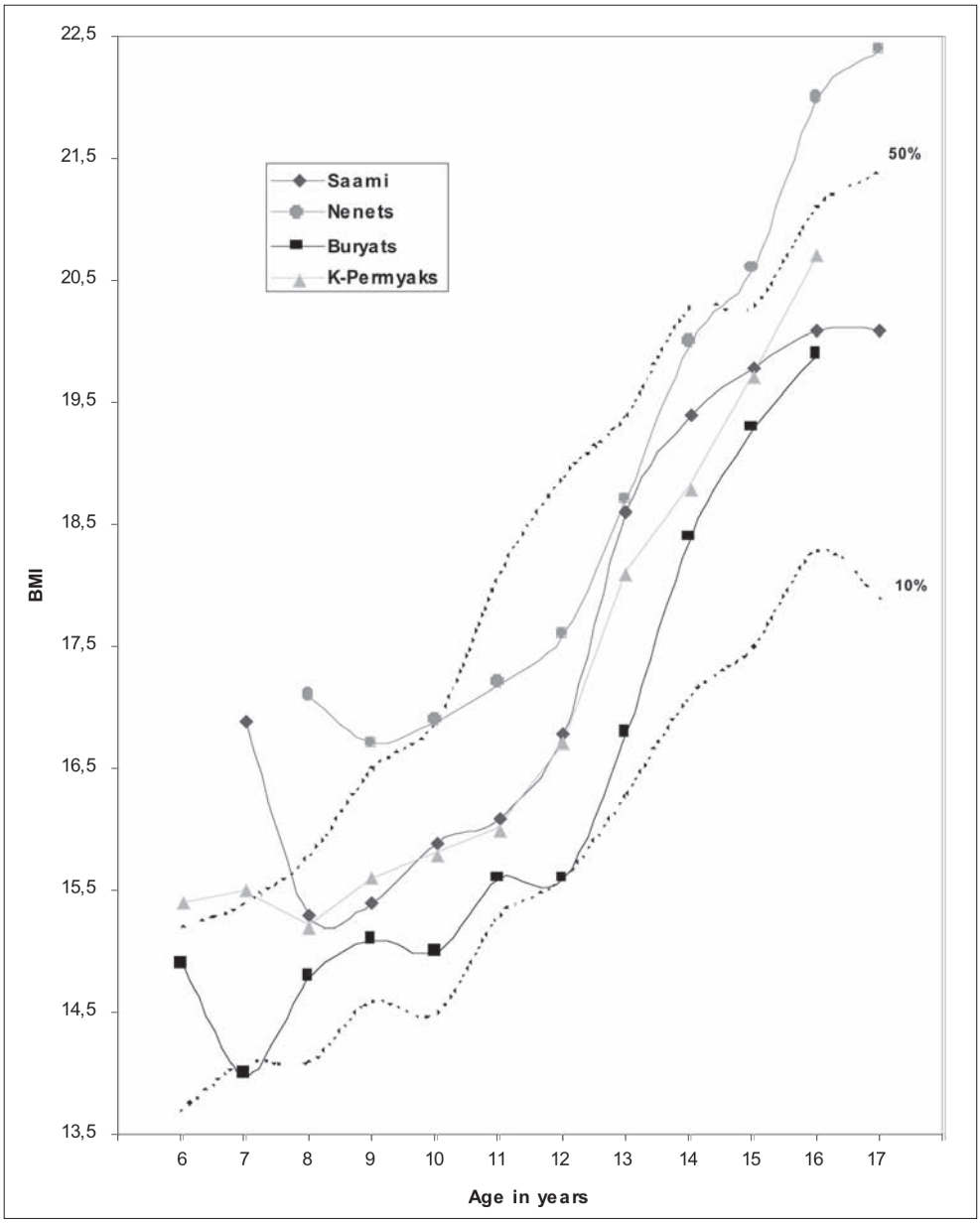

Fig. 5.2. BMI by age in rural girls of different ethnic groups.

Table 5.6. Triceps skinfold (mm) in Lovozero children of different ethnicity.

Sex and age	Saami			Komi			Russians		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Boys									
9-10	41	7.5	2.5	23	6.8	1.8	25	7.1	2.2
11-12	42	8.4	2.9	20	8.6	4.6	19	8.2	3.1
13-14	29	9.4	3.7	19	8.8	4.0	20	10.6	5.9
15-16	10	6.2	1.5	14	7.9	3.5	9	8.4	3.4
Girls									
9-10	51	8.0	2.6	29	9.4	2.9	17	7.7	1.7
11-12	32	9.1	3.0	26	10.7	4.5	10	9.7	1.5
13-14	28	11.7	2.9	12	12.9	3.3	19	12.1	3.0
15-16	26	14.2	2.6	21	13.7	3.5	16	15.6	3.8

Thus, various anthropometrical methods of nutritional state estimation show that the energy and protein intake was sufficient in children of different northern ethnic groups in the last years of the Soviet period.

In our study of the literature, we did not find any mention of undernourishment in adult representatives of the indigenous populations of the Russian subarctic and Arctic regions, Siberia and the Far East. Similarly, our own research data gave us no reason to suspect a deficiency of protein and/or energy intake with food. However, overweight and obesity occurred rather often among adult northerners, the intensive body weight increase in village inhabitants being observed as early as 25 to 30 years of age. For example, in Nganasan women aged 20–29, even the mean BMI value equaled 26.3 units, which was higher than the lower boundary of overweight, and in the 40–49 age cohort, the BMI mean was 29.8 units, approaching the diagnostic parameters of obesity (Shephard and Rode, 1996). Among Chukchi and Siberian Yupik under 35 years of age, overweight and obesity were found in 16% of men and 19% of women, and in the 35–49 age cohort, in 35% of men and 52% of women (Young, 1994). During our studies of the late 1980s, 8% of men and 20% of women aged 18–59 living in the northern Mansi villages were overweight, and in the Komi-Izhem samples of Western Siberia, 7% of men and 10% of women were overweight.

These figures on the whole agree with the data on overweight and obesity frequencies in other regions of the USSR and Eastern Europe for the same period. So, in the late 1970s, overweight was registered in 10% of the rural and 16–20% of the urban population of Poland, and in about 14% of the 20–69-year-old men of the USSR (Tatoń, 1981; Vinogradov et al., 1987). It is true that in the big cities and metropolises, overweight and obesity were much more frequent: in the mid-1980s they were revealed in 59.5% of Muscovites aged 17–64 (Eganyan et al., 1987).

We may assume that the prevalence of overweight and obesity in native northerners resulted from changes in food composition, combined with a reduced level of physical activity caused by the withdrawal from their traditional life-styles. The social and industrial reforms of the second half of the twentieth century appreciably affected the cultural

traditions and nutritional ecology of indigenous populations of the Soviet North. Naturally, the effects of individual factors had their regional specificity; however, all native groups, irrespective of their settlement territory and type of economy, were exposed to the influence of these social and industrial reforms in varying degrees.

Rather typical was the situation in Chukotka (Fomenko, 1990; Pika et al., 1993). By the end of the 1980s, the traditional protein-lipid diet of the villagers in Chukchi and Siberian Yupik was largely destroyed. This situation was discussed at length in the previous sections; now, however, we would like to emphasize that different nutritional cultures began to be formed even within one ethnic group.

First, different nutrition patterns developed within different age groups. In young people, the European (more precisely, the Soviet) variation prevailed because they did not know much about national dishes or about traditional ways and techniques of food processing; whereas the Chukchi and Siberian Yupik of the older generation still adhered to traditional types of meals and nutrition, albeit they had begun to include some elements of Soviet cuisine. Similar intergenerational differences were also registered in the population of Taymyr Nganasan and in the indigenous population of the

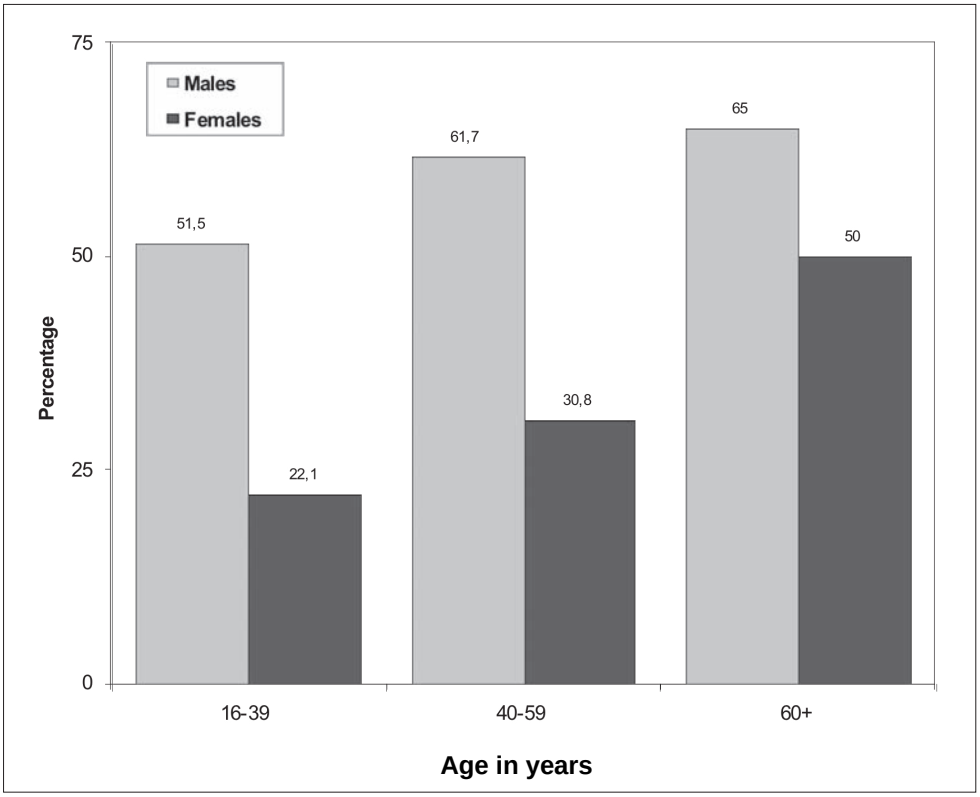

Fig. 5.3. Percentage of Kets eating regularly traditional foods by sex and age. Source: Krivinogov 1998

Yenisei taiga in Kets (Shephard and Rode, 1996; Krivonogov, 1998).

The second important change was the development of gender differences in northern nutrition. In particular, in the Ket population, half of the men and only a quarter of the women regularly included traditional foods in their meals (Krivonogov, 1998). The Ket example also demonstrated that gender differences grew more and more marked with time. When dividing the general sample of respondents into age cohorts, we found out that the share of regular users of traditional dishes was especially small among young women (Fig. 5.3).

At first sight, this may seem strange. It would seem that women, by the very character of their "domestic" activity, should have a bent for traditional cookery and habitual ways of food processing. However, in this case, we again have to consider the influence of boarding schools. The dishes of Soviet cuisine and the skills for cooking them were imparted to girls during the school's lessons of "housekeeping" and thus became habitual for younger northerners. These dishes, instead of their mothers' and grandmothers' traditional recipes, began to be perceived as ordinary everyday foods. Besides, the cooking choices for a woman in a northern village were influenced by the availability of easily cooked market foods, above all carbohydrate foods, as well as the food's suitability for long storage (which allowed a housewife to hold food in reserve and, accordingly, to provide a more uniform consumption throughout the year).

However, those who were engaged in traditional activities in the taiga or tundra had limited access to market foods. Therefore, the national food prevailed among hunters and fishermen. By the end of the 1980s, fishing and hunting in Kets were considered to be purely men's occupations, which accounted for quite significant gender differences in the nutrition pattern (Krivonogov, 1998). In reindeer herders, especially the owners of private herds, the share of women' participation in traditional economic activities was appreciably bigger (Zadorin, 1987). Among Nenets reindeer herders or Tundra Chukchi, the gender differences in the use of ethnic foods were not so pronounced as in Ket hunters. However, such distinctions were observed to varying degrees in all groups of northerners.

To summarize, by the end of the Soviet epoch, the changes in diets and food composition, as well as the nutritional state of native northerners of the USSR, on the whole followed the tendencies characteristic of the world's circumpolar areas. In most general terms these changes may be defined as "westernization," with certain corrections for the "Soviet" specificity of this process and for the lag (compared with the Western countries) typical of the Soviet social system.

Then the Soviet system collapsed.

Economics of food in the post-Soviet period

Changes in the political, economic and social systems following the collapse of the Soviet administrative structure affected, among other things, northerners' nutrition.

The withdrawal from state monopoly in foreign trade and the growing share of imported foods in the 1990s supplied new foodstuffs for the consumer markets of the Russian Federation and introduced new ways of cooking. The Soviet cuisine as a cultural phenomenon was influenced by substantial outside pressure and began to change appreciably. Today, the nutrition of many inhabitants of the country is shifting towards the "marketed-European" cuisine.

Active invasion of new nutrition patterns, which were no longer traditional either for native northerners or for Soviet cuisine as a whole, extended into the northern areas of the country. At the beginning of the 1990s, private trade that would have seemed utterly impossible in the Soviet era reached remote Arctic villages, which were separated by hundreds of kilometres from their district centres. The tundra-dwellers saw for the first time the novel foodstuffs: instant soups and mashed potatoes, imported macaroni and confectionery (Yoshida, 1997). Private shop-barges full of such foods would call at indigenous Mansi and Khanty villages located on the Ob, Sosva and Konda Rivers. By the late 1990s, such novel foods, either imported or made in the Russian Federation using innovative technologies and hence totally different from the traditions of Soviet cuisine, became the main trade objects in northern villages and cities.

Considering the situation, it may seem strange that at that very time local foods and some elements of national cuisine began to gain more and more popularity in the Russian North. This phenomenon is easy to explain, although the reasons for the resurgence in popularity of traditional foods and national dishes are different for each of the indigenous groups living in the North. However, the most important factor promoting nutritional changes in native northerners was the economic one.

The dismantling of the Soviet system of distributing benefits resulted in the pauperization of a considerable part of the population. Particularly severe was the decrease in purchasing power in the rural areas, especially in the northern villages.

According to official statistics, during the 1990s the real income in Chukotka AO was continually reduced, and by 1999 it amounted to no more than 25% of the 1993 income value. Between 1994 and 2000, the average per capita cash income (per month) in the AO population in rubles grew from 601 to 1,686 r; however, if counted in US dollars the income fell from 169 to 65 due to the high inflation of the Russian currency. By 2000, the indigenous population's purchasing power regarding foodstuffs was one-twelfth of what it was in 1985 (Litovka, 2001).

Although by the end of the 1990s Chukotka was one of the "poorest" regions of Russia, the status of its indigenous population in terms of access to market goods was typical of all Russian Arctic territories. Our analysis has shown that statistical economic indicators of any particular northern region of Russia have very little correlation with the monetary income of its indigenous population. In particular, in the early 2000s, the indigenous incomes in Khanty-Mansi AO, one of the "richest" regions not only in the North but also across Russia, were the same as in Chukotka (the situation will be discussed more fully in chapter 6). Naturally, the prices (including prices for foods) in the region were determined by the numerically larger and economically better off non-native population.

Additional challenges in the food supply were the decline and liquidation of almost all stock-raising and poultry farms created in northern villages, as well as the drastically reduced scopes of centralized food delivery from other regions.

The situation in Chukotka was also influenced by the crisis in the supply of whaling products. In the 1950s and 1960s, teams of local hunters (*brigades*) practised whaling from motorboats off the coast, but beginning in 1968 the needs of coastal villages began to be served by a modern vessel that went far out to sea for whaling. Although the basic and officially established purpose of whaling was to provide feed for fur farms, the Eskimos and Coastal Chukchi nonetheless reserved a part of the whaling harvest for their own needs. Such practises of "technologically advanced" whaling for the natives' needs continued until 1991, when the native communities (formally known as rural state enterprises or *sovkhozes*) could no longer pay rent for the whaling vessel. The centralized whale harvesting ceased, and the coastal villages were left without any whale meat.

The situation in the native communities of northern Russia in the early post-Soviet years is well described in a quotation from a classical author of nineteenth-century Russian literature, Mikhail Saltykov-Shchedrin: "The inhabitants are inclined to food, but have no means for it." Because of this lack of means, relatively expensive market foods began to be replaced by cheaper ones. Moreover, instead of market foods, the natives of the Russian North began to be increasingly oriented towards local foods that could be procured independently. This tendency can be seen in Table 5.7, which provides data about the changes in consumption of various foods by the natives of the Providenia and Chukotka Districts.

Table 5.7. Changes in food consumption in Chukotka between 1985 and 2000 (in grams per capita per day).

Decrease	Change	Increase	Change
Market meats (including tinned meats)	-193	Meat of marine mammals	+115
Market fats and oils	-18	Fat of marine mammals	+21
Bread and flour products	-62	Flour	+146
Sweets and jam	-26	Sugar	+24

Such shifts towards other food sources occurred everywhere in the North in varying degrees. The use of local foods during "perestroika" was also facilitated by the demolition of some conditions that had restricted availability of traditional foods in the Soviet period. In particular, in Western Siberia by the beginning of the 1990s, the fishing quotas were raised for some species (including sturgeons) traditionally used by the natives. This allowed the northerners to lower the consumption of those species which had always been considered "forbidden" or "weed fish" but which were included in the indigenous diet because of the restrictions imposed on "good fish." This change in the species composition of fish used by the natives for their own needs enabled them to include more national dishes in their diet. In the long run, the growing amounts of whitefish and sturgeons consumed by the natives in the north of Western Siberia may produce beneficial effects on the epidemiologic situation in terms of helminth invasions — in particular, the opisthorchosis.

However, new times also brought new problems. The scope of inland industrial fisheries was reduced drastically. According to official statistics, in 2000 centralized fisheries produced on the average 4.4 kilograms of fish for the Chukotka natives (per capita per annum) — that is, one-tenth of the 1985 amount. The abrupt reduction in deliveries made northerners turn to independent or "amateur" (as it is usually called by officials) fishing. By 2000, the number of indigenous northerners regularly practising fishing for their own needs increased twofold compared with1985, from 15.7% to 30.3% (Litovka, 2001). It enabled each native inhabitant to use an additional 23.6 kilogram of fish (Ajnana et al., 2002).

It should be noted, however, that individual fishing does not always provide the needed amounts of fish for the northerners. In some regions, rivers that are especially rich in fish are leased to tourist companies that have denied natives access to these natural resources. For example, one firm on Kola Peninsula, according to the lease agreement, has the sole right to fish in the Ponoi River from which the Saami used to catch 40 to 80 tonnes of salmon annually (Robinson and Kassam, 2000). Nevertheless, individual fishing remains for the northerners an important way to replenish the family's "food basket."

The situation with reindeer-herding products is not simple, either. The reindeer herds individually owned by the natives living in the tundra, above all the Nenets, began to grow by the late 1980s (Pika and Prochorov, 1994). This allowed the herders to provide more dishes from venison for themselves and their families, even though on the community scale the growing share of products obtained from individually owned domestic reindeer appreciably lagged behind the increase of private herds (Yoshida, 1997). The reasons for such backlog were diverse. Among them were the organizational problems associated with selling the products to consumers, the difficulties of independent delivery of venison from tundra to villages (the cost of transportation grew drastically), as well as lack of experience in building relations with all sorts of dealers and intermediaries. The private herds suffered huge losses due to

poaching, including illegal shooting of reindeer by military personnel (Konstantinov, 1996; Robinson and Kassam, 2000).

We again emphasize that the situations were different in different regions of the Russian North. In most general terms it can be said that indigenous groups traditionally occupied as reindeer herders were able to keep and then increase their livestock. One example is the Nenets of Yamal. On Taymyr and in some areas of Chukotka, on the contrary, privatization of state herds at first led to a drastic reduction in their numbers. The causes were numerous. In some areas, a significant number of privatized deer were simply slaughtered for meat for the sake of short-term profit, and it took much time and effort to recover the stock afterwards. In Chukotka, the negative factors were the unfavourable weather conditions of the mid-1990s, combined with the economic disorder in the region and the undermined structure of reindeer herding. As a result, by 2000 the livestock of cooperative herds in Chukotka decreased almost sixfold and that of private herds by almost twofold, compared with 1985 (Ajnana et al., 2002).

In the early 2000s, the situation began to improve. According to our study of 2003, local foods, first of all venison, were used by about 80% of indigenous inhabitants of Vaegi village (in central Chukotka) either daily or four to six times a week (based on a sample size of 91 people). Reindeer herding, as a traditional activity of native northerners,helped them to get out of the food crisis.

Indigenous marine hunting started to revive too, its basic purpose now being to supply food for the inhabitants themselves. In 1993, that is only a year after the centralized whaling ceased, the population of Chukotka coastal villages renewed the traditional hunting for gray whale from wooden whaleboats and leather *baydara* boats. By 2000, the number of harvested whales reached 67% of the 1985 level. But since only young small-sized animals were harvested, the amount of whale meat produced was considerably smaller: only 45% of the 1985 level. The overall annual consumption of whale meat by the indigenous population of Chukotka coastal areas was reduced from 83.6 kilograms per capita in 1985 to 52 kilograms in 2000.

The lack of whaling products was made up for by other marine mammal products. Following the drastic decrease at the end of the 1980s, it began to grow, and since 1998, it has remained stable. The increase was mainly accounted for by the intensification of harvesting small pinnipeds (seals, but not walruses), which was conducted by local people, both in teams and individually. On the whole, in 1985, marine mammals provided slightly more than a half of all meat consumed by the inhabitants of Chukotka coastal areas (the other 45% was marketed beef and pork and tinned meat). By 2000, marine mammal hunting yielded 89% of meat contained in the Yupik and Coastal Chukchi diets.

Thus, we may conclude that the basic consequences of the economic crisis that affected the indigenous communities in the North were the shift in natives' diets to the cheapest marketed foods and their re-orientation towards local food sources.

Culture, traditions and food choice

However important the role of economics in food choices may be, the traditional nutritional culture, even though it may have lost its major role in everyday meals, continues to be both an important element of festival ceremonies and a symbol of ethnic identity. The "main food" or "cultural superfood" is not just a foodstuff providing maximum caloric intake. No less important is its symbolic value.

The "cultural superfood" can acquire a special role during a crisis of ethnic self-determination. Today, the inhabitants of Russia, including the indigenous peoples of the North, are experiencing such a crisis. People are turning to particular ethnicity markers, including traditional cuisine, which not long ago had been looked down upon but which is now "permitted." This social-psychological aspect of the problem may be traced through comparing the declared versus real food behaviour in groups of reindeer herders and marine hunters in Chukotka.

Similar proportions of native residents of inland areas and coastal villages of Chukotka (64% and 70%, respectively) claim to prefer their ethnic or national cuisine to "Russian" food. While for those in the age group of 40 and older the differences between reindeer herders and marine hunters are not pronounced (80% and 66%, respectively, prefer ethnic food), younger northerners clearly differ in their opinions. In the reindeer-herding areas, about 40% of respondents under the age of 40 prefer national cuisine, whereas in villages where marine mammal hunting has recently started to revive, the share is twice as large at 76%.

One of the explanations for such divergences lies in "traditionalist" aspirations. During the Soviet period, the authorities attached no importance to marine hunting as a source of food for the population. Moreover, dishes from marine mammal meat, oil and blubber were considered to be a sign of the natives' "backwardness." Many informants told us that Eskimos and Coastal Chukchi, residents of big settlements and cities, had eaten them secretly, feeling embarrassed in front of their neighbours, especially Russians. Today, after the revival of marine hunting for the needs of the indigenous population, traditional dishes from whale, walrus and seal meat and blubber are viewed by many Yupik and Coastal Chukchi as one of their ethnic identification symbols.

The "ethnicity-related" reaction to venison is not so clearly expressed. In Soviet times, venison was easily accessible; it was sold in local shops and was commonly used for food by both native and non-native residents of the area. Dishes made with venison and various parts of the deer carcass were always perceived as "ordinary" and hence attracted less attention. Today, Chukchi women of various ages from Vaegi village (inland Chukotka) do not show significant differences in the frequency of using local foods. Venison is used either daily or four to six times a week by 88% of women aged 40 and older, and by 72% of younger women. At the same time, senior women claim almost six times more often than younger women to use mostly national instead of "Russian" food. Venison's regular

availability and lack of competition make members of the younger generation perceive it as an everyday foodstuff, as ordinary as any habitual marketed food. However, for older people dishes with venison and deer intestines still remain the "cultural superfood," one of the ethnicity symbols.

The artificial restriction of the coastal Chukotka natives' access to traditional foods during the Soviet period has resulted in local inhabitants today having (or at least claiming to have) a negative attitudes towards "westernized" foods and foodstuffs. All young (under 40) indigenous respondents from inland Chukotka would like (though in varying degrees) to combine traditional foods and dishes with elements of the "Soviet" cuisine, whereas among the inhabitants of coastal villages only 12% of men and 26% of women would prefer this type of nutrition.

This somewhat affectionate attitude of Yupik and Coastal Chukchi towards traditional cuisine is not quite typical of the Arctic areas of modern Russia. On the whole, the preferences of most northerners today are determined by the availability of foods, which, in turn, largely determines the ways they are processed. This is well seen in the example of taiga hunters, the Kets (Krivonogov, 1998). Practically all Kets (93%) are familiar with traditional dishes, but only 41% use them on a regular basis in their diets. Dishes of national cuisine take first position in the diet of hunters and fishermen: three-quarters of them use national foods regularly. However, only half of the unemployed, housewives and unqualified workers give preference to traditional cuisine; and only-one tenth of qualified workers living in villages and specialists of indigenous origin regularly use dishes of national cuisine (Fig. 5.4).

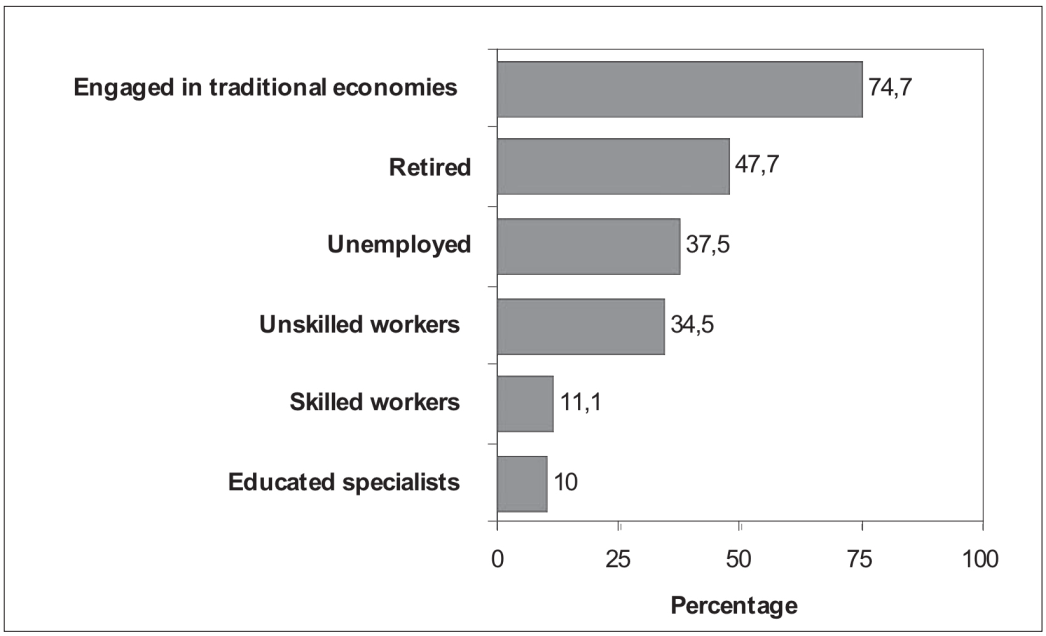

Fig. 5.4. Percentage of Kets eating traditional foods by occupation.

We may conclude that in the Russian North national dishes are retained above all in groups whose way of life is still close to a traditional life-style and also among the unemployed who are compelled to sustain themselves through the subsistence economy. The nutrition of native northerners who permanently reside in villages differs essentially from the nutrition of those who spend most of their time in reindeer-herding "brigades" or on hunting or fishing grounds. Outside large villages, traditional "behavioural culture" and "nutritional culture" support and mutually condition each other. It does not imply purposeful preference or rejection of the traditional culture of nutrition. Rather, the choice is determined by the availability of foods and ways to prepare them.

However, in terms of the northerners' nutritional culture — that is, the entire complex of knowledge, traditions and beliefs associated with the provisioning, processing and use of foods — the situation is rather alarming. These concerns are corroborated by our inquiry into how schoolchildren and adults of the Saami and Komi-Izhem groups of the Kola Peninsula understand their food cultures (Kozlov et al., 2005; Varshaver et al., 2006).

Only one girl out of 46 native schoolchildren in our inquiry gave a detailed answer and attempted to analsze features of her national cuisine and meal customs. Seven respondents appeared to be insufficiently or incorrectly informed: in particular, they believed that some typical food borrowings from the Russian orthodox culture were the traditional festival dishes of their own people. Another 22 respondents said that their people's traditional dishes were "meat and fish," thus showing an essential lack of information about the features of their national cuisine. The statement is generally true, of course, but it does not reflect the ethnocultural specificity. The remaining 16 Saami and Komi-Izhem children claimed to know nothing about the peculiarities of their people's nutrition (Table 5.8). Thus, the overwhelming majority of indigenous schoolchildren (38 out of 46) appeared to be unfamiliar with the features of their national cuisine and with the nutritional traditions of their ethnic community.

Table 5.8. Familiarity of northern indigenous children with their traditional ethnic diet.

Level of familiarity	Number of respondents
Aware	1
Poorly aware	7
Very poorly aware	22
Unaware	16
Total	46

Judging by the children's answers, it would seem that the nutrition patterns accepted in their families on the whole correspond to the Russian variation of the all-European cuisine and are deprived of both ethnic and local peculiarities. Yet this it not entirely so. According to the inquiry of Saami housewives in Lovozero village, local foods are widely used in cooking various dishes — primarily as part of the daily cuisine. These foods include various parts of the reindeer, river and lake fish, berries, mushrooms and edible wild plants. It is true, however, that many of their cooking techniques have become appreciably "westernized" and have lost much of their ethnic specificity.

Thus, the children of modern northerners are either unaware of or do not attach any importance to the ways of cooking local foods and dishes of the "Arctic cuisine," even if these are familiar to their parents. This is an alarming

sign. Knowledge of traditional cuisine is justly considered to be one of the steadiest components of a culture; however, among the natives of the Kola region, the continuity of generations in handing down this element of ethnicity appears to have been disrupted.

Judging by the inquiries conducted among both children and adults, today's festival dishes of the Kola Saami and Komi-Izhems are dishes taken from European cuisine and prepared mainly from market rather than local foodstuffs. This is not just a consequence of the market being filled up with standard foods; it is also evidence of the low prestige given to traditional cuisine.

The situation in the Kola Saami and Komi-Izhem communities is but one example. The majority of Russia's northerners today are unfamiliar with the basics of their own national cuisines. The papers of many present-day Russian cultural anthropologists describe specific nutrition variations and characteristics of particular northern ethnic groups. Unfortunately, serious attempts to present the results of their research in publications that are widely available to local residents have only recently been undertaken. We believe that their work is very important, in particular from the medical viewpoint: the break-up of the cultural complex associated with traditional nutrition patterns may affect the health of native northerners.

Chukotka marine hunters

As a matter of fact, what we are now observing in the Russian North is not a return to traditional foods or to traditional nutritional culture but a return to local foods. The substitution of traditional cuisine as a cultural phenomenon by the use of local foods may be illustrated by the example of the Chukotka marine hunters.

The food crisis in Chukotka became one of the reasons for resuming the native marine mammal hunting that had been a tradition for centuries. Market fats and oils were replaced by marine mammal oil and blubber, and tinned meat, sausages and the products of livestock and poultry farms were replaced by whale, walrus and seal meat. However, different local foods were also accessible to the natives in varying degrees.

Whaling is not only a dangerous occupation but also requires special equipment (whaleboats, high-powered motors, gasoline, special-purpose weapons and ammunition) and teams of at least two or three whaleboats working together. Hunting for another dangerous marine mammal — walrus — in the open sea is possible for an individual *brigade*, armed with rifles and working as a team from a single whaleboat. A seal can be harvested by an individual hunter working alone. The high cost of equipment and limited possibilities of purchasing it in Chukotka, the need to get permission for hunting, as well as a whole range of other organizational and financial factors has resulted in essential shifts in the composition of consumed meats and oils from various marine mammal species within the last 15–20 years.

The total growth of marine mammal meat consumption by 115 grams per capita per day between 1985 and 2000, shown on Table 5.7, does not reflect the structure of the marine mammal harvest. Only the harvesting of seals actually increased (+192 grams per capita per day). The consumption of walrus meat remained practically unchanged (+9 grams), and that of whale meat decreased consider-

ably (-86 grams). However, the products of different marine mammal species differ both in their composition and caloric content. As seen from Table 5.9, the caloric, protein and fat content in the "same" products can differ one- to twofold and more. But proteins, fats and carbohydrates by no means determine the entire composition of these products: edible parts of sea mammals also differ in the microelements, vitamins and saturated and unsaturated fats they contain (Nutrient Data Laboratory, 2004). Calculations show that the substitute of ringed whale meat for gray seal meat alone may shift the daily energy balance by 10% (Table 5.10).

Not one detailed nutritional study has been conducted with Chukotka's native groups in the last decade. The most general estimates show that energy intake with food in Yupik and Coastal Chukchi in 2000 decreased by about 16%, compared with 1985 (Litovka, 2001). At the same time the balance of basic nutrients changed too: the share of carbohydrates in the diet remained practically the same, but the protein contribution grew appreciably, and the contribution of fats was lowered (Fig 5.5). As a result, a peculiar nutrition composition formed in coastal Chukotka as the inhabitants orientated themselves towards living in a subsistence economy. This composition is equally remote from both typical "European" and traditional nutrition types; the example of the latter is the Greenland Inuit diet at the beginning of the twentieth century (Krogh and Krogh, 1913).

Table 5.9. Caloric and main nutrients' component in the products of marine hunting (per 100 g of edible part.

Product	Energy value (kj/100g)	Protein (g/100g)	Lipid (g/100g)	Carbohydrate (g/100g)
Skin with subcutaneous fat				
Gray whale	470.0	12.60	46.10	1.20
Walrus	282.0	16.3	24.1	0
Raw meat				
Beluga whale	111.0	26.5	0.5	0
Walrus	199.0	19.2	13.6	0
Ringed seal	142.0	28.4	3.2	0
Bearded seal	110.0	26.7	0.4	0

Source: Nutrient Data Laboratory 2004

Table 5.10. Change in nutrients supplied by marine harvest due to the change of hunted species.

Product, Nutrient	Daily consumption (in 2000 relative to 1985)
Meat of gray whale	- 86 g
Meat of ringed seal	+ 95 g
Energy	+ 31.7 kcal
Fats	+ 2.61 g

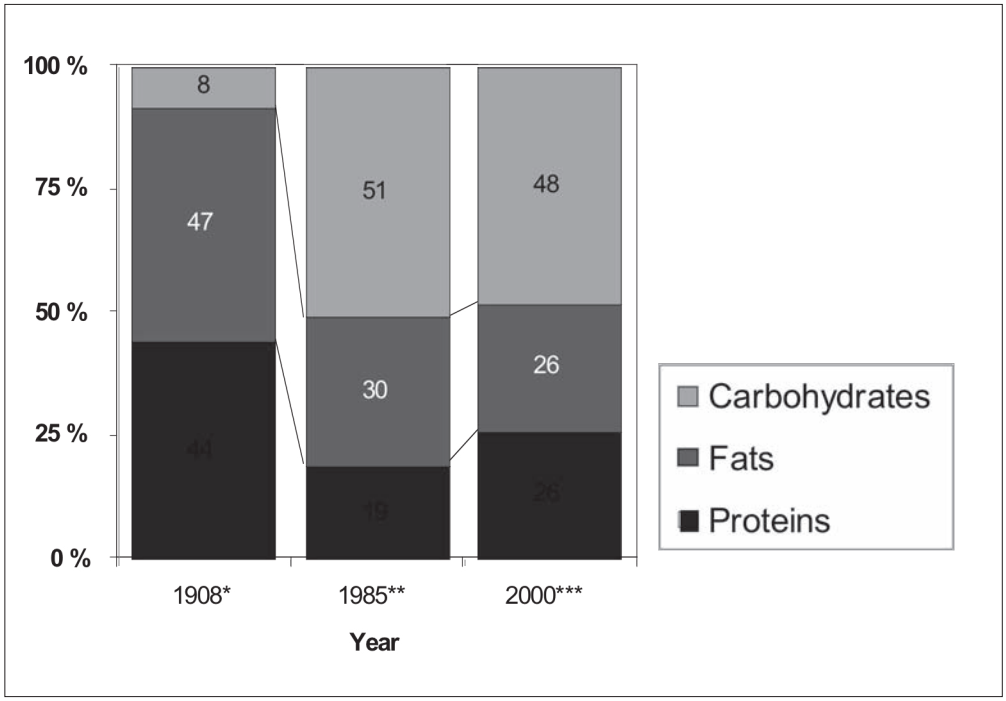

Fig. 5.5. Change in proportion of basic nutrients (in % of daily energy intake) in the diet of Siberian Yupiks and Coastal Chukchi. Sources: * Krogh and Krogh 1913; **Volfson et al 1985; ***Litovka 2001

The rules of today's food processing and cooking also differ from the traditional ones. In the middle of the twentieth century, the marine hunters of Chukotka used to differentiate between products of different sea mammals, in particular, the cetaceans. Gray whale meat was available mostly in summer, during the harvest period. Because it could be stored only when it had been frozen, which was not always possible before the cold season, gray whale meat was traditionally considered to be a "summer food." Seasonal fluctuations in the consumption of whaling products were made up for by the use of bowhead whale meat, which was suitable for long-term storage. However, in recent years, the harvesting of bowhead whale (which is three times larger in size than the gray whale) has practically ceased: in 2001, the total harvest was 112 gray whales and only one bowhead whale (Ajnana et al., 2002). The quotas for the annual harvest of five bowhead whales for the needs of the indigenous population of Chukotka, issued for 2003–2007, are not being used to the fullest. The change in hunting techniques makes the problem of whale meat's seasonal availability more acute.

The food composition is essentially influenced by the way it is processed. For example, water is lost in the process of drying meat, resulting in the increase in the content of proteins, fats and microelements per unit mass, which grows three- to fivefold. The energy cost grows too: dried beluga whale meat contains three times more calories than fresh meat (Nutrient Data Laboratory, 2004).

Along with drying, another peculiar way of processing meat and fish that is typical of

the "Arctic cuisine" is fermentation (dishes prepared with the use of fermentation are commonly called "sour foods"). Chukotka's inhabitants know many fermented dishes; however, these dishes can be prepared only from certain ingredients. In particular, seal meat or gray whale meat is practically unsuitable for this purpose: only walrus or bowhead whale meat is suitable. But, as it has already been mentioned, bowhead whales in Chukotka are not currently being harvested, and the hunting for walruses — that could at least partially make up for this lack — has not increased. The reduced consumption of traditional dishes made with "fermented meat" may have unfavourable effects on the natives' health. In particular, the traditional marine hunter's diet that includes plenty of fermented meat may to some extent prevent the development of stomach or duodenal ulcers caused by *Helicobacter pylori* infection (Kozlov, 2002).

We may conclude that the natives' turning to local food sources of the coastal Chukotka area does not at all mean a revival of traditional nutrition. Both the ways of culinary processing and the composition of local foods used by the population have become poorer. However, as it was already emphasized, the striving for a possibly wider use of the entire range of foods provided by ground and sea mammals, birds, fish, invertebrates and plants has always been one of the major evolutionary adaptation strategies of the inhabitants of coastal Arctic areas. The reduced variety of consumed species of local fauna and flora means poorer microelement food composition and, at the same time, creates an imbalance in the intake of macroelements and vitamins.

Judging by the numbers of harvested seals, walruses and cetaceans, the quotas for marine mammal harvest in Chukotka AO are not being filled. In particular, in 2000, the harvest scope amounted to 61% of the issued quotas (Podgainy and Zdor, 2001), and in the following years it grew insignificantly, mainly due to the increase in harvesting small pinnipeds.

The reduced variety of harvested species may influence both the health of the indigenous population and the stability of the Arctic biome. This should be taken into consideration in order to organize native hunting in ways that provide not only a quantitative harvest increase but also maximize its species diversity, thus lowering the load on the environment.

Reindeer herders

Important changes have also taken place among the native groups orienting themselves towards another kind of traditional subsistence, reindeer herding. Figure 5.6 shows a dramatic redistribution of the basic nutrient balance in the tundra Chukchi diet in 2001, compared with 1990. Actually, the distribution of proteins, fats and carbohydrates became identical to that characteristic of the population of European Russia in the Soviet period (Martinchik et al., 2002).

The reasons for such changes, as in the case of the marine hunters, were basically economic. However, the patterns of changes in the reindeer herders' communities were obviously different.

During the post-Soviet period, local foods became less available in the villages of inland Chukotka. In 2000, the daily venison consumption for residents of Kanchalan village amounted to 43.7 grams per capita, only 13% of the amount in 1985. But at the same time

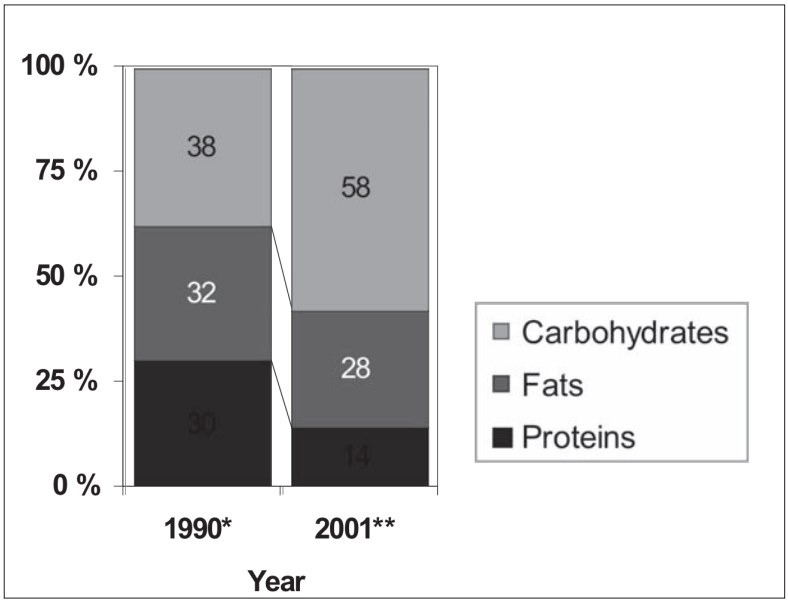

Fig. 5.6. Change in proportion of basic nutrients (in % of daily energy intake) in the diet of Tundra Chukchi. Sources: *Klochkova et al 1990; **Litovka 2001

the drop in real incomes was less acute for the natives of tundra Chukotka than for the inhabitants of the coastal areas (Litovka, 2001). Thus, the inhabitants of the Chukotka inland areas still had at least minimal funds for buying foods. The shift in their choice began to be conditioned above all by the price of marketed food. At the beginning, the two "favourites" were flour and refined sugar. Having enough means for buying them created an illusion that it was still possible to live by following the "Soviet" type of nutrition.

The abrupt cessation of centralized whaling did not affect the inhabitants of inland villages as much as the natives of the coastal zone. It should be noted, however, that changes in the structure and scope of the marine mammal harvest also influenced the nutrition of the tundra zone population: in the late 1990s and early 2000s, the established pattern of traditional barter between the inhabitants of coastal and inland villages appeared to have been disrupted. Nevertheless, the illusion of living "in the old way" slowed down the shift from market to local foods. The consequences are seen in Fig. 5.6: by 2001, the amount of consumed carbohydrates increased and that of fats and especially proteins decreased. The share of energy intake in the Chukchi due to carbohydrates (58%) was even higher than what had been typical of the "Soviet" diet (52%). This does not mean that the reindeer-herders' nutrition became "super-Soviet" in the post-Soviet period: practically all proteins consumed by them and a considerable part of fats were of animal origin, obtained from maintaining reindeer herds, and from river, lake and migratory fishing.

A similar composition of proteins, fats and carbohydrates was found in the study of modern Nenets of Western Siberia conducted by Ionova and Aglabyan (2005) (Table 5.11).

The food composition among the Nenets is also obviously approaching the "Russian" patterns, but it is hard to say whether this change resulted from the reforms of the Soviet period or from the shifts in nutrition of the last decade.

What compels our attention in the above data is the small energy intake in male Nenets. The daily caloric content of food consumed by them is 40% lower than in Evenki reindeer herders of central Siberia in the 1991–1992 study (Leonard and Katzmarzyk, 1994). At the same time, the energy consumption in female Nenets is similar to that in Evenki females. The reasons for such gender and interpopulation differencess are not quite clear. The Ionova and Aglabyan publication (2005) does not describe the conditions involved in gathering the data about the Nenets' nutrition. This lack of information prevents us from estimating the just how representative the data is across Western Siberia; however, a similar composition of basic nutrients in the Chukchi's and Nenets' diets shows that reindeer-herding peoples in various regions of Russia undergo similar changes in food consumption.

Table 5.11. Energy value (kcal/day) and content of the main nutrients (in % of daily energy) in the diet of indigenous people in Yamal-Nenets AO (Mean±SE).

Gender	Energy value	Proteins	Fats	Carbohydrates
Males	2271.9±57.2	19.6±0.8	28.1±0.8	50.8±1.3
Females	2177.1±101.6	18.3±0.3	29.4±0.4	52.3±0.6

Source: Ionova and Aglabyan 2005

Changes in child health and nutrition since the 1990s

As shown in chapter 2, the native northerners of Russia are characterized by certain anthropological peculiarities of body dimensions at birth. Taking this into account, we estimated the nutritional state of full-term Chukchi and Siberian Yupik newborns (n=209) using the Z-scores classification system. The Z-scores were estimated based on the WHO Anthro 2005 program. Children whose Z-score exceed the limits of ±2SD on at least one of the indices were categorized as growth retarded or malnourished. In Chukotka, 82.8% of newborns were classified as having an average nutritional state, 0.5% were above average, 14.3% below average and 2.4% were seriously malnourished. On the whole, the sample nutritional state on the BMI-for-age values should be estimated as below average (mean Z-score= -1.16, SD 0.94).

The conclusion that the nutritional state of infants is below average is corroborated by an exceedingly high prevalence of low birthweight

among indigenous babies in Chukotka: 25 out of 257 (9.7%) babies born in 2000–2003 in Anadyr Area Hospital weighed less than 2,500 grams, which is considerably higher than the average figures registered both for Russia (6.2%) and indigenous groups of Alaska and Canada where they amount to 5.5% and 6.5%, respectively (Arctic Council 2005).

The Chukchi infants born in 2000–2003 (87 boys, 96 girls) had the same body length within their gender groups as their peers born in 1966–1970. At the same time the newborn cohorts of the 2000s had significantly ($p<0.05$) lower weights and, accordingly, lower height-weight index values. Between 2000 and 2003, when the social situation in the region improved, the BMI values in newborn natives showed a tendency to increase: from 11.69±1.19 in 2000 (n=48) to 12.01±1.22 (n=87) in 2003 ($p<0.06$). However, both the sample size (the annual number of indigenous childbirths in the Anadyr hospital) and the observation period (four years) are too small to make a positive conclusion about improvement in the newborns' health.

To assess the nutritional changes in children, we can compare the results of the studies conducted in the Kola region in 1995–1997 and in 2005. To assess fitness and nutrition of children aged 7–17 attending schools in Lovozero village; we also applied the Z-scores classification system, using the height-for-age, weight-for-age and weight-for-height indices (the latter for boys up to 145 cm and girls up to 137 cm high). The frequency of deviations from standard fitness in Lovozero children in 2005 is shown in Tables 5.12 and 5.13.

A reduced level of fitness based on evidence of failure to grow and/or lag in weight increase was observed in 11% of children; no cases of pronounced body mass deficiency were revealed. Taking WHO recommendations into consideration, we could conclude that malnutrition is a rare occurrence in the studied ethnic groups of the Kola Peninsula population (WHO, 1995). During 10 years, the proportion of growth-retarded children decreased by one-third (in 1995-1997 various forms of growth retardation were revealed in 16.6% of schoolchildren, of whom 1.5% had a pronounced body mass deficiency).

The proportion of schoolchildren with obesity remained very low (below 1%), but the number of overweight cases grew almost

Table 5.12. Percentage of deviations from standard fitness in Lovozero schoolchildren in 2005.

Sample	Failure to grow	Low weight for age	Underweight
All children	6.0	5.1	0
Saami	16.0	9.6	0
Komi	3.0	6.0	0

Table 5.13. Prevalence (%) of overweight and obesity in Lovozero schoolchildren in 2005.

Sample	Overweight	Obese
All children	6.6	0.9
Saami	4.3	0
Komi	4.0	0

twofold — from 3.9% in 1995–1997 to 6.6% in 2005. We should note that our conclusion about overweight is based on crossing the threshold of BMI values. The use of such a method places individuals with advanced development of the muscles (usually resulting from sports activities) in the group of overweight individuals, in addition to children with surplus adipose tissue.. Thus, the overweight frequency in the examined sample is slightly overestimated.

Overall, 12.5% of children in 2005 showed various degrees of deviation from standard body weight (both excess and deficient weights for age and weight for height). In 1995–1997, the proportion of such children was 10.6%. Considering possible fortuitous fluctuations typical of small-size samples, we are inclined to conclude that after 10 years no essential changes in the fitness level of children from Lovozero village can be detected.

Current nutritional status of adults

We do not have any data of our own for the analysis of nutritional state changes in adult inhabitants of the Russian Arctic and subarctic regions in recent decades. Among the students of Anadyr Multiple-Discipline College (Chukotka) of all ethnic groups (n=150, age 17–25) in our 2004 study, underweight was revealed in 8.7% and overweight in 7.3% of the subjects. Table 5.14 compares the frequencies of nutritional state deviation between residents of Anadyr and the Moscow Oblast. We can see that the proportion of subjects with BMI values lower than 18.5 and higher than 25.0 units are lower in the young people of Anadyr than in their peers from the European part of Russia.

It would seem that a relatively small proportion of overweight children and youth in northern populations should testify to a rather optimistic situation in terms of northerners' nutrition (given that the share of underweight children and youth is also low). However, we would rather withhold conclusions in this case. As it was shown earlier in this chapter, during the Soviet period the indigenous northerners were characterized by intense age-

Table 5.14. Deviations in nutritional state among students in Anadyr and Moscow Region (per cent).

Type of deviation	Males		Females	
	Anadyr	Moscow Region	Anadyr	Moscow Region
Underweight	6.8	14.0	10.5	25.8
Overweight	6.8	4.0	7.9	4.4

Note: Moscow region data from Negasheva 2006.

related body-weight growth. It is difficult to comment on changes in the BMI levels by age in modern indigenous populations, as no age-specific data are available from recent publications. The relatively high percentage of adults who are overweight and obese (the group includes individuals aged from 18 to 55–60) indirectly corroborates that the situation has not changed for the better.

The recent studies of native village-dwellers of the Yamalo-Nenets AO, mainly Nenets, have revealed higher than normal body weight in 23.3% of subjects (Eganyan et al., 2005). This is appreciably more than in the late 1980s. In 1987–1991, when examining the 18–59-year-old natives of the Khanty-Mansi AO (neighbouring the Yamalo-Nenets AO), we found 8% of male and 20% of female Mansi to be overweight (including obesity) and for the Komi-Izhems, 7% and 10%, respectively. Although data from our studies conducted 15–20 years ago may be regarded only as rough (these were not epidemiological research), the tendency towards being overweight in the native groups of Western Siberia is an issue worthy of attention. Among the Evenks of Eastern Siberia, being overweight (21.3% in males and 29.3% in females) and obese (3.6% and 13.8%, respectively) is even more widespread than among Nenets (Dogadin & Nozdrachev, 2006).

The results of nutritional studies among various indigenous groups of the Arctic and subarctic regions of Russia in the post-Soviet period can hardly be integrated within a common picture.

The nutrition pattern that is currently being developed in the marine hunters of Chukotka is new for physicians and nutritionists, as well as for the natives themselves. There are probably no analogues of such a diet within the circumpolar zone outside Russia. Today's type of nutrition for Siberian Yupik and Coastal Chukchi is as remote from the "traditional" and "Soviet" patterns as from the "Coca-Cola diet" of Alaska Natives.

The nutritional changes in indigenous inhabitants of the tundra and taiga are different from the changes observed in the coastal area population. In the reindeer-herders' and hunter-fishermen's communities of the taiga zone, an orientation towards eating cheap carbohydrate foods, which began during the Soviet era, continues to persist. However, here too, the local foods begin to replace market foods. In the near future, this process will probably become more intense and will most likely lead to further changes in nutrition.

Since the nutritional state is the result of past nutrition (Ulijaszek & Strickland, 1993), the changes in anthropometrical characteristics tend to lag behind the social and economic changes affecting a particular region. This muddles the picture even further. The nutritional state of various regional and age-sex groups of northerners reflects the effects of changes which took place several years ago and by now may have lost their relevance.

The nutritional changes reflect deep and rapid changes in the life-styles of the population of Arctic Russia. In order to better understand them, it is necessary to analyse the whole complex of economic, social and cultural changes affecting the native peoples of Russia.

CHAPTER 6

THE HEALTH CONSEQUENCES OF MODERNIZATION

The traditional social organization of northern peoples of the Arctic is oriented towards not only on building interpersonal relations but also on maintaining a balance with the extremely fragile environment. Throughout the history of traditional northern communities, modifications in their social structures followed various changes in the Arctic ecosystem. In other words, the rate of social change is correlated to the rate of basic biological processes. As a result, the polar biome remained "unruffled" by the cultural and technological innovations in native communities even at times of major climatic changes.

The modern methods of industrial development of the Arctic, however, are characterized by an abnormal rapidity that is incompatible with the adaptive potentials of both the flora and fauna, and even human beings themselves. Therefore, the industrial development of high-latitude regions has a destructive effect on the natural environment, as well as on the physical and mental health, culture and social organization of the indigenous populations.

Political and economic changes (including erroneous administrative decisions) on the one hand, and direct anthropogenic breaches of the environment in industrial development areas, including the decreased traditional territory of wildlife, on the other hand, become serious social stressors for modern northerners. These stressors affect both individuals and entire communities.

Slow reproduction typical of Arctic ecosystems compelled the major native communities to distribute their economic activities within vast territories: only nomadic or semi-nomadic life-styles could provide a safe level of pressure on the environment. In order to "eliminate the survival of the primitive nomadic life-style," the Soviet administration undertook a policy of forced resettlement of northern natives to larger villages. The location of these villages was dictated, above all, by available transportation to the areas. This imposed system of settlement was in conflict with the principles of traditional nature management and did not consider the existing social structures of the native commu-

nities. Its adoption implied a spread of "westernized" (as it was understood by the Soviet administration) way of life and the beginning of urbanization processes in the native northern populations. These were supplemented by human pressure on the environment (and hence on the native communities) which was a result of the region's industrial development. The "technological" approach is different from the "traditional" one as it is directed towards the maximum use of resources (this is especially evident in the mining industry throughout the Arctic regions).

All these factors aggravate the pressures brought about by "westernization" and urbanization.

During the Soviet period, no purposeful studies of "modernization's" effects on the indigenous populations of the Russian Arctic were conducted, for ideological reasons. The relevant data obtained in the post-Soviet period by physicians, ethnologists and demographers refer to different populations whose life conditions are not always comparable. These materials, therefore, can hardly be integrated within an overall picture. To be able to judge objectively the degree of pressure on the native population brought about by modern technogenic, cultural and social changes in the Arctic, special research was needed, which had to be carried out within a relatively short time interval (a few years) and which would rely on the simultaneous use of the same basic techniques in each population (community).

This chapter is based on the results of our own studies of indigenous populations of northern Western Siberia — the northern Mansi (residing along the Sosva River) and the northern Khanty — conducted in 2000–2003. It should be emphasized that the information represents a "case study" and reflects the real situation in only one of the northern regions of Russia. Judging by our observations in Chukotka and on the Kola Peninsula, the situation in other indigenous northern groups of Russia is similar; however, we have no data for objective comparison.

The stress of westernization: The case of Western Siberia

Our study was focused on the Khanty and Mansi communities of the Khanty-Mansi AO and Yamalo-Nenets AO. Traditional activities of these peoples include hunting and fishing in the taiga zone, as well as reindeer breeding on the boundary of the taiga and tundra. Owing to their linguistic, cultural and anthropometrical similarity, the Khanty and Mansi are often united into a single group of Ob Ugrians (Funk and Sillanpää, 1999). The Ob Ugrians, together with the Nenets and Selkups, represent the indigenous population of northern Western Siberia. Though the names Khanty and Mansi are conferred on one of the largest northern

territorial-administrative regions of Russia, today the people that bear these names have become a typical ethnic minority: over 98% of people residing in their traditional settlement territories are migrants from various regions of the former Soviet Union. The Ob Ugrians differ from the migrant, mainly Slavic, population in both their language and cultural traditions.

We believe that Western Siberia is one of the territories most suitable for studying the effects of the sociocultural stress caused by modernization.

The modern northern "ethnic" villages differ appreciably in their size. Hence, it is possible to compare the situation in large "modernized" villages and in smaller ones; the latter are characterized by basically "traditional" life-styles. We estimated the effects of the urbanization factor by comparing the stress signs in the natives living in "small" (less than 500 people) and "big" (500 to 3,000 people) villages, as well as in cities.

The educational and professional diversity of the inhabitants of northern West Siberian villages enabled us to compare the effects of chronic stress on representatives of those occupied in "traditional" and "modern" spheres of activity. When subdividing the subjects into social groups, we considered first of all their types of occupation. The first group was comprised of the Khanty and Mansi who were engaged in traditional activities (hunting, fishing, reindeer breeding) and the unemployed villagers living mainly "off the land". Representatives of "modern" occupations living in the same villages made up the second group (medical personnel, teachers, shop assistants, village administrators). The third group ("workers") included the Ob Ugrians who had lived in cities for no less than three years and who were employed mainly in food-processing work. The fourth group represented students of indigenous origin who had left their villages to continue their education and who had lived in the city for no more than three years. The reference group included the Russian urban population of northern Western Siberia.

It was also important in terms of planning the research that at least one of the potential stressors could be dated with as much precision as possible. The year 1964 was associated with the production of the first "Siberian oil" in the Khanty-Mansi AO, and so symbolized the beginning of the "oil boom" which seriously affected the condition of both the natural environment and the native population. Thus, the mid-1960s may be regarded as one of the turning-points in the region's "westernization."

In studying the effects of modernization on the Ob Ugrian communities, we considered a number of indicators, deviations from which were interpreted as signs of stress. All technical issues (sizes of studied samples and research methods) have been described in our publications (Kozlov, Vershubsky and Kozlova, 2003; Kozlova, 2002, 2004); therefore, we shall confine ourselves here to an account of the main results.

According to ethnological and historical data, up until the middle of the twentieth century, changes in the traditional life-styles of indigenous populations of northern Western Siberia proceeded rather smoothly. The assimilation of Ob Ugrians into the Russian population became more intense by the late nineteenth century, but even in the early twentieth century the Khanty and Mansi communities retained their unique features, including language, beliefs, traditional social structure and nature management. A series of abrupt

changes followed in the 1950s and 1960s. Social reforms initiated and controlled by the state entailed drastic changes in the life of native northerners. Their forced resettlement to big villages made it impossible for them to maintain their traditionally semi-nomadic way of life, tearing them away from their hunting and fishing grounds and reindeer pastures.

Between the 1930s and 1970s, the Ob Ugrians experienced a rapid and basically forced "westernization" (or rather, the "Soviet-ized" version). School training was organized mainly in the form of boarding schools, and children were separated from their families, culture and native language for eight to nine months a year. According to Cheshko's (2000) estimation, by the beginning of the 1990s, 38% of Khants and 60% of Mansi were exposed to complete language assimilation. It deprived them of the opportunity to communicate with their elders and the continuity of their cultural traditions was interrupted. The traditional spiritual culture of Ob Ugrians, above all their ideas about the world (the pantheon of gods and their functions) and their attitude to shamans, was fundamentally transformed. Due to the cultural gap between generations, even the most "stable" spheres of northern household culture, like the nutrition system or the outfits used in traditional trades, were shattered.

In the early 1950s, the economy of Western Siberia was fully controlled by the state and was focused exclusively on fishing. Such specialization might have seemed favourable for the Ob Ugrians, since historically their way of life had been closely connected with the rivers and fishing (no wonder the ethnographers of the nineteenth century used to call the Mansi "ichthyophages"). In fact, many Khanty and Mansi, who were by now incorporated into fishing collective farms and crews (*artel*), at first continued to exploit their traditional fishing grounds. However, by the early 1960s, the fish-processing industry in the region was concentrated in several large centres. As a result, many fishing grounds became too remote from the central villages and had to be deserted. The fishing brigades were now administratively subordinate to fish factories. Among the workers of such factories in the Yamalo-Nenets AO were about 5,000 Khanty, Nenets and Selkups. They made up 70% of all workers engaged in the state fishing brigades of the area (Narody Sovetskogo Severa, 1991). Considering that the total indigenous population of the Yamalo-Nenets AO at this period amounted to 25,700 people, we may conclude that the fishing brigades took in almost all of the employable native population. However, five years following the reorganization, the employment of native northerners in the fishing industry dropped down from 94% to 59% for men and from 89% to 32% for women (Shevelev, 1987). It led to a pauperization of the natives of Western Siberia.

The rapid development of oil production in the region that started in the middle of the 1960s exerted an extremely powerful influence not only on the natural environment but also on the structure of traditional communities of the native population. The ethnic make-up of the villages changed rapidly and substantially. The "enlarging" of villages and the development of the oil producing industry in the region called for a huge inflow of migrants. As a result, the number of interethnic marriages in the formerly isolated populations of Siberian natives rose sharply.

The majority of migrants who came to the Tyumen North were men. Consequently, in

two-thirds of the interethnic marriages the indigenous population was represented by women, who subsequently left their former homes together with their husbands. It caused a significant sex ratio imbalance in the rural population of northern Khanty. About 13% of Khanty males aged 20–50 (one out of seven!) could not find a marriage partner within their ethnic group. They either married women from other ethnic groups (which was rather seldom) or remained unmarried.

The Mansi communities, residing in remote areas difficult to access, also experienced an appreciable sex ratio imbalance. In their case it was caused not by the migration of women but by the high death rate of men, above all young men. In the 1990s, about 69% of all Mansi deaths were of men aged 15–59. In 1996–1999, men between 20 and 29 years of age accounted for 17% of all deaths among the northern Mansi. Such a high death rate among males also led to a drastic sex asymmetry and reduced young people's chances of marriage.

The analysis of archival materials (Pivneva, 1995; our data, 2001) has shown that adverse demographic changes in the Mansi of the Berezovo District (Khanty-Mansi AO) began in the 1960s. Until 1960, life expectancy increased both in men and in women; later, however, the average age of death in women became stabilized, while in men it began to go down. Between the years 1960 and 1970, the intersex differences in life expectancy reached 20 years. Then, because of the lowering of the average age of death among women, the gap began to narrow (Fig. 6.1). In 1996–1999, the average age of death in the Mansi population of Berezovo was 43.5 years for men and 52.4 for women.

The demographic data testify to a deep crisis in native northern communities, which began between the second half of the 1950s and the middle of the 1960s and is still going on to this day.

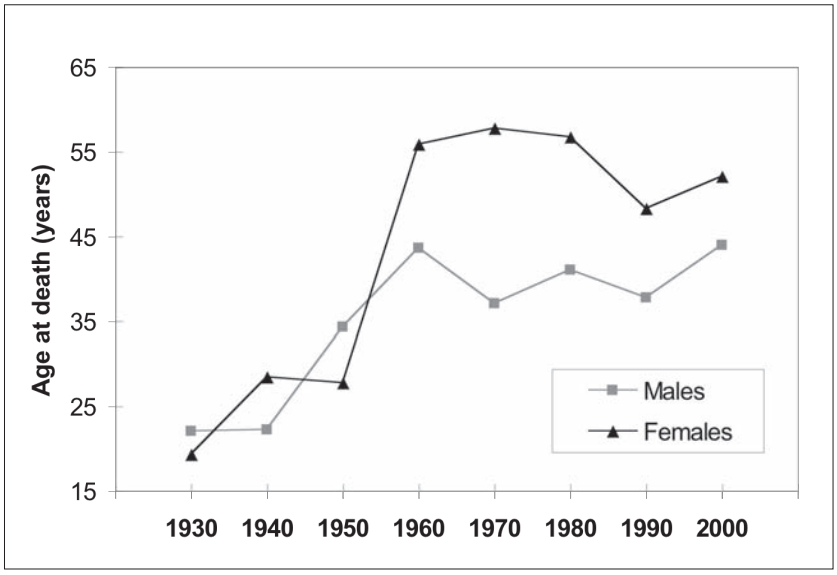

Fig. 6.1. Change in the average age of death in Mansi from 1930 to 2000.

Although such demographic changes could have occurred irrespective of the influence of chronic stressors, we believe that in this case the "modernization stress" effects cannot be ignored. The analysis of medical and biologic stress markers provides corroboration of this viewpoint. We considered the prevalence of "civilization diseases" — the arterial hypertension and diabetes — to be one such marker.

A typical example is the situation in Nyaksimvol, one of the Mansi villages in the Berezovo District. In the 1950s and 1960s, not a single case of arterial hypertension was registered among the Mansi residents of this village. In 1974, hypertension was revealed in 1.7% of adults who were seeking medical aid. Ten years later, hypertension was registered in 2.1%, and in 1998, in 6.5% of the rural Mansi population.

Before the early 1980s, there were also no cases of diabetes in the natives of the district. By the official data, in 1998 the diabetes frequency in adult Khanty and Mansi was 0.17 %. Of course, this appears to be a low morbidity level, but our studies of 2000 suggest doubts as to the accuracy of these data. Our epidemiological study of the population of three "ethnic" villages in the district, differing in their size and location, revealed glucose intolerance in 11% of the adult indigenous population (we examined 52% of the registered number of all adult natives). This relatively high glucose intolerance frequency in our sample suggests that diabetes may actually be a more widespread disease among the Mansi and Khanty than the official statistics claim it to be.

The medical archival data and the results of our studies testify that arterial hypertension and diabetes began to appear in the Ob Ugrian population in the 1970s and 1980s, that is, 10–15 years after the beginning of the intensive social reorganizations of the 1950s and 1960s. The "stress induced diseases of civilization" — essential hypertension and diabetes — are characterized in particular by such "delayed" onset.

The second, basically different stress marker that we have selected is the asymmetry level of bilateral morphological characteristics. Since such approaches are not often used in medical research, we shall consider this marker in more detail.

The structure of bilaterally symmetrical organs is defined by the effect of one gene. Had the development of an organism been conditioned only by genetic factors, the bilateral organs would have remained completely identical to each other. However, the realization of genetic information in the course of embryonic development is always associated with disturbances or malfunctions that lead to upsetting the symmetry. Such a random undirected variability of morphological asymmetry is a manifestation of developmental homeostatic instability. Certain asymmetry of bilateral morphological structures can always be found in humans.

The connection between the effects of environmental stressors and the increased level of bilateral morphological structures' asymmetry was first established in the 1930s (Astauroff, 1930). Nowadays, the assessment of the asymmetry level is used in controlling the effects of natural and/or anthropogenic factors on animal populations. There are plenty of data to confirm that under the influence of environmental stressors the random non-directional asymmetry of bilateral structures increases considerably (Siegel and Smookler, 1973; Mooney et al., 1985).

In humans, the environmental stresses also raise the asymmetry level of various structures (Livshits and Kobyliansky, 1991; Albert and Greene, 1999). A high asymmetry level is marked in children whose mothers are characterized by a lowered health status (Kieser, 1992; Kieser et al., 1997).

To assess the environmental stress pressure on human populations, different bilateral characters may be selected, but the most suitable and informative are dermatoglyphic characteristics. In the course of preliminary studies, we found that whorl patterns may serve as an indicator of environmental pressure in prenatal ontogenesis (Pechenkina et al., 2000). Besides, dermatoglyphic traits are formed in the end of the first trimester and beginning of the second trimester of embryonic development and remain unchanged afterwards (Penrose and Ohara, 1973). Thus, knowing the subject's birth date, we may define the period when his/her organism was exposed to the pressure of the environment (mediated through the mother's organism).

By their "classical" dermatoglyphic characteristics, the Khanty and Mansi subpopulations differ from one another. However, as no significant interethnic differences in pattern asymmetry were revealed, this allowed us in the consequent analysis to regard all Ob Ugrians as a single group. However, the male and female samples were analysed separately, as the finger and palm patterns are subject to sexual dimorphism (Cummins and Midlo, 1961; Schwidetzky and Jantz, 1979). Considering the method restrictions arising from the quantitative evaluation of the dermal ridge relief, we considered only the pattern types, and assessed the coincidence of arches, loops and whorls on corresponding fingers of the right and left hands.

The dermatoglyphic data allowed us to reveal the period when the destabilization of ontogenesis processes in the Ob Ugrians was the most strongly expressed. We divided the subjects into three cohorts according to their birth period: the first one — 1945 to 1954; the second — 1955 to 1965; and the third — 1966 to 1975. The analysis of pattern symmetry on each finger in men showed that in the 1955–1965 cohort, the pattern symmetry in all fingers is reduced. The differences from the cohorts with birth dates before 1955 and after 1965 are significant when comparing the pattern symmetry levels for the pollex (respectively $p=0.02$ and $p=0.07$). In women, the pattern symmetry changes are feebly marked, but the lowest symmetry level is typical of representatives of the same age cohort, 1955–1965 (Fig. 6.2 and 6.3).

The elevated level of dermatoglyphic character asymmetry testifies to the developmental homeostatic instability in northern natives. Unfortunately, the asymmetry level is a nonspecific character. It implicates an environmental impact on the organism but does not specify which factors have destabilized the process of realization of genetic information.

It was possible to assume that in native northerners, whose connection with their natural habitat is a very close one, the development of dyscrasia reflects the intensity of the anthropogenic influence on the environment, above all industrial pollution. However, up until the mid-1960s, the scope of industrial pollution caused by oil production and transportation in northern Western Siberia was not yet critical. The northwest tributaries of the Ob River — the basic area of settling and economic activities of the northern groups under study — also remained unpolluted. The intensive pollution

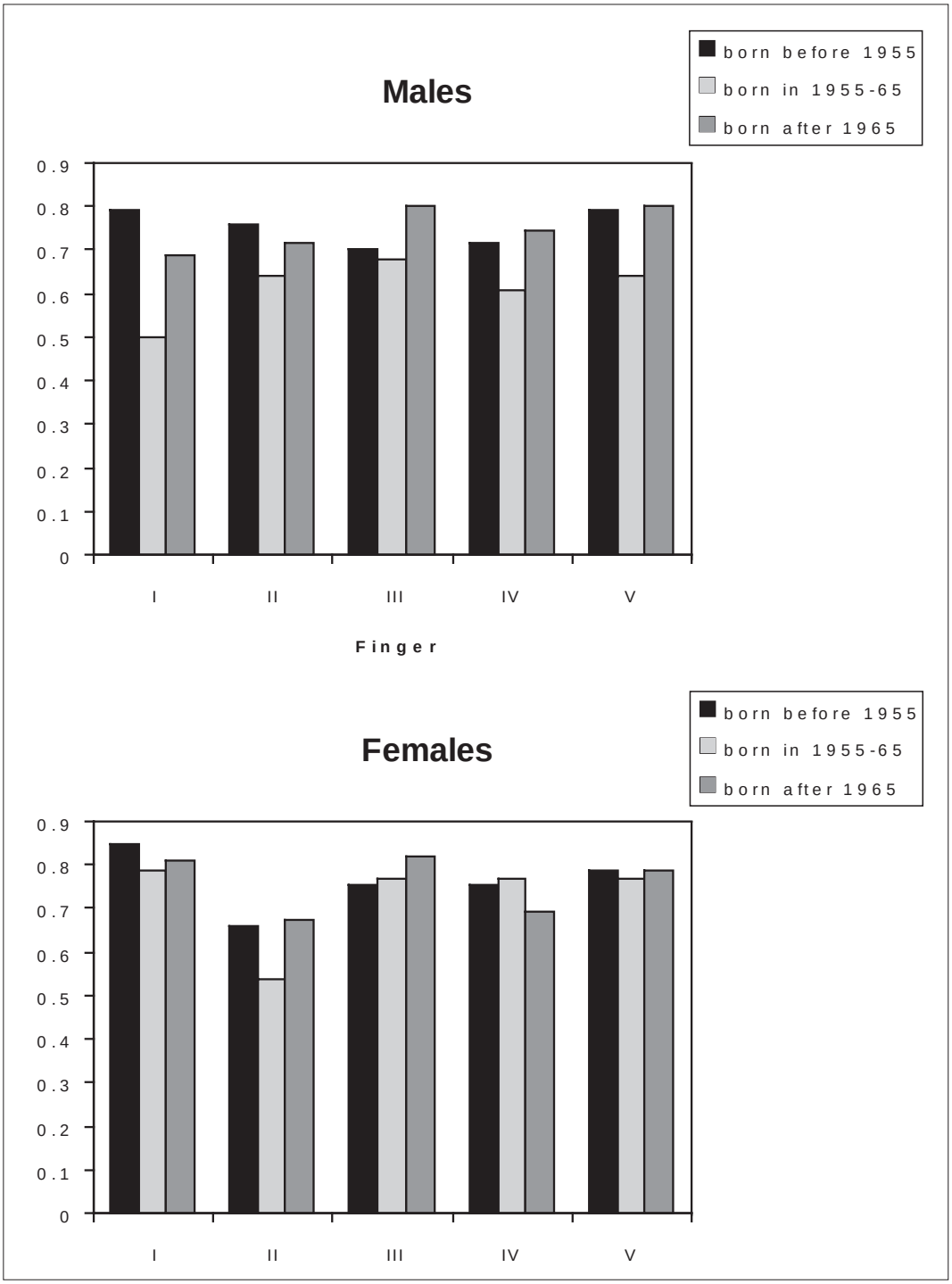

Fig. 6.2. Levels of dermal ridge symmetry on fingers in three age cohorts of Ob Ugrians.

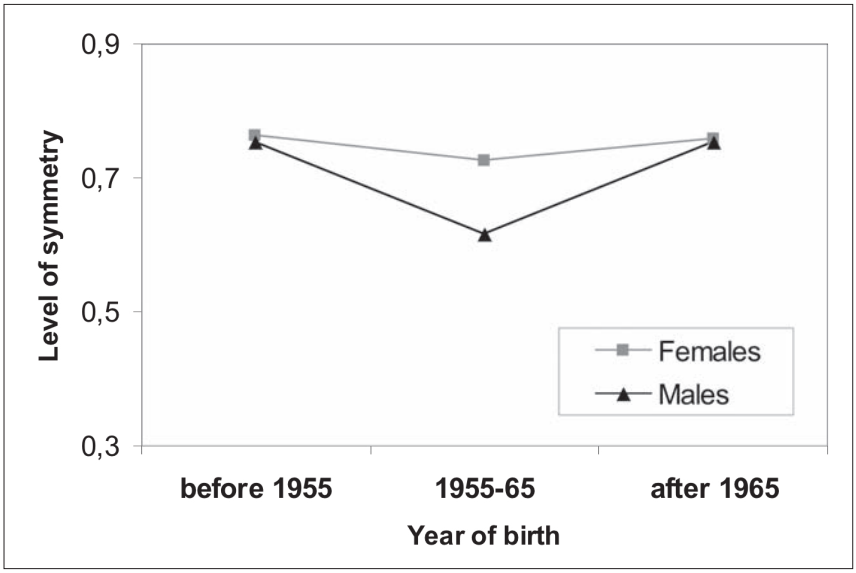

Fig. 6.3. Integral levels of dermal ridge finger symmetry in three age cohorts of Ob Ugrians.

of the Ob-Irtysh watershed by the products of oil and gas production began at the end of the 1960s; however, the maximum level of finger whorl asymmetry is observed in representatives of the 1955–1965 cohort who were born before the late-1960s.

Therefore, we have to admit that the hypothesis of industrial pollution's negative impact appears untenable. We believe that social changes within the Ob Ugrian communities are more likely to have been the strongest stressors. And it was within that period — from the first half of the 1950s to the mid-1960s — that a lot of social changes occurred which affected the very bases of the traditional life-style and nature management of the northern Mansi and Khanty. The results of studying medical documentation, as well as our own data on the asymmetry of bilateral morphological traits, do not disagree with the assumption that social transformations of the 1950s and 1960s were the basic stressors affecting the indigenous populations of the region.

But even in this case we cannot speak with the utmost certainty about the negative impact of the modernization processes per se. For example, the natives' resettlement to new villages could also have caused a stressful effect. Though the amalgamation of small villages into bigger ones and the transition of traditionally semi-nomadic populations to a settled one are both associated with modernization-induced innovations, we still needed to make certain that the very fact of involving the natives into the "western" relationship pattern did become a stressor for them.

The "indicators of westernization" that we used in our study were the extent of urbanization and the occupation of indigenous northerners residing in the region; the intensity of the stressors' influence was assessed based on the reactions of the cardiovascular and endocrine systems.

The results of examining 516 native northerners have shown that the average values of blood pressure and glucose content in the serum increase with the growth of their village size. The systolic and diastolic pressure is higher in inhabitants of large villages, compared with the inhabitants of smaller ("national") ones. In the Mansi and Khanty residing in cities, the blood pressure (especially diastolic) is higher still. The changes of glucose content in the blood take a similar pattern. In male samples (which are smaller in size), the intergroup differences are not significant; however, in female groups the glucose level is significantly ($p<0.05$) lower in women from smaller villages than in inhabitants of bigger villages and cities (Fig. 6.4).

Apparently, the first years of adaptation to the urban environment are especially stressful. The Khanty and Mansi students who have recently left their villages and moved to the city in order to continue their education have a significantly higher glucose content in their blood than the adult villagers. In young male students, it is significantly ($p<0.01$) higher than in adult native men who have lived in the city for more than three years (in female samples the tendency is the same, but the differences do not reach a significant level).

In the process of urbanization, not only do the average physiological values increase but the cardiovascular and endocrine derangements also become more frequent. Glucose intolerance is found in 11% of the examined inhabitants of northern villages, which is lower than in native northerners who have come to live in the city (15% of the total of 391 examined urban subjects). Arterial hypertension was revealed in 16% of Khanty living in small ethnic villages and in 27% of the inhabitants of large villages with an ethnically mixed population (Vasiliev et al., 1987).

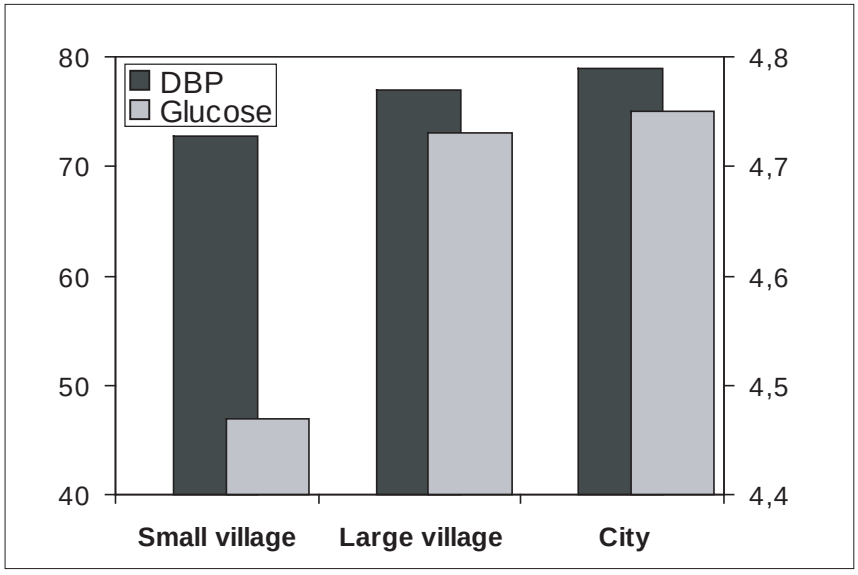

Fig. 6.4. Diastolic blood pressure (DBP) and serum glucose in Ob Ugrian females by residence.

Blood pressure and glucose concentration in the blood also increase as the northerners give up their traditional life-styles (Fig. 6.5). The values of blood pressure in the group of natives adhering to traditional kinds of activity are lower than in those engaged in "modern" occupations. Glucose concentration in the blood of northerners working in education, medicine commerce or management is also higher than in the natives engaged mainly in hunting, fishing and reindeer breeding.

The reaction of the cardiovascular system and the increase of glucose concentration are just indirect evidence of increased adrenaline and cortisol production in the urbanized groups. However, the direct endocrinological studies also confirm the stress effects of growing settlement sizes on indigenous northerners.

Our preliminary studies have revealed a correlation between the cortisol excretion level in the saliva and the degree of urbanization of the Ob Ugrians (Fig. 6.6). In the natives who have moved to the city, the cortisol content in saliva samples is higher than in the native inhabitants of "national" villages. However, the analysis of cortisol content in the saliva has certain methodological restrictions. In particular, the results of the analysis may be overestimated due to microbleedings in the oral cavity. Therefore, we consider the obtained data to be approximate. It is important, however, that our findings correspond with the results of studies conducted in various Selkup communities — the indigenous population of Western Siberia who are close to the Ob Ugrians. In the Selkups residing in northern villages, the average cortisol level in the blood is significantly higher than in the Russian city-dwellers of Siberia; in the natives living in traditional villages, the cortisol content is lower than in native city-dwellers (Pikovskaya et al., 1997).

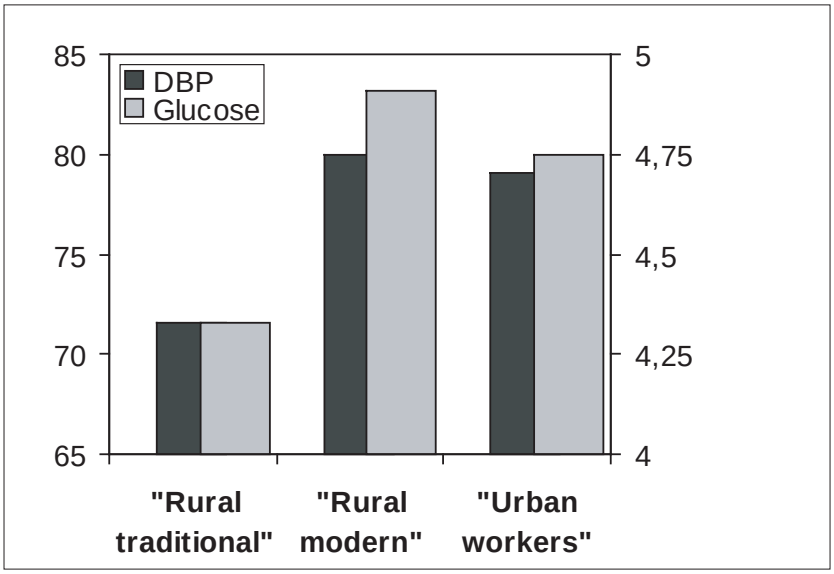

Fig. 6.5. Diastolic blood pressure (DBP) and serum glucose in Ob Ugrian females by occupation.

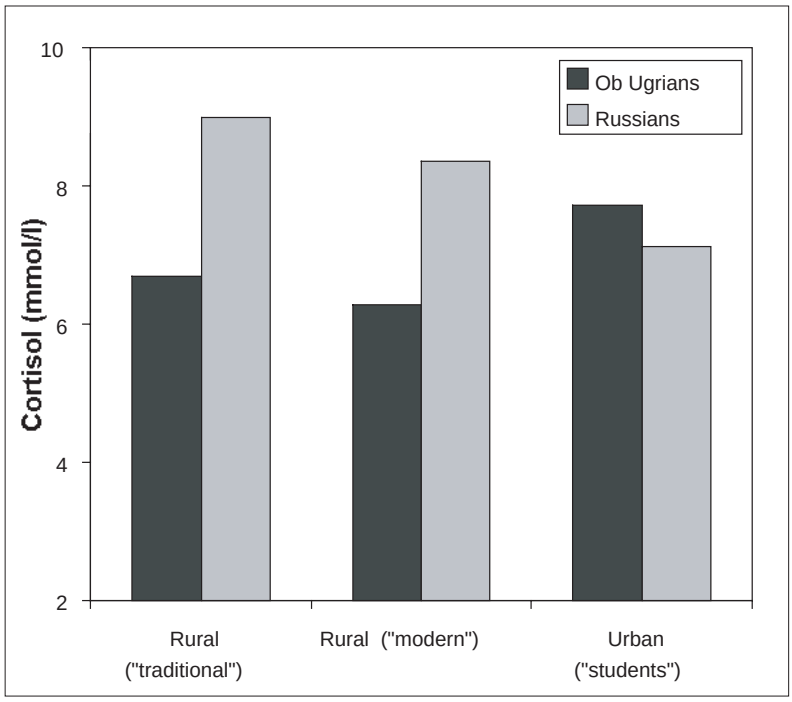

Fig. 6.6. Levels of cortisol in saliva in different social and ethnic groups.

Thus, the correlation with the intensity of stress markers is evident above all within the indicators that reflect the involvement of native northerners in the system of "western community" relations: type of occupation ("traditional" versus "modern") and the degree of urbanization. We are, therefore, inclined to think that the "westernization" processes of the mid-1950s and 1960s influenced the development of chronic stress in the Ob Ugrian populations.

To summarize the above discussion, it should be said that the higher the social modernization level, the more pronounced the northerners' stress reaction to the environment to which they have to adapt themselves. On the whole, social maladaptation is known to be associated with the idea of hopelessness of the current situation and with indifference towards one's own life and health.

On the contrary, an orientation towards maintaining one's health and leading a healthy life is characteristic of successfully adapted individuals and groups who have a clear and positive vision of the future. Thus, in the following section we consider the characteristics of self-preservation behaviour observed in native northerners of modern Russia.

The rise of deviant behaviour and violence

The indices of self-preservation behaviour provide some materials that allow us to judge the success of social adaptation. Therefore, we think it appropriate to consider the issues concerning the northerners' attitudes towards smoking and alcohol in this part of the book which we have devoted to health effects of modernization.

Smoking

Strangely enough, the habit of smoking tobacco, so widespread today in the majority of Arctic regions, is historically quite new. For example, among the Indians of northern Canada and the U.S., smoking became popular only in the 1930s (Blondin, 1990). The spread of smoking among northerners was speeded up by contacts with other ethnic groups, which can be illustrated by the example of the Saami. At the end of the nineteenth century, the habit of smoking was a rare occurrence between the Kola Saami who inhabited the central part of the Kola Peninsula. However, the eastern groups of the Kola Saami — who had many contacts with the Russian Pomors and especially with the Saami of Scandinavia who adopted some everyday habits of the Norwegians, Swedes and Finns — were active smokers (Kharuzin, 1890).

Unfortunately, smoking (the "habit of the poor") has become a norm in all of today's circumpolar populations (Rode and Shephard, 1996). The prevalence of smoking among native northerners usually exceeds the average within their countries. The Saami of Finland and Sweden are probably the only exceptions. The share of smokers among the Saami of Finland is only slightly higher than among the Finns — 32% versus 29%, accordingly (Laurila et al., 1997). In Sweden, the prevalence among Saami and non-Saami living in Västerbotten is 21% and 22%, respectively (Edin-Liljegren et al., 2004).

The northerners of Russia start to smoke early in their lives. According to our inquiry conducted in 2005 in the village of Lovozero of Murmansk Oblast (the centre of Saami settlement in Russia), 59% of 122 school students aged 15–18 (30% of girls and 63% of boys) smoke either regularly or occasionally. The average age for beginning to smoke is 12.6 years in boys and 13.7 in girls, but the intensity of smoking is higher for girls — 8.4 cigarettes a day on the average (compared with 6.4 for boys). These figures are very close to the data obtained from other northern regions. For example, 34% of schoolchildren aged 10–14 and 63–71% of youths aged 15–19 in the Arctic regions of Canada are either regular or occasional smokers (Millar, 1990).

The attitude towards smoking in representatives of indigenous northerners (Saami and Komi) and in Russians of Lovozero is identical. The self-rated health is also very similar: despite smoking, the majority of respondents consider their own health to be good or satisfactory.

The proportion of smokers among adult northerners of Russia is very high too. In the early 1990s, the highest sales volume of tobacco products (per adult inhabitant) was registered in the northern areas of the country: the Magadan Oblast, Chukotka, the Yamalo-Nenets AO, the

Khanty-Mansi AO and the Komi Republic (Feschbach, 1995). Since chewing tobacco is practically unknown in Russia, all data refer to smoking. Among the Nganasans of Taymyr, the prevalence of smoking reached 78% in men and 56% in women (Shephard and Rode, 1996).

It should also be noted that the prevalence of smoking among women is very high among native northerners. Thus, among the Russian inhabitants of Yakutia villages practically all men smoke (93%) but only 20% of women smoke, among rural Yakuts we observe no gender differences in the use of tobacco: 54% of men and 52% of women are smokers. Similar results are found among the Even and Evenk: 57% of men and 50% of women smoke (Khandy, 1997).

A high daily consumption of cigarettes is also very typical of different Arctic regions in and outside Russia. Among the population of Greenland, tobacco consumption attained its peak (the average of 10.5 cigarettes a day) in 1979–1985 (Misfeldt, 1990). In the early 1990s, the tobacco consumption in Nganasans of Taymyr was practically the same — 10–20 cigarettes a day in men (11.3 on the average), and about half of this amount in women (6.2 on the average). These figures are close to the data obtained from the Canadian Inuit (Rode and Shephard, 1996). By our data, in 2005, the average daily cigarette consumption among Saami youths of Russia was 7.4.

The prevalence of smoking in the Arctic regions results in the worsening of external respiration indices, which is observed in the majority of native northerners. This, in turn, aggravates the unfavourable situation concerning lung diseases, typical of the high-latitude populations (see chapter 4).

Problem drinking and alcoholism

Alcohol consumption in the North is very high and has a number of specific medical and social characteristics. In 1999, rates of chronic alcoholism in northern autonomous areas of the Russian Federation was 1.3 (Evenk AO) and 3.6 (Taymyr AO) times higher than the all-Russia average of 76.6 cases per 100,000 people (Pivneva, 2004). But these average values hardly reflect the real situation in native communities: the representatives of the numerically dominant non-native population make the greatest absolute contribution to these sad statistics. However, the focus of our research is on the amount of alcohol consumed by native northerners.

Any person who has visited national villages of northern Russia cannot but recognize the gravity of alcohol-abuse problems among the inhabitants. Strange as it may seem, scientific publications devoted to this topic are not numerous, for several reasons. First of all, during the Soviet period the analysis of alcohol-caused casualties in the native groups of the USSR in general was forbidden ground for researchers. But even after the removal of security classifications at the end of the 1980s, there was no essential "breakthrough" in publishing. Probably, the situation was influenced, along with other factors, by numerous technical and financial difficulties associated with conducting studies in the North. In our 2006 review, we included almost all papers published in Russia in recent years (Kozlov, 2006). The following section is based mainly on this review.

The correct statistical analysis of alcoholism prevalence in the North is not an easy task, since no accurate data are available either in the Russian Federation or abroad. For example, the alcoholism prevalence assessment among

the Inuit of Canada in various settlements ranges from 6% to 72% (Shephard and Rode, 1996). The divergences between the alcoholism morbidity data within the same administrative units of Yakutia, obtained in 1984 and 1995, are one and half- to twofold (25.5 and 13.9 per 1,000 or even 21.3 and 8.6 per 1,000), respectively (Kershengolts et al., 2000). Moreover, the dynamics of official statistics (Osnovnyje pokazateli, 1996) showing significant improvement in the medical situation and reduced alcohol consumption in Yakutia within the specified decade, clearly disagree with independent expert estimations. According to the latter, the consumption of alcohol in Russia did decrease in the late 1980s, but then it rose sharply between 1991 and 1994; besides, about 20% of alcoholic drinks consumed during that period were toxic substitutes (Nemtsov, 2001). This should have inevitably aggravated the alcoholic situation instead of improving it. Taking this into account, we are inclined to question the official data of the Sakha Republic (Yakutia) Committee on Statistics.

The discrepancies and contradictions in the estimations result not only from a lack of addiction treatment and rehabilitation services in northern regions, inaccurate registration of patients and poor diagnostic capacity but also from problems inherent in the methods used to assess alcohol consumption and its impact.

In the Soviet period, statisticians could rely on "alcohol consumption from the state resources," even though these data disregarded a considerable share of home-distilled vodka traditionally produced in Russia in large amounts (even though at that period home-brewing was not yet widespread in the Arctic regions). After April 1992, when the state monopoly on the manufacturing and sale of alcohol was abolished, it became much more difficult to estimate the alcohol-consumption level. According to the Department of State Sanitary and Epidemiologic Inspectors of the Russian Federation, the consumption of a pure alcohol equivalent per capita in 1999 was 7.9 litres, whereas according to independent estimators it was almost double that amount — 14.5 litres (Nemtsov, 2001).

Another widely used indicator is the alcohol-caused death rate. But it is even more difficult to estimate alcohol-caused losses in the North, especially in native populations. The accuracy of medical statistics, low as it is in Russia, is further reduced by the small size of the native population, leading to unstable rates. Significant distortions result from incorrect cause-of-death statements which are due to a lack of professional skills in doctors and pathologists, as well as to the poor facilities typical in northern hospitals. Thus, the sharp increase of alcohol and "counterfeit" alcohol consumption in the first half of the 1990s led to an appreciable increase in the death rate; however, in medical documentation the cause of death was very seldom associated with alcohol, the most common cause being "death caused by poisoning." The statistical errors are also aggravated by a conscious misrepresentation of alcohol-caused death diagnoses. Medical staff sometimes deliberately includes inaccurate diagnoses on the death certificates, in order to spare relatives of the deceased social stigma and any undesirable psychological consequences.

The use of population surveys to assess alcohol consumption also has a number of limitations and is regarded as least accurate (Ulijashek and Strickland, 1993). A tendency to distort self-reporting of alcohol consumption that is typical of some social groups should also be taken into consideration. Lastly, the

investigators of "northern alcoholism" in Russia (especially physicians) seem to take no account of some ethnically important specific features of alcoholic behaviour typical of different cultures, in particular the attitude towards alcohol consumption (Gomberg, 2003). In "European" communities alcohol consumption is known to be frequently concealed or underestimated, whereas in some American Indian groups the respondents, on the contrary, are inclined to overstate their alcohol intake, thus supporting the popular "drunken Indian" stereotype (Lemert, 1980). Similar discrepancies in alcohol intake assessment are also observed in Canadian Inuit communities (Wood, 1999). However, no studies have been undertaken to find out whether similar tendencies are also present in the native northern communities of Russia.

Nevertheless, despite the above difficulties and lack of data, there is no doubt that alcoholism is one of the most acute problems facing native northern populations.

As an example we shall consider the situation in the Chukotka AO, where for many years the alcohol consumption per capita has been higher than the average across Russia. Thus, during 1980, an "average" inhabitant of the region drank what was equal to 15 litres of pure alcohol (Troitskaya et al., 1990) compared with 10.5 litres for all Russians. At the same time the native inhabitants of the region — the Chukchi and Siberian Yupik — consumed more alcohol than the migrants (Voevoda et al., 1994). According to the Institute of Internal Medicine (Siberian Branch, Russian Academy of Medical Sciences), in 1991 the average single dose of alcohol consumed by native northerners of Chukotka was 166 grams of pure alcohol equivalent in men and 72.5 grams in women (Shubnikov, 1991). Subsequent publications cited even higher doses — 177.6 grams in men and 74.3 grams in women (Avksentyuk et al., 1995). Based on these figures, we can conclude that the average annual per capita of alcohol consumption by Chukotka natives was close to 6 litres, the total alcohol sales via trade shops in 1991, amounting to 4.5 liters of pure alcohol per capita (Nikitin et al., 1992).

Since this research was conducted during the anti-alcohol campaign that started in 1985 and wound down by 1992, the cited amounts of consumed alcohol are probably underestimated (the calculations were made based on the official sales volumes of alcoholic beverages, without considering the consumption of counterfeits and home distillates; and the probability of understating alcohol intake by respondents in the course of the survey was also very high). However, even from the available figures we can conclude that the high single doses of alcohol consumed by the natives of Chukotka should be regarded as intoxication doses, and the alcohol consumption level in the indigenous population is higher at least by a quarter than in the migrants.

The frequency of alcohol use in Chukotka natives is also high. Table 6.1 provides alcohol use frequency data for Chukchi and Siberian Yupik obtained by Novosibirsk researchers. Misrepresentations of data caused by the above mentioned anti-alcohol campaign were minimized in this case, since the respondents were asked about the frequency of alcohol use "currently or in the past." It can be seen that 82% of native men and 30% of women used alcoholic beverages at least once a week. It should be noted that during the Soviet period, even before the anti-alcohol campaign, market alcoholic drinks in the villages were not as accessible as

they are today. Liquors were usually delivered twice a month and sold out within a couple of days ("drunk days," as they were called locally). This entailed negative changes in the criminal and medical situation in the villages (Lensky et al., 1998).

The situation in other northern regions is similar to that in Chukotka.

In Yakutia, the greatest proportion of alcohol abusers (within their respective ethnic groups) can be found among indigenous peoples of the North — Evens and Evenks (67%); the proportion among Yakuts is slightly lower (60%), and that of Russians lower still — about 45% (Khandy, 1997). In the Sakha Republic (Yakutia), workers and employees spend up to 16–19% of their total family food budget on spirits. Among the regions of northern Russia, the share of household expenditures on alcohol (which in the North as a whole is the highest across Russia) is similarly high only in Buryatia and Murmansk Oblast, and is surpassed only in the Sakhalin Oblast (Feschbach, 1995).

Another huge problem is the prevalence of drinking and alcoholism among northern women. The proportion of women who drink in the native populations is almost as high as that of men (Fig. 6.7). This situation is not only found in Russia: a very high rate of alcoholism morbidity is also reported among native women of Canada (Waldram et al., 1995). Here again, as in the case with smoking, a specific gender attitude that is accepted in traditional Arctic cultures is of importance: the use of alcohol is not regarded as "shameful" for a woman, as it is in Slavic or European communities.

Table 6.1. Prevalence (%) of alcohol use among indigenous people of Chukotka.

Sex	Never	Several times a year	1-2 times a month	Once a week	More than once a week
Male	0	1.3	17.7	34.2	46.8
Female	3,7	14.7	52.9	18.8	9.9

Source: Shubnikov 1991

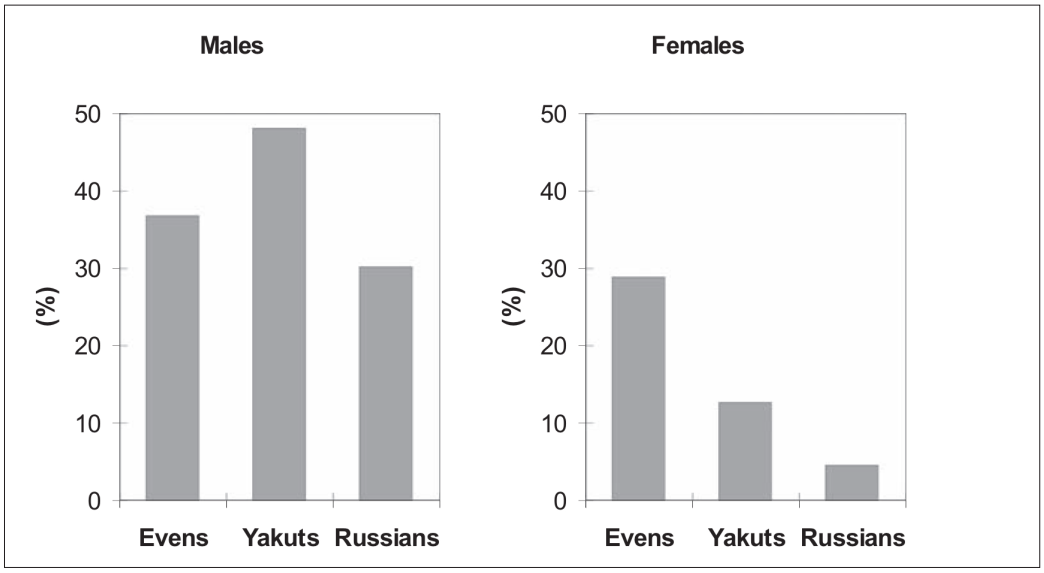

Fig. 6.7. Proportion of drinking males and females in different ethnic groups of Northern Yakutia.

However, for women who are mothers, alcoholism is known to have greater impact on their children's health when compared with the fathers' alcohol abuse. This is also true for northern native populations (Khandy, 1997). A host of family problems among native northerners can be attributed to alcohol. Children perceive the alcoholic behaviour of their family members as a "normal" one, alcohol abuse for them is a "natural" component of everyday life.

According to the results of the survey conducted in 1996 in the Kola Medical College, half of Saami and Komi-Izhem youths have a positive attitude towards the use of alcohol. About 14% of the Lovozero college students use alcohol at least four times a month, and 3% at least five times a month.

As a result of the ever-growing availability of liquors after 1992 and their poor quality, almost all alcohol-related health indicators (the frequency of alcoholic psychoses and deaths from alcoholic poisoning or from cirrhosis of the liver) reached their peak by 1994 in the Russian Federation and exceeded the level of 1984, the most unfavourable period in Soviet history. A short-term decrease of alcohol consumption in 1995–1998 was again followed by its rapid increase (Nemtsov, 2003).

Northern regions as a whole, and communities of indigenous peoples in particular, continue to hold leading positions in alcohol-related damage. Alcohol undoubtedly takes the first place among the direct causes of violent death in the North (Stolyarov, 1993). In the middle of the 1970s, 31% to 57% of violent deaths in various Chukchi groups were associated with alcohol abuse (Etnodemograficheskije, 1995). By the beginning of the 1990s, the situation became even more depressing: as many as 73% of those killed, 55% of suicides and 64% of accident victims among the native northerners of Russia were found to have been experiencing the effects of moderate to strong alcoholic intoxication (Pika and Prokhorov, 1994).

The typical situation of the last two decades of the twentieth century can be illustrated by the results of an alcoholic-death-rate analysis of the inhabitants of the Berezovo District (Khanty-Mansi AO) in 1996–1999. While compiling the sample based on primary medical records, we included the deaths of 362 native northerners and 638 migrants (except for children less than a year old). Alcohol-related causes accounted for the deaths of 29% of Khanty and Mansi, while the corresponding figure for the migrant population was 15%. The alcohol-related death rate in the native population was twice as high as in the migrant population (Table 6.2). The proportion of alcohol-caused deaths among all deaths in female northerners was five times as high as in the Russian inhabitants of the North (15.2% and 3.5%, respectively).

Table 6.2. Distribution of causes of death (%) in Berezovo Rayon of KMAO in 1996-99.

	Indigenous		Non-indigenous	
Causes of death	Male	Female	Male	Female
Diseases (total)	44.1	67.9	66.4	88.8
Non-alcohol related	40.3	61.6	60.0	85.7
Alcohol-related	3.7	5.4	6.4	3.1
External causes (total)	55.9	32.1	33.6	11.2
Non-alcohol-related	45.3	22.3	28.3	10.7
Alcohol-related	10.6	9.8	5.3	0.5

Note: children less than 1 year old are not included

Our data are comparable to the Chukotka data obtained in 1994 (Table 6.3). According to the published data of the Chukotka Okrug Narcological Clinic, the alcohol-related death rate among Chukchi and Eskimos is also higher than the death rate among the non-native population (Lensky et al., 1998). The alcohol-caused death rate among the native women of Chukotka in 1980, 1988 and 1994 was 2.3 times higher than the corresponding rate calculated for all women of the *okrug*. In 1994, alcohol caused 19% of deaths of all women of the Chukotka AO and 42% of deaths of native northerners (Demina et al., 1998).

Table 6.3. Alcohol-related death rate (per 1000) among Chukotka inhabitants.

Cause of death	Whole population	Indigenous people
Alcohol poisoning	81.5	97.0
Cardiovascular disease	41.2	72.8
Accident	60.0	90.9
Suicide	13.1	24.2

Source: Lenskiy et al 1998

So what explanations can we offer for this enormous scope of alcohol consumption associated with such dreadful consequences?

Excessive drinking can be accounted for by various reasons. A desire to attain a more comfortable psychological condition and to get rid of emotional pressure is natural for a person in a stressful situation caused by a collapse of his/her habitual way of life. Traditional communities of native northerners had developed some specific forms of psychotherapeutic remedy ages ago — among them various calendar holidays and rites that included connecting with shamanism. In Soviet times, however, these rites and ceremonies were either eliminated or deformed so that they could no longer perform their original functions. The native northerners' contact with alcohol that began almost four centuries ago and has been increasing in intensity ever since has resulted in a situation in which drinking alcohol is currently perceived as a traditional and basic thing to do and often the only way to get rid of mental discomfort.

It is hard to say to what extent certain ethnospecific alcoholic traditions are marked in northern natives. We believe this question to be insufficiently investigated; meanwhile, a deep understanding of the ethnic specificity of alcoholic behaviour is extremely important for health care delivery. If an addiction specialist is aware of the alcoholic behaviour typical of a particular population, she/he can better plan the course of psychotherapeutic intervention for a patient.

In Russia, the η-type of alcoholic dependence is prevalent, in which the use of alcohol is justified and explained (often in an exaggerated way) by "ethnic customs." This type of alcoholic dependence was almost "mechanically" transferred onto native northerners. Actually, their experience of intoxication is often combined with some kind of illusory perception reminiscent of "falling into a trance," so that an observer who belongs to the European or Russian culture may develop an idea that such alcoholic behaviour represents one of the northerners' "ancient ways of communicating with the spirits." Once again, we have to repeat that this viewpoint is not only unproven, it has never been studied consistently enough, at least in Russia. The study of such a delicate issue would require cooperative efforts of highly professional ethnologists, ethnic psychologists, biochemists, geneticists and narcologists. Therefore, we prefer at this stage to discuss the "Soviet" traditions of alcohol use in northerners.

There is one more important circumstance to be emphasized. The representatives of numerically small peoples of Northern Russia, the Saami of Fennoscandia, the northern Indians of the U.S. and Canada and the American and Greenland Inuit belong to different anthropological groups of the Earth's population. They settled in the Arctic and subarctic zones at different historical periods, and their gene pools are far from identical. At the same time, the chemistry of intoxication and the biological processes underlying the development of alcoholic disease are rather complex and are controlled by certain gene groups, the distribution of which are different in each population (Edenberg, 2000; Osier et al., 2002; Mulligan et al., 2003). Taking all this into consideration, we can hardly apply the information concerning physiological features of ethanol metabolism, obtained from one or two populations, to all indigenous population groups of the North and Far East of Russia. It is necessary to continue careful analysis of the findings of scientific literature and to conduct active population studies.

Signs of intoxication such as dizziness, tachycardia, perspiration, nausea and "red flashes" (the latter being the most typical sign) manifest themselves differently in each ethnic group (Wolff, 1972; Goedde et al., 1979; Ward et al., 1994). This complex reaction, most expressed in the peoples of East Asia (Japanese, Chinese, Koreans), serves as one of the first signals to stop alcohol intake; when the reaction is not pronounced, it reduces the individual's control over the alcohol intake (Mori et al., 1989; Parrish et al., 1990).

Today we know that in some northern native groups alcoholic intoxication is accompanied by specific physiological manifestations along with motor disinhibition, singing and euphoria. In particular, an "atypical flashing" reaction is sometimes observed when the intake of large amounts of alcohol causes a flash-reaction, but this flash-reaction is not taken by the individual as a sign to stop the intake of alcohol. The "atypical flashing" syndrome is also characterized by another important feature. The reaction of the facial blood vessels is not dissimilar to the reaction caused by a plaster moistened with ethanol and then applied to the skin of the forearm.

According to the results of an inquiry conducted by the Institute of Internal Medicine, 10% to 13% of native men and 26% of native women of Chukotka admit having had a flash-reaction (Shubnikov, 1991; Avksentyuk et al., 1995). Gender differences revealed in the course of the inquiry (the flash-reaction is twice as frequent in women as in men) were not correlated with the results of the objective alcohol sensitivity testing. A positive reaction to the ethanol plaster test was observed in a similar proportion in men and women (20% and 21%, respectively); besides, 5% of women demonstrated a false-positive reaction, when the plaster applied to their skin was moistened with water instead of ethanol. This, along with the fact that 94% of male and 69% of female respondents admit that they continue to drink alcohol after the appearance of the first intoxication symptoms, testifies to the prevalence of "atypical flash-reaction" in Chukchi and Siberian Yupik.

The intensity of flash-reaction and alcohol tolerance is associated with the carriage of specific genes; the best known are the distribution of *ADH1B*47His* (former name *ADH2*2*) and *ALDH2*2* alleles (Goedde et al., 1992; Thomasson et al., 1993; Novora-

dovsky et al., 1995). The frequencies of these alleles in Arctic Natives are the same as in peoples of central and northern Europe, but different from the populations of the south of East Asia (Voevoda et al., 1994; Borinskaya et al., 2005; Segal, 1999). In particular, the *ALDH2*2* allele is not present in northerners, and the concentration of *ADH1B*47His* is very low (Table 6.4). It can be assumed that the atypical reaction to alcohol by the high-latitude inhabitants is controlled by some other loci, or that it has a different biochemical base compared with that of the south Asian type.

In this respect, the pattern of alcohol consumption among the peoples residing along the Amur River is worth our attention. According to available data, the alcohol intake among the natives of the Far East, in contrast to Arctic Natives, is not higher than in migrants from European Russia. Alcohol is used very seldom in 20% of Russian and 36% of Nanai families, and it is used moderately in 80% and 43% of families, respectively (Savosin and Ostroushko, 1990). The data on low alcohol consumption by the Nanais agree with the available genetic and clinical data. The frequency of the *ADH1B*47His* allele in representatives of numerically small peoples of the Far East, in particular the Orochi, is closer to that characteristic of Chinese and Japanese, rather than Inuit and Chukchi (Table 6.4). The flash-syndrome intensity in the Nanai of the Amur area is also close to the one typical of the populations of the south of East Asia (Kurilovich et al., 1998).

These distinctions show once again that the "numerically small peoples of the North of Russia" is a category based on social and political principles rather than on an anthropological affinity of its ethnic groups. Therefore, it is a gross mistake to approach the medical problems encountered by these peoples without considering their differences and peculiarities or to offer, as this is often done, standardized or "universal" solutions.

Table 6.4. Frequencies of *ADH1B*47His* and *ALDH2*2* alleles in Northern and Far Eastern indigenous and neighboring populations.

Ethnic group	*ADH1B*47His*	*ALDH2*2*
Swedes	0.01-0.04	0
Finns	0.01	0
Russians (Kostroma)	0.03	na
Russians (Tomsk Region)	0.04-0.08	na
Saami (Sweden)	0.01	0
Komi-Zyrians	0	na
Khanty	0	na
Siberian Eskimos	0.03	0
Chukchi	0.02	0
Alaskan Eskimos	0	0
Yakuts	0.10-0.19	na
Altai	0.26	0
Buryats	0.25	0.02
Orochi	0.38	na
Chinese	0.68-0.76	0.30
Japanese	0.59-0.76	0.24-0.35

Source: Borinskaya et al 2005; Han et al 2005

As for the rapid development of alcoholic dependence in the natives of high-latitude regions, it is probably caused by the specificity of their biochemical processes. It was long ago noticed by researchers that the ethanol metabolism in the northerners is rather slow, and ethanol concentration remains high for a longer period and considerably exceeds the "normal" level for Europeans (Fenna et al., 1971). However, no congruent concept has been offered so far for the explanation of this phenomenon.

In the 1970s, the researchers' attention was focused on the mechanisms regulating the balance of endo- and exogenous alcohol. Microorganisms living in human intestines produce a certain amount of endogenous ethanol. This endogenous ethanol was believed to control the comfort/discomfort level. The lowering of its content was believed to result in the activation of opioid receptors and in the irritation of "displeasure centres," leading to an increase of emotional tension and a desire to relax. The individual compensates for the lack of endogenous ethanol by consuming alcoholic drinks; this reduces alcohol production in the organism, but raises the need for its inflow from outside. Thus, a "vicious circle" is formed, maintaining the growing alcoholic motivation.

Nowadays, this theoretical model is regarded with a certain reservation, and the researchers are rather sceptical about the role of endogenous ethanol in the development of alcoholic dependence. Nevertheless, below we consider some data showing that the "lipid" type of energy metabolism characteristic of northern populations is correlated with the reduced speed of endogenous ethanol formation.

These observations require further verification and analysis. The existence of correlation between the studied variables does not necessarily mean that they are directly linked to each other. As we have seen in chapter 4, the "lipid" variant of energy metabolism is the result of native northerners' adaptation to the specific type of nutrition, which, in turn, influences the intestinal microflora composition. Thus, the low level of endogenous ethanol content in Arctic Natives may be explained simply by the pattern of their traditional nutrition and have nothing to do with alcohol metabolism in the organism.

However, there may be other links, too, between the "Arctic metabolic type" and ethanol metabolism. When dietary fats are absorbed into the blood, plenty of chylomicrons are produced, which reduce the steroid production in the adrenal glands. As a result, the amount of "stress hormones" (corticosteroids) decrease in the blood. Thus, the protein-lipid diet produces an anti-stress effect (Panin, 1987). Giving up the traditional protein-lipid diet may contribute to the development of a growing thirst for alcohol in northerners. The reduced share of fats in the diet leads to a higher concentration of corticosteroids and, accordingly, to a higher level of anxiety. For many people, alcohol becomes a habitual way to relieve this anxiety. Besides, the ethanol coming from outside provides a shunt pathway for the energy supply through the citric acid cycle. The relaxation of tension occurs not only because of the mediated ethanol action on the above-mentioned opioid receptors but also because of the increased energy supply (each gram of ethanol provides 7.1 kcal of energy).

These biological characteristics of northerners can account for more than 9–10% of alcohol users in the "problem drinking" and "alcoholic dependence" categories (the average figure for Russia and the U.S.). We may assume

that the early development of alcoholic dependence and the rapidly progressing alcoholism both in men and in women, characteristic, in particular, of the native peoples of Chukotka and Alaska (Parks et al., 2001), is partly caused by the medical and biological specificity of northern populations.

Significant though the contribution of genetic and physiological factors may be, we cannot disregard the social backgrounds and explain "northern alcoholism" by these factors only.

Earlier in this chapter we showed the stressful effects of "modernization." The growing unemployment of native northerners, the problems of their adaptation to the realities of a "technogenic civilization," giving up some elements of traditional cultures and many other causes entail negative psychological consequences. Perceiving the situation as hopeless, people develop indifference to their own life and health. The natives of the North of Russia remain face to face with their worst enemy — alcohol, with no one to depend on but themselves.

Is the situation absolutely hopeless in this case? To answer this question we should first find out whether measures were taken in the past to improve the alcoholic situation in the North, and whether these measures were effective.

Considering the practices of other northern countries, we may note that the "prohibition" policy, pursued at various periods by the governments of the U.S., Finland, Norway, and Canada, did not produced any positive outcomes. In Russia, the state's anti-alcoholic campaign of 1985–1991 was analogous to such "prohibition" policy. The measures taken within this campaign appeared to be beneficial for the native groups of the North. Positive changes of alcohol-dependent demographic indices were registered during this period both in the North of Russia as a whole and in individual regions — in Khakassia, on the northern reaches of the Yenisei, and in Chukotka (Pika & Prokhorov, 1994; Krivonogov, 1997; Lensky et al., 1998).

However, the campaign of the late 1980s, based on the extreme form of command-administrative methods, did not lead to a long-term steady decrease of alcohol consumption in Russia, including its northern regions (Nemtsov, 2003). The removal of the state monopoly on alcohol manufacturing and sales at the beginning of the 1990s resulted in an almost immediate loss of all "demographic gains" of the second half of the 1980s.

The laws, decrees and regulations issued since the mid-1990s and intended to rehabilitate the state control over this sphere, work badly even in the central regions of Russia. In the North, judging by our own observations, the official control over the sales and quality of alcoholic drinks remains nominal up to this day. Moreover, the "prohibition campaign" of the late 1980s and early 1990s pushed the northerners to use alcohol substitutes (perfumes and technical liquids), as well as home-made alcohol, which before that period had never been popular in the North (Pika and Prokhorov, 1994).

On the whole, according to Nemtsov (2001), the current priorities of state alcohol politics in Russia lay almost exclusively in the economic sphere and are focused mainly on the budget replenishment through alcohol sales taxation. Preservation of human health and lives within the framework of this politics is regarded as an "associated task." The regulation of alcohol sales is supposed to secure their quality and reduce alcohol consumption, which is "naturally" expected to produce beneficial effect on the health of the population.

As a result, the prohibitory-punitive alcoholic policy of state bodies demonstrated its inadequacy on the one hand; but on the other hand, it helped northerners to recognize one of their bitterest enemies. Very revealing are the results of an inquiry conducted by Krivonogov (1998) among the Kets of Yenisei. One of the questions asked was: What hampers the development of the Ket people and threatens their existence? All respondents gave one and the same answer: alcohol.

In Arctic populations, families and especially communities, whose influence is traditionally strong, are attracted to the solution of problems caused by drinking and alcoholism. Alcohol-related programs assign an important role to social services (including alternative ones) and non-governmental organizations. Besides, in the Arctic such programs should also have an expressed ethnocultural focus. The experience of Canada shows that various forms of traditional medicine play an appreciable role in the native populations' fight against alcohol damage (Waldram et al., 1995). And this is one of the reasons why we have repeatedly addressed the problem of ethnic specificity of the northerners' alcoholic behaviour. It is impossible to offer serious and effective psychotherapeutic help to problem drinkers and alcoholics without being aware of the peculiarities of ethnic psychology. In this respect, however, a good shaman usually has more expertise than a modern narcologist (who, in most cases, is a non-native).

Based on the analysis of the results of alcohol-related programs implemented in various ethnic groups of the U.S., American researchers recommend combining traditional approaches inherent in a particular tribe with modern methods of alcohol abuse and alcoholism treatment: the use of only one method (either traditional or modern) in Indian communities proved to be ineffective (Gomberg, 2003). We believe that such an approach should be regarded as the most promising.

Violent deaths

The geography of alcoholism and alcohol-caused problems in Russia coincides with the prevalence of other kinds of deviant behaviour — criminality, violence and suicides. As a whole, such unfavourable tendencies are more pronounced along the south-west–north-east axis, reaching their maximum in Siberia, in the Far North and in the Far East. Especially alarming is the steady growth of violent behaviour in the North, with the situation of the indigenous populations in the North being the most depressing.

Deaths by external causes (accidents, poisonings, traumas, homicide and suicide) in some groups of native northerners take first and second place in the general mortality structure. At the beginning of the 1990s, the violent death rate exceeded 30% of the total number of deaths in the native populations of the North — compared with an all-Russia average of 11% (Pika and Prokhorov, 1994). In the natives of Krasnoyarsk Kray, the death rate from external causes in 1995 was 2.3 times higher than the average regional rates (46% and 19.7%, respectively)(Pivneva, 2004). According to our data, in 1998, the death rate from external causes among the indigenous population of the Berezovo District (Khanty-Mansi AO) in men was 3.3 times and in women 3.9 times as high as Russia as a whole. The effect of accidents, homicides and suicides on the native northerners' life expectancy is shown in Table 6.5.

In some groups of native northerners, the violent death rate may be higher still. For

example, in the beginning of 1980s, the violent death rate among the Chukchi of Enurmino village reached 54% of the total number of deaths in adults.Accidents within this group caused 57% of all children's deaths (Pika, 1995).

As a whole, the circumpolar regions are believed to be characterized by a high burden of injuries. Judging by the official 2004 statistics, however, injuries, poisonings and the effects of external causes in resident areas of numerically small native populations of the North made up 10% of the total morbidity rate, whereas the all-Russia average was higher at 12% (Ekonomicheskije, 2005; Rossiya, 2005). In part, this discrepancy may be accounted for by a lower number of road-traffic injuries in the Russian Arctic as compared with the country as a whole. In 2004, the death rate from road accidents in Russia took second place among all deaths from external causes (29 cases per 100,000 people), while the first position was taken by suicides (Vishnevsky, 2006). But it is also quite possible that the general picture of northern trauma in Russia is influenced by the discrepancies of medical statistics, as well as by the relatively low medical aid availability, which is characteristic of the indigenous areas.

The published data describing the situation in the Chukotka AO give some idea of the structure of "northern traumatism" (Table 6.6). Unfortunately, we have no data that would directly characterize the situation in native northern communities.

In the Soviet period, the suicide level in Russia was one of the highest among all the Soviet republics. The situation in the RSFSR was especially grave in 1980 with 34.5 suicide cases per 100,000 people. By 1988, the rate had been reduced to 24.3 (partly due to the anti-alcohol campaign), but then it began to increase once again. By 1991, it reached 26.5 cases per 100,000, and by 2003, it reached 36.1, exceeding the crisis figure of 1980 (Prokhorov, 1993). In 2004, the suicide death rate across Russia was 34.4 per 100,000 people (Vishnevsky, 2006).

The data about the suicide levels among native peoples of northern Russia are extremely scanty. According to expert estimations, suicide rates in the North are three to four times higher than the all-Russia average (Pika and Prokhorov, 1994). Suicide and accidents among the men are three times more frequent than among the women of northern peoples.

The violent death rate among the northern natives of Russia has become appreciably "younger" in recent decades. For example, in the 1980s men who died at the age of 20–29 accounted for 14% of the general death rate among the Northern Mansi (Pivneva, 1995). In 1990–1999, this proportion grew to 21% of all deaths (in 1996–1999, according to our data, 16.8%).

The situation in the Russian Arctic is similar to other circumpolar regions of the world.

Table 6.5. Average age at death by causes (in years) in indigenous people of Berezovo Rayon, KMAO, in 1996-99.

Cause of death	Males	Females
Diseases	55.44	58.64
External causes	34.96	38.14

Table 6.6. Main types of injuries among residents of Chukotka AO in 1997.

Type of trauma	Percent
Wounds and contusions	59.7
Dislocations, strains, joint deteriorations	11.0
Fractures	10.4
Burns	6.5

Source: Nazarov et al 2000

A distinctive feature of both the Russian and non-Russian North is the occasional "epidemic character" of suicides in ethnic villages (Thorslund, 1991). Thus, by our data, within the two months of June and July 1992 in the village of Ovgort (Yamalo-Nenets AO), whose total population is 934, five young Khanty men committed suicide. These suicides were not interconnected, but it should be emphasized that all of them occurred following the regular calls of "shop-barges," which trade in alcohol.

The alcohol abuse among native northerners discussed above largely results from the general situation in the community. Frequent use of alcoholic drinks in everyday life results in a whole spectrum of grave consequences for families. First of all, the protective role of the family concerning the physical and mental health of children is reduced. The family more and more often fails to provide social, psychological and moral protection for its members, which results in a growing frequency of suicides and other kinds of deviant behaviour. The low marriage level among young native people in the northern regions of Russia also correlates with the growth of violent deaths and suicide rates. Four out of every five male northerners who died a violent death in the first half of the 1990s were unmarried (Pika and Prokhorov, 1994).

To summarize what has been said in this chapter, we may say the following. The widespread belief in Russian society that alcohol abuse and alcoholism are inherent to and "genetically caused" among the northern peoples must be reconsidered. We maintain that various kinds of deviant behaviour in native northerners should be regarded as resulting from the reduced level of self-preservation behaviour and the general social maladaptation of native communities. Loss of a goal in life, lack of guides and orienting points, the feeling of one's own "uselessness" and "irrelevance" in the changing world — these are the main causes for the crisis in personal identity.

Adapting to change: psychological, sociocultural and economic aspects

The lack or insufficiencies of self-preserving motivations and, as a consequence, the development of various kinds of deviant behaviour are the most evident manifestations of psychological maladaptation. However, maladaptation may also declare itself in other ways.

In order to form a considered judgement about the adaptation of an individual or ethnic community, its failure or success, we should first analyse the major components of the complex adaptation process, including the psychological, sociocultural and economic ones. Such a comprehensive analysis will allow us not only to acquire an integral picture of the actual situation but also to reveal "weak spots" and find ways to optimize the process of the

native peoples' adaptation in the present sociocultural conditions.

Psychological adaptation

Psychological adaptation assumes that an individual has attained psychological comfort, mental well-being and a strong sense of her/his own personal or cultural identity. The Khanty and Mansi in our study, however, show a significant level of psychological maladaptation. The proportion of respondents with high anxiety level is very high in all age groups: 64% of the total sample. The anxiety indices in the Ob Ugrians are much higher than in the Russian respondents ($p<0.001$). At the same time, the analysis reveals a significant correlation between the increase in the anxiety level and the growing glucose concentration in the blood. It means that the psychological reaction to the stressors' influence is so high that it leads to a steady shift in the normal physiological variables (Kozlov et al., 2003).

The process of social adaptation is especially difficult for young people, who are more sensitive to social influences. These influences largely define the development of young people's ideas of themselves and their place in the world. The search for sociocultural identity in young individuals is concurrent with the process of their personal identity formation. One of society's responsibilities towards a young individual is to introduce him/her to a spectrum of potential opportunities for development, which are available within a given culture and approved by this culture. Thus, the social group supports young people at the most challenging period in their lives: the period of choice.

In young Ob Ugrians, the search for their own personal and sociocultural identity is accompanied by an increase in their anxiety levels and by the growth of internal pressures. They acutely perceive the psychological specificity of their native ethnic community, but they are not always ready to identify themselves with it, and there is much evidence to support this statement.

One of the important, even basic attributes of ethnic identity is the person's perception of the native language (it should be noted that we are now focusing on the attitude towards the language of one's own nationality rather than one's competency in that language). The choice of language, perceived by the person as his/her mother tongue, reflects the subjective significance for the individual of his/her identification with the corresponding people.

However, according to Kharamzin and Khairullina (2002), the less competent the native northerners are in their native language, the more inclined they are to judge their own and other people's ethnicity based on criteria other than language competency. Thus, about a quarter of respondents who were fluent in their mother tongue said that nationality should be defined by the native language; whereas among those who did not speak the language of their ethnic community, only slightly more than 9% expressed such opinion. Half of the respondents (51%) who did not have command of the language of their ethnic community thought that nationality should be defined "at the person's will," whereas among those who were fluent in their language, only 29% agreed with such a statement.

Among young Khanty, Mansi, Kola Saami and Komi-Izhems in our study, a reference to their mother tongue sounded in most cases like an emotional statement, not supported by real practise. When asked "What language

do you think in?" 91% of Khanty and Mansi college students named Russian, and less than 3% mentioned the language of their own ethnic community. Among school students, 83% of Saami and 88% of Kola Komi-Izhems consider Russian to be their mother tongue. About 76% of the young Komi of Lovozero village (the centre of indigenous settlement in the Murmansk Oblast) do not have command of their native language (Varshaver et al., 2006). These language preferences indicate a lack of a robust positive ethnic identity among the young natives of the Western Siberia and Kola areas.

The students' answers to a direct question about whether they are satisfied with their ethnicity provided more evidence in support of the above thesis. The Kola Saami (high school and college students) considered their attitude towards representatives of the Russian and Saami peoples to be equally high; however, the majority of Komi-Izhems rated their own attitude towards the Russians higher than their attitude towards representatives of their own ethnic group (Varshaver et al., 2006). When asked to complete the statement "Thinking about my own people, I feel…", 76% of Khanty and Mansi college students expressed, more or less clearly, positive emotions; however, in 18% of these students, these positive emotions were combined with a negative or indifferent attitude towards their ethnic community. At the same time, 34% of respondents answered that they had no feeling towards their people, 7% mentioned disappointment and 1.4%, irritation.

Thus, the data of sociological and social-psychological studies testify to fundamental ethnic identity transformations in the Ob Ugrians, Saami and Komi. Moreover, if ethnic self-identification is relatively settled among the older representatives of the indigenous population, children and teenagers show a strong tendency towards feeling marginalized (Pavlov, 2001; Kharamzin and Khairullina, 2002).

The majority of representatives of the adult indigenous population of the Khanty-Mansi AO consider the language of their nationality to be their mother tongue and recognize the necessity of teaching the language, as well as the history and culture of their people, to school children. It testifies to their understanding of the value of the traditional culture of their own ethnic community. However, the more unstable emotional aspect, that of ethnic identity, appeared to be significantly transformed in the adult population too, influenced by the exacerbated problems of economic survival and cultural self-preservation.

The situation is even more disturbing among children. Every fifth child of mixed marriages experienced difficulties when asked to define his/her ethnicity, that is, he/she showed a lack of clear self-identification. And although the majority of the respondents born from mixed marriages identified themselves as belonging to the indigenous population, the main argument in favour of such self-identification was the economic one: "Khanty are allotted their ancestral hunting and fishing grounds, deer, snowmobiles, motorboats, fishing tackle — all of it for free" (Pavlov, 2001, p. 153).

The study of aesthetic preferences in children of native northerners showed an obvious orientation towards the European type when defining "a handsome person." Taking into account negative definitions used by children to characterize representatives of their own ethnic community ("ugly," "not strong,"

"they drink too much,"), we can speak about the "marginalization of identity, verging on ethnonihilism" (Pavlov, 2001, p. 175). This is an alarming inference, since the individuals who are marginal in terms of their ethnic self-identification are likely to develop a whole complex of unfavourable individual psychological properties that testify to their level of frustration: a sense of psychological vulnerability, lack of sociability, low level of claims, passivity and reluctance to uphold the values of their kin and ethnic community (Park, 1998).

Thus, we may conclude that in the complicated period of personal identity formation and their search for their place in the world, young native northerners of Russia too often find themselves devoid of one of their major assets — self-identification with their ethnic community (Kozlova, 2004).

Sociocultural adaptation

The process of sociocultural adaptation can be assessed by the success of the individual or social group in building harmonious relations with other social communities. The interethnic relations that are being formed in the North have become one of the indicators of this process. The interactions between representatives of native and "migrant" ethnic groups were studied from a sample of residents in the Khanty-Mansi AO (Pavlov, 2001; Kharamzin and Khairullina, 2002; Kozlova, 2002, 2004).

Interethnic relations in the *okrug* are far from idyllic. Practically the same proportion of respondents (about 40%) from among the native, Slavic and Tatar populations of the area characterized the relations between the native and migrant inhabitants as tense. Among college students in our study, 23% of Khanty and Mansi showed obvious interethnic intolerance, while 59% expressed an interestin and a benevolent attitude towards representatives of other ethnic communities. About one-third of respondents thought that interethnic relations in the *okrug* had become worse in recent years.

The adjustment of relations between the native and migrant populations in the *okrug* is hampered by the influence of unfavourable ethnocultural, economic and social-psychological factors.

The interethnic intolerance in the studied Khanty and Mansi respondents correlates with the recognition of cultural and psychological singularity of their ethnic community. The Ob Ugrians feel their own cultural and psychological exclusion very acutely. As it has already been said, it is not always perceived positively, but the overwhelming majority (78.5 %) of indigenous respondents of the Khanty-Mansi AO are anxious about the threat of losing their people's cultural specificity (Kharamzin and Khairullina, 2002). The recognition of real or imagined inequality being infringed upon in any sphere —political, economic or cultural — provokes the activation of social-psychological protection mechanisms. People feel a need to retain at any price a positive vision of their group and, thus, of themselves. In this situation, intolerance serves as one of the psychological protection mechanisms of one's own "self-concept" — both at the individual and at the ethnic community level.

It is natural that intolerance directly correlates with anxiety: a person who considers "others" to be an unfriendly force cannot feel confident. Today, many native northerners (both those residing in villages and those who have moved to cities) perceive the world around them as an unpredictable and hostile environ-

ment, where the course of human life does not depend on the human's will (Kozlova, 2002, 2004). Their anxiety indices grow significantly ($p<0.05$) with the decreased rating of their own social success ($r=-0.54$), their decreased satisfaction with the social environment ($r=-0.70$), as well as their perception of the stability of the world around them ($r=-0.50$).

The feeling of the world's instability is extended, first of all, to the sphere of social relations and is accompanied by the growing social maladaptation. Northerners feel a need to adapt in the "westernized" environment, but too often they have no sufficient opportunities for it. This lack of opportunity or readiness to inwardly readjust oneself in order to accept and meet a new value system has a negative effect on the psychological well-being of a person. It results in the growth of stress, which may rightfully be called "stress under modernization."

Economic adaptation

The social and economic division of the population of the northern regions of Russia, which is often parallel with the ethnic division, undoubtedly possesses a strong potential for generating conflict. The majority of native northerners of Russia have to exist in severe economic conditions, whereas practically no correlation is observed between the income levels of native communities and the migrant population. As an example, we shall consider the two very different situations that developed in 1999 in two regions of the Russian North in terms of their economic well-being: the "prosperous" Khanty-Mansi and the "poor" Chukotka AO (Rossijskij Statisticheskij Ezhegodnik, 2003). The average "per capita" incomes of the population of these *okrugs* on the whole were 2.9 and 1.9 times higher than the average figure for the Russian Federation. However, due to the high cost of living in the North and the non-uniform distribution of income in the regions, 16% of the inhabitants in the Khanty-Mansi AO and 71% in the Chukotka AO had incomes below the subsistence level (the figure for Russia as a whole at the same period was 30%).

At the same time, the incomes of native northerners in both areas were lower than the average in these regions and across Russia as a whole. According to the data obtained from our focus group with the indigenous population of the Berezovo District (Khanty-Mansi AO), the average per capita cash income of rural Khanty and Mansi in 1999 amounted to 664 rubles a month (which at that time was equivalent to U.S.$27), which was only 15% of the *okrug*'s as a whole and 42% of the average income across the Russian Federation. The average per capita monthly income of Chukotka natives was practically the same — 628 rubles, or U.S. $25 (Litovka, 2001).

While financial security problems are a concern to the majority of native northerners, the situations in urban and rural areas are different. According to the results of the 1997 survey, up to 58% of villagers and only 40% of city-dwellers in the Khanty-Mansi AO complained about their low level of incomes. The differences between the urban and rural inhabitants of the *okrug* are clearly seen in the self-determination of their economic status: 53% of villagers and 12% of city-dwellers classified themselves as being in the lowest economic strata (Kharamzin and Khairullina, 2002).

The reasons for these differences may be diverse. For one thing, there are more economic

opportunities in the cities, and the urban population of Russia as a whole is basically better provided for than the villagers. But there is also another aspect of the problem. Native northerners of different social groups react to their income levels and to the property status of their families differently.

In our focus group of Khanty and Mansi residing in "ethnic" villages of Western Siberia, the representatives of "modern" occupations showed practically no differences in their income levels compared with hunters or fishermen. The monthly average cash income of native northerners from both "westernized" and "traditional" groups in 1999 was extremely low and was equivalent to U.S.$31.6 and U.S.$21.4, respectively. The difference of U.S.$10 could not significantly influence the economic status of a family following "Western monetary" patterns of relations, due to the high prices for market products and essential commodities (clothes, hunting and fishing outfits, gasoline, etc.). For example, one kilo of bread, the most essential of all the market products in native villages, cost 8 rubles, which at that period was equivalent to U.S.$0.32. Accordingly, no appreciable differences with income satisfaction were observed between representatives of the "westernized" and "traditional" groups of the indigenous population. In both groups, about one-third of respondents were dissatisfied with their incomes and about two-thirds considered them to be middling, "like everybody else's."

However, the self-estimation of property-status satisfaction was different in representatives of "modern" and "traditional" occupations. About 40% of the former — administration or medical workers, teachers and shop assistants — and only 27% of the family members of hunters and fishermen considered their property status "sufficiently satisfactory" (i.e., they believed that they possessed either "moderately enough" or "quite enough" property).

The slightly higher cash incomes of the "westernized" group could hardly have provided for them an appreciable advantage in terms of their property status. All indigenous respondents of the Khanty-Mansi AO appeared to be positioned below the poverty line (in 1999 the monthly subsistence wage officially established for the population of the Khanty-Mansi AO was equivalent to U.S. $51).

Apparently, the differences in self-estimating the sufficiency of property are defined not only by the cash income differences between the "westernized" and "traditional" groups of the natives residing in villages. It should be noted that during the Soviet and early post-Soviet periods, when the centralized system of "material wealth distribution" was dominant, the position of members of "modern" occupations within this system was more favourable.

However, today another factor appears to be more important. The village administrators, teachers and medical workers are more involved in the "Western" system of relations, and feel more at ease in the changed world. As a result, given the same cash income as the hunters and fishermen, they are much more successful in providing their families' with sufficient property.

The economic stratification that has developed in northern Western Siberia has a significant potential for generating conflict. It is especially dangerous that belonging to this or that social and economic stratum often coincides with the person's ethnicity. The "middle

class" is mainly represented by the migrant population, whereas the native northerners occupy the extremes of economic stratification (Kharamzin and Khairullina, 2002). On the one hand, the middle class make up the local national elite, having been incorporated more or less successfully into the top echelons of political administration. On the other, the overwhelming majority of the indigenous population appears unable to adapt to modern conditions and poverty and destitution hover over their daily lives.

Employment is an important economic characteristic of the population. However, if we are to judge the employment level based on official Russian statistics, we should bear in mind that this source is not accurate enough as it provides only the number of people who came to the placement service on their own initiative to be registered for employment.

Nevertheless, even based on data collected by the Russian Federal State Statistics Service (Ekonomicheskije…, 2005), we can say that the employment issues present a much more acute problem for the native peoples of the North than for the other groups in the country. Only in the Sakha Republic (Yakutia) and the Yamalo-Nenets AO was the proportion of unemployed among the economically active population slightly lower among the natives — their unemployment rate was only about 80% of the region's as a whole. In most northern regions, the proportion of the unemployed among native northerners is, on the contrary, 1.3 to 3.6 times higher than in the corresponding regions in general (Table 6.7). The unemployment rate is extremely high among the native population of the Khanty-Mansi AO and the Tyumen Oblast (6 and 11 times higher, respectively, than the general regional rates).

Table 6.7. Rate of unemployment among indigenous northern people and in the total population of the region.

Region	Indigenous people	Total population
Arkhangelsk Oblast	4.0	1.2
Kamchatka Oblast	12.8	6.6
Krasnoyarsk Kray	7.3	5.7
Koryak AO	17.4	11.7
Sakha Republic	3.9	4.8
Tjumen Oblast	7.9	0.7
Murmansk Oblast	6.8	1.9
Nenets AO	4.1	1.8
Khabarovsk Kray	7.2	5.5
Khanty-Mansi AO	6.0	1.0
Chukchi AO	7.9	4.9
Yamalo-Nenets AO	3.4	4.8

The most alarming issues concerning employment for the indigenous northern population are not its seasonal character (which is quite natural for a fishing and hunting economy) and not even the partial unemployment problem in remote villages (which cannot be solved completely), but the long-term structural changes in the employment of native northerners. The proportion of northerners constantly or temporarily engaged in unskilled and low-paid manual labor (cleaners, loaders, maintenance workers and unskilled workers of odd jobs) is growing (Pika and Prokhorov, 1994). Russian researchers correlate the marginalization problem in the native population of northern villages with the fact that natives are excluded from positions in the social-administrative sphere, with such positions generally being filled by migrant workers. The employers are often mistrustful of local residents as potential workers: native northerners are usually uneducated people, and many of them are drinkers and indifferent to the tasks they have been assigned. The situation is further aggravated by the shrinking number of workplaces in these northern regions.

The traditional "northern" spheres of production cannot provide enough jobs. In the Khanty-Mansi AO, for example, they provide jobs for only 27% of working natives, while the decline in fishing, hunting and reindeer breeding, which started 20–30 years ago, continues. The traditional natural grounds in Western Siberia now serve the needs of oil and gas production, and the young Khanty, Mansi and Nenets become more and more disappointed in what used to be their primary ethnospecific activities.

The long-term unemployment results in negative social and economic consequences: people lose hope for favourable changes and cannot find in themselves the strength to endure such adversity. As a result, the individual's motivation to work is reduced. Thus, according to Kharamzin and Khairullina (2002), when asked whether they can improve their economic conditions, more than half of native northerners reacted rather pessimistically: 36% did not know what to do, 17% were not going to do anything and 11% gave no answer at all. Only one-third of respondents showed a readiness to take some definite steps: work more diligently in their workplace, take up hunting, store up nuts and berries or search for a higher paid job.

Urbanization: risks and benefits

The problems encountered by the native northerners in the rapidly changing world often cause an emotional rejection of the "urban life." But are the urbanization processes in native northerners of Russia really so intense? Do their moving to cities and their essential life-style changes represent a serious threat to the existence of their entire ethnic groups?

It should be noted that during the last decade of the twentieth century, the urbanization processes in Russia as a whole underwent fundamental changes. The intensive growth of the urban population that began in the 1920s and continued for almost 75 years was replaced by the opposite process. The number of city-dwellers began to decrease both in terms of absolute figures and in relation to rural inhabitants (Vishnevsky, 2001). Furthermore, in the last decade of the twentieth century, the decrease of urban population was much more pronounced in the Far North than in the more "habitation-friendly" central areas of Russia. In the Chukotka and Koryak AO, the number of city-dwellers was reduced by half, and in other northern regions, by 15–25%. These processes were caused above all by the outmigration and natural loss of the population (the number of excessive deaths over births). The situation was aggravated by administrative transformations, which caused a number of northern cities to lose their city status (true, this change of status from cities and towns to villages was

in itself a reflection of demographic losses in the regions).

Contrary to these general tendencies, the urbanization of native northerners is an intense process, and the outflow of migrants from the northern cities results in an increasing share of indigenous city-dwellers. According to our calculations based on the data of the all-Russia 2002 census, the share of urban population in 26 groups of numerically small native peoples of the North within their primary residence areas averages 28%, ranging from 5.8% (Tofalars) to 56.7% (Oroks). Among the 20 ethnic groups with numbers exceeding 1,000 individuals, Selkups are the least urbanized (14.9%) and Mansi the most urbanized groups (50.0%).

What are the consequences of the natives' urbanization? Do cities really "destroy the souls" and lead to the ultimate assimilation of native northerners? To answer these questions, we should first analyse the reasons for the trend towards urban migration among the numerically small peoples of the North of Russia.

The most obvious reasons for leaving villages are economic ones. Since economic opportunities tend to concentrate in cities, this naturally attracts people, especially those who have received a better education. Among native northerners, the educational level for men is on the whole lower than it is for women; therefore, we may expect gender disproportion to develop in the native population of northern cities.

Indeed, the urbanization process involves indigenous women to a greater degree. More than half of all indigenous northerners living in the cities of Russia are women (58%). Women more often move to cities to study in professional schools and universities, and then do not return to their villages.

However, the difference in the educational level between men and women is just one of the gender differences. Women appear "preadapted" to the city environment even when they are still living in their native villages, since they constantly come into contact with elements of "modernized" relations and lifestyles. Besides, women are more likely to find occupations in the non-manufacturing sector, which also implies a higher level of contacts and awareness. This also facilitates the process of subsequent adaptation to the urban environment. Men, however, being involved in traditional kinds of activities, spend more time in the taiga and tundra and less time in their villages, so they are involved to a lesser degree in "westernization" processes.

Another relevant factor contributing to the higher frequency of indigenous women migrating to cities is marriage. In ethnically mixed families, indigenous women make up a bigger share than men: few Russian or Ukrainian women would marry a Khanty or an Eskimo. Far more often, Russian men marry local women and later move with their families to larger villages or cities.

However, all native northerners encounter difficulties in the process of their social adaptation to the city. Surrounded by an alien culture (and quite often, language), they find themselves separated from their habitual environment; this aggravates the complexity of their social-psychological maladaptation. More than a half (60%) of Khanty and Mansi who have moved to a city to receive an education rate their own social status as rather low and are not satisfied with their environment (family and peers) and current occupation.

The situation is further complicated by the necessity of searching for jobs; however, the

employment and unemployment problems are not so acute for indigenous city-dwellers of the Khanty-Mansi AO than for the villagers. Accordingly, the Khanty and Mansi residing in cities subjectively perceive their own circumstances as more favourable compared with those of the villagers. As a result, city-dwellers, whose social and economic situation appears to be more stable, are inclined to view their ethnicity more positively than the villagers.

The intensity of non-demographic gain, that is the "cross-flow" of representatives of other peoples into indigenous ethnic groups of the North, does not correlate with the northerners' urbanization level. If the non-demographic gain is to be regarded as one of the indicators of the stability of assimilation processes (and this is how we regarded it in chapter 1), the inference is that the urbanization factor is exerting no negative influence on the ethnic self-identification of native northerners of Russia. On the contrary, according to our own data, as well as the data obtained by Kharamzin and Khairullina (2002), the native northerners living in the cities of the Khanty-Mansi AO are more satisfied with their ethnicity than the village residents.

Therefore, we maintain that urbanization presently poses no hazard to the ethnic self-identification of northern natives.

Prospects for the future

The statement about the urbanization of native northerners not threatening the existence of northern ethnic groups does not at all imply that modernization processes in the Russian Arctic are smooth and painless. On the contrary, the systematic reorganization of northern cultures obviously creates a situation when new factors, unfavourable both for the social group and for an individual, become more intense.

The problem is that modernization changes affect not only the sphere of social and economic relations. The transformations embrace the sphere of values, social norms, habits and behaviour patterns. At the economic level, regulation mechanisms appear flexible enough and may more or less easily be transformed, since they are related to a rational control over the sociocultural processes. The value-normative level, on the contrary, is not so easy to understand and analyse; its corresponding mechanisms are more rigid and conservative. Today, many northerners fail to bring their value-normative system into line with modernized social and economic relations. This disagreement, the inability to restore a balance between different levels of the sociocultural systems, presents the main risk for conflict development.

The mechanisms of stress resistance devel-

oped in traditional societies prove to be inefficient in new conditions. There may be various ways to reduce the pressure of the "stress under modernization." Our study in the groups of Khanty and Mansi showed that there may be at least two adaptation strategies that can reduce the effects of such stress.

The first one is associated with the basic orientation towards support from the sociocultural community. The psychological "inclusiveness" of the individual in his/her ethnic group serves as a protective mechanism that helps one to feel more comfortable in the changing world via the connections with the ancient culture. However, such a style of behaviour is not flexible enough; such "protective" self-identification with the ethnic community, even though it provides an adaptive effect under certain conditions, hampers the person's individual development and self-realization. As a matter of fact, this behaviour pattern, by reducing the stressors' pressure at the individual level, slows down the integration of the entire traditional group (community) into the new environment. Moreover, given an insufficient level of personal maturity combined with a developed ethnic identity, there is a risk for interethnic intolerance and the development of aggressive nationalism.

The other adaptation strategy relies on the person's individual potential. The internal psychological changes in the course of modernization concern, first of all, the development of personal responsibility for one's life and actions (the locus of control internalization). Accordingly, the person's own individuality acquires a greater value for himself/herself. This individuality is perceived by the person as something integral and continual in time; she/he feels responsible for his/her own life and uses creative approaches to work through challenges. At the same time, the strategy also has its weak points. The intrafamily and intracommunity connections lose their value for the individual. Social connections beyond and outside the family, as well as the "universal" values and norms of the "westernized" world, assume much greater importance than is characteristic within the traditional system of social relations. The individual adapts more easily to new realities, but the traditional life-style of the ethnic group becomes more and more "washed away."

We have seen that both these adaptive behaviour models have their strong and weak points. Undoubtedly, the search for effective adaptation strategies that meet the realities of the changing world for the indigenous population of the North needs to continue. One thing, though, is clear enough: native northerners' hope for external help from Russia (in particular, from the state bodies) is hardly justified in the present situation. Expecting things to gradually "sort themselves out" is not realistic either. However, this does not mean that the situation is hopeless. With a sensible approach and with carefully considered choices, the natives of the North have the means to meet the challenges of the inevitable processes of modernization and globalization.

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Appendix

Chapter 2. Child Health, Growth and Development

Table 1. Anthropometric characteristics of newborns from different ethnic groups.

Ethnic group	n	Body weight (kg) Mean	SD	Body length (mm) Mean	SD	Head circ. (mm) Mean	SD	Chest circ. (mm) Mean	SD
Boys									
Saami	90	3077.1	582.5	510.2	34.5	343.7	20.6	336.7	20.8
Khanty	37	3370.3	481.5	522.8	26.1	349.7	21.2	343.1	22.5
Mansi	26	3397.7	513.5	543.5	23.8	354.8	14.5	347.1	16.9
Nanais	29	3348.3	520.7	526.2	22.5	352.4	14.5	347.9	18.2
K-Permyaks	310	3398.1	515.6	511.9	23.4	352.6	16.0	342.2	18.6
Buryats	87	3572.4	401.5	512.6	19.6	344.8	16.8	333.4	14.8
Chukchi	107	3247.3	552.0	519.5	28.0	339.1	16.8	329.3	22.9
Russians	113	3629.5	545.4	531.4	26.6	346.2	13.4	341.6	12.8
Girls									
Saami	70	3020.7	510.4	509.0	30.7	339.0	18.0	331.7	22.5
Khanty	41	3286.3	416.1	515.1	31.1	344.9	12.5	334.4	16.5
Mansi	27	3341.6	450.8	530.4	27.2	347.2	10.8	346.4	18.6
Nanais	23	3122.0	428.2	521.0	19.7	347.5	10.7	337.9	18.7
K-Permyaks	325	3301.0	438.8	505.4	19.0	347.4	14.3	342.2	18.6
Buryats	57	3418.6	378.2	505.6	19.1	342.3	12.8	331.3	13.8
Chukchi	122	3156.4	561.8	514.1	29.3	335.1	17.1	326.5	24.3
Russians	116	3422.0	440.3	519.9	22.4	342.9	12.3	339.6	14.0

Table 2. Body height and weight by age in rural schoolboys of different ethnic groups.

Age (yrs)	Saami n	Height (cm) Mean	SD	Body weight (kg) Mean	SD	Nenets n	Height (cm) Mean	SD	Body weight (kg) Mean	SD
6	-	-	-	-	-	-	-	-	-	-
7	7	117.6	6.7	22.1	3.5	-	-	-	-	-
8	20	123.2	5.2	24.1	3.6	52	118.5	5.2	23.5	2.5
9	20	129.0	4.7	26.6	4.0	51	123.0	3.9	25.4	2.4
10	21	132.9	5.8	29.6	4.1	54	126.5	7.0	27.4	4.2
11	22	137.3	6.0	32.1	4.2	46	129.3	6.6	29.4	4.0
12	20	141.9	6.4	34.7	5.5	40	133.1	6.5	32.0	5.7
13	16	146.2	7.9	38.7	6.8	51	138.6	6.6	35.7	6.7
14	13	154.9	8.6	44.8	7.5	58	144.1	8.0	39.0	7.1
15	8	154.9	5.0	44.8	4.6	44	151.2	7.5	45.1	6.6
16	2	165.3	10.3	52.4	10.2	44	154.2	7.8	49.1	7.0
17	5	172.5	5.3	57.8	8.3	42	157.8	5.2	53.6	6.5

Table 2. (continuation). Body height and weight by age in rural schoolboys of different ethnic groups.

	Komi-Permyaks					Buryats				
Age		Height (cm)		Body weight (kg)			Height (cm)		Body weight (kg)	
(yrs)	n	Mean	SD	Mean	SD	n	Mean	SD	Mean	SD
6	-	-	-	-	-	17	111.3	4.2	18.5	2.6
7	41	118.0	5.3	21.5	3.0	11	120.0	4.4	21.3	2.1
8	35	123.8	5.9	24.1	2.9	23	121.4	4.0	22.0	2.5
9	34	128.6	5.7	26.1	3.3	8	125.3	5.1	24.0	1.9
10	43	133.6	6.5	29.2	3.9	19	134.4	4.4	28.7	2.8
11	39	138.8	6.1	32.5	3.5	17	137.5	7.6	30.2	4.0
12	39	142.6	6.6	35.0	4.9	22	143.8	7.5	32.0	3.9
13	34	146.3	8.4	36.3	5.9	18	150.9	7.9	36.9	5.5
14	33	154.7	9.6	45.3	9.5	8	155.3	6.0	37.9	5.1
15	27	161.7	9.8	50.7	8.6	8	163.3	4.7	45.9	5.0
16	25	168.0	7.0	56.5	8.0	5	165.4	7.7	48.5	5.4
17	-	-	-	-	-	-	-	-	-	-

Table 3. Body height and weight by age in rural schoolgirls of different ethnic groups.

	Saami					Nenets				
Age		Height (cm)		Body weight (kg)			Height (cm)		Body weight (kg)	
(yrs)	n	Mean	SD	Mean	SD	n	Mean	SD	Mean	SD
6	-	-	-	-	-	-	-	-	-	-
7	6	114.8	4.3	22.4	3.9	-	-	-	-	-
8	36	120.6	6.0	22.4	3.5	51	117.5	7.2	23.8	5.9
9	54	126.4	6.7	24.8	4.3	49	120.1	4.6	24.4	2.8
10	48	130.4	6.5	27.2	5.0	42	124.5	5.0	26.2	2.6
11	34	137.1	8.0	30.5	6.3	57	129.8	5.3	29.1	3.6
12	30	143.9	8.4	35.1	6.9	60	135.2	6.1	32.3	4.3
13	28	150.3	8.2	42.5	8.6	45	141.5	6.3	37.6	5.4
14	28	154.1	5.0	46.1	5.1	61	145.0	7.9	42.2	6.7
15	30	153.9	5.5	47.0	5.4	46	145.7	6.2	43.9	6.5
16	22	155.0	4.0	48.4	5.8	50	147.8	5.2	48.3	7.5
17	12	154.6	3.6	48.1	6.5	40	149.2	5.0	49.9	6.2
	Komi-Permyaks					Buryats				
6	11	113.8	5.7	20.1	2.7	13	115.0	3.8	19.7	1.3
7	31	118.4	4.2	21.5	2.3	5	117.9	3.6	19.5	1.3
8	45	121.9	5.2	22.7	3.0	5	123.6	5.4	22.7	2.6
9	45	127.4	6.0	25.5	4.3	9	125.5	5.3	23.7	3.2
10	59	133.7	6.1	28.2	4.6	12	138.6	5.0	29.0	3.7
11	47	138.4	6.8	30.9	4.7	8	138.0	6.6	29.1	3.8
12	47	143.2	8.4	34.6	6.4	18	142.7	8.3	31.8	5.2
13	28	150.1	5.7	41.3	6.0	10	154.7	5.5	41.1	4.6
14	36	152.6	7.2	44.4	6.6	14	155.9	5.3	44.7	4.8
15	45	155.5	5.9	47.4	6.1	15	153.9	4.8	45.6	5.2
16	27	157.7	4.8	52.7	6.6	12	154.5	7.9	47.4	6.0
17	-	-	-	-	-	-	-	-	-	-

Table 4. Annual growth rate for height (HR) and weight (WR) in boys of different ethnic groups.

	Saami		Nenets		Komi-Permyaks		Moscow Russians*	
Age (yrs)	HR (cm/year)	WR (kg/year)	HR (cm/year)	WR (kg/year)	HR (cm/year)	WR (kg/year)	HR (cm/year)	WR (kg/year)
8	5.6	2.0	-	-	5.8	2.6	-	-
9	5.8	2.5	4.5	1.9	4.8	2.0	5.2	0.4
10	3.9	3.0	3.5	2.0	5.0	3.1	3.6	1.9
11	4.4	2.5	2.8	2.0	5.2	3.3	7.3	4.7
12	4.6	2.6	3.8	2.6	3.8	2.5	4.2	4.2
13	4.3	4.0	5.5	3.7	3.7	1.3	5.9	4.3
14	8.7	6.1	5.5	3.3	8.4	9.0	8.2	6.6
15	-	-	7.1	6.1	7.0	5.4	5.6	5.1
16	-	-	3.0	4.0	6.3	5.8	5.6	5.7
17	-	-	3.6	4.5	-	-	1.4	5.0

* calculated from data: Miklashevskaya et al., 1989

Table 5. Annual growth rate for height (HR) and weight (WR) in girls of different ethnic groups.

	Saami		Nenets		Komi-Permyaks		Moscow Russians*	
Age (yrs)	HR (cm/year)	WR (kg/year)	HR (cm/year)	WR (kg/year)	HR (cm/year)	WR (kg/year)	HR (cm/year)	WR (kg/year)
8	-	-	-	-	3.5	1.2	-	-
9	5.8	2.4	2.6	0.6	5.5	2.8	4.4	2.0
10	4.0	2.4	4.4	1.8	6.3	2.7	3.9	2.9
11	6.7	3.3	5.3	2.9	4.7	2.7	6.5	3.7
12	6.8	4.6	5.4	3.2	4.8	3.7	7.7	5.7
13	6.4	7.4	6.3	5.3	6.9	6.7	5.9	5.5
14	3.8	3.6	3.5	4.6	2.5	3.1	2.8	4.6
15	-0.2	0.9	0.7	1.7	2.9	3.0	1.5	2.7
16	1.1	1.4	2.1	4.4	2.2	5.3	1.3	3.0
17	-0.4	-0.3	1.4	1.6	-	-	1.1	0.7

* calculated from data: Miklashevskaya et al., 1989

Chapter 3. Anthropometrical Characteristics of Adults

Table 6. Body dimensions of 18-25 years of age men in different ethnic groups.

		Height		Body mass		BMI	
Ethnic group	n	Mean (cm)	SD	Mean (kg)	SD	Mean	SD
Mansi	18	160.9	5.1	59.03	6.46	22.82	2.47
Khanty	75	159.4	6.0	56.52	8.58	22.15	2.47
Nenets	43	157.9	6.1	55.01	6.25	22.02	1.66
Komi	10	171.3	8.5	69.18	7.11	23.53	1.63
Komi-Permyaks	67	169.7	6.5	61.58	8.56	21.30	2.14
Evenks*	36	160.6	8.1	55.90	8.60	21.70	2.80
Buryats	90	169.4	5.7	63.63	7.65	22.18	2.55
Russians (Tyumen)	173	171.9	6.4	66.17	9.55	22.35	2.68
Russians (Perm)	104	174.4	6.8	70.30	8.47	23.09	2.32

* Leonard, Crawford et al., 1994

Table 7. Body dimensions of 18-22 years of age females in different ethnic groups.

Ethnic group	n	Height Mean (cm)	SD	Body mass Mean (kg)	SD	BMI Mean	SD
Mansi	29	150.3	5.4	51.33	6.55	22.76	2.87
Khanty	88	150.4	4.7	50.37	5.86	22.25	2.15
Nenets	78	149.6	4.7	50.23	6.08	22.43	2.28
Komi	14	157.6	5.8	54.28	7.57	21.74	1.93
Komi-Permyaks	90	158.5	5.7	57.41	8.04	22.82	2.64
Evenks*	21	149.2	6.1	50.60	9.20	22.80	3.90
Buryats	116	158.8	4.9	57.18	6.68	22.65	2.36
Russians (Tyumen)	193	161.3	6.3	56.85	7.41	21.85	2.29
Russians (Perm)	29	162.4	5.8	57.00	9.11	21.55	2.89

* Leonard, Crawford et al., 1994

Table 8. Body composition (% of bone, muscle and fat of total body mass) in different ethnic groups.

Ethnic group	n	Bone Mean (%)	SD	Muscle Mean (%)	SD	Fat Mean (%)	SD
Males, 18-25 yrs							
Mansi	18	17.25	1.32	46.02	3.60	9.73	1.90
Komi	10	16.79	1.38	48.48	2.89	11.06	2.38
Komi-Permyaks	67	18.44	1.61	45.98	2.28	12.18	2.95
Buryats	90	17.65	1.55	47.51	3.43	11.77	3.09
Russians (Tyumen)	173	17.66	1.64	48.06	2.72	12.31	3.32
Females, 18-22 yrs							
Mansi	29	15.06	1.49	39.91	2.67	20.00	4.34
Komi	14	15.84	1.61	43.19	3.43	20.54	5.62
Komi-Permyaks	90	15.01	1.29	40.17	2.27	24.89	4.63
Buryats	116	15.09	1.13	39.54	3.93	24.59	4.57
Russians (Tyumen)	193	15.13	1.11	43.10	2.73	23.11	3.90

Table 9. Skinfold thickness (in mm) in different ethnic groups.

Ethnic group	n	Subscapular Mean	SD	Suprailiac Mean	SD	Triceps Mean	SD	Calf Mean	SD
Males, 18-25 yrs									
Mansi	18	6.9	1.5	6.3	2.1	5.6	1.8	5.6	1.3
Komi	10	8.4	2.3	9.0	4.5	6.6	2.1	6.3	1.8
Komi-Permyaks	29	7.6	2.5	9.3	3.6	6.7	2.6	5.6	2.4
Buryats	88	8.5	2.5	8.1	3.0	7.4	2.2	8.9	2.8
Russians (Tyumen)	161	7.8	1.9	9.0	3.5	6.9	2.2	8.8	2.4
Females, 18-22 yrs									
Mansi	27	11.6	4.4	11.9	5.1	12.4	3.2	11.6	2.8
Komi	14	12.2	4.9	14.0	7.0	14.1	5.4	12.2	4.3
Komi-Permyaks	93	13.8	5.1	16.8	5.4	16.4	4.4	13.0	3.4
Buryats	109	15.7	4.2	16.8	4.5	15.6	3.3	13.6	3.1
Russians (Tyumen)	196	12.2	3.8	14.9	4.5	15.3	3.4	14.7	3.7

Table 10. Anthropometrical characteristics of women in fertile ages.

Measurement	Chukchi n=228		Saami n=92		Ob Ugrians n=368		Buryats n=247		K-Permyaks n=291		Russians n=338	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Height	1594.6	62.1	1549.4	48.0	1539.3	72.1	1590.9	55.7	1576.4	54.7	1609.8	53.0
D.Cristarum	273.4	13.9	261.6	16.3	268.6	14.0	278.1	15.6	273.9	13.7	271.9	15.0
D.Spinarum	247.6	13.1	237.1	17.3	244.3	14.3	248.2	16.3	248.1	13.5	246.5	14.1
D.Trochanter.	303.2	16.8	301.7	16.9	296.5	17.7	314.0	17.1	305.9	13.7	310.9	19.4
C.Externa	195.8	13.2	194.9	9.5	195.8	10.3	202.8	14.5	195.1	9.1	199.7	11.5
D.Cr.*100/H	17.2	0.9	16.9	1.0	18.2	1.2	17.6	1.0	17.4	0.8	16.9	0.9

Table 11. Significant (P<0.05) correlation coefficients between the mother and newborn boy's anthropometrical dimensions in various ethnic groups.

Mother's dimensions	Newborn's dimensions			
	Body weight	Body length	Head circ.	Chest circ.
Mansi				
Height	-	0.51	0.47	0.55
D.cristarum	-	-	0.47	-
D.spinarum	-	0.59	0.60	0.55
C.externa	-	0.63	0.69	0.53
Buryats				
Height	-	0.25	0.32	0.22
D.cristarum	-	-	0.23	-
D.spinarum	-	0.23	0.36	-
C.externa	-	-	0.38	-
Russians				
Height	-	0.33	-	0.29
D.cristarum	-	0.31	-	-
D.spinarum	0.36	-	-	0.34
C.externa	0.40	0.36	-	0.40

Table 12. Significant (P<0.05) correlation coefficients between the mother and newborn girl's anthropometrical dimensions in various ethnic groups.

Mother's dimensions	Newborn's dimensions			
	Body weight	Body length	Head circ.	Chest circ.
Mansi				
Height	-	-	-	0.54
D.cristarum	-	0.43	-	0.62
D.spinarum	-	-	-	0.59
C.externa	-	-	-	0.74
Buryats				
Height	-	0.27	-	-
D.cristarum	0.33	0.33	-	-
D.spinarum	-	-	-	-
C.externa	-	-	-	-
Russians				
Height	0.23	-	0.19	-
D.cristarum	-	-	-	0.49
D.spinarum	-	-	-	-
C.externa	-	-	-	-

Table 13. Absolute and relative (to body weight) handgrip and back lift strength in different ethnic groups.

		Handgrip Absolute (N)		Handgrip Relative (N/kg)			Back lift Absolute (N)		Back lift Relative (N/kg)	
Ethnic group	n	Mean	SD	Mean	SD	n	Mean	SD	Mean	SD
Males, 20-35 yrs										
Mansi	54	428.75	73.08	77.3	11.5	32	1308.85	251.15	237.7	42.3
Nenets	34	429.81	68.27	-	-	34	1274.04	218.27	-	-
Komi	42	484.42	82.21	75.1	9.3	27	1758.75	268.46	270.9	34.6
Buryats	103	460.38	62.60	72.0	8.1	75	1083.17	232.79	177.9	36.9
Russians	167	485.67	76.35	75.9	11.1	136	1352.21	232.79	222.5	32.6
Females, 19-35 yrs										
Mansi	79	259.71	47.79	51.1	7.7	18	717.98	307.79	138.3	54.1
Nenets	52	240.38	44.23	-	-	52	583.65	101.92	-	-
Komi	36	286.83	36.25	50.7	8.0	20	929.33	179.71	162.6	54.5
Buryats	110	261.73	44.90	46.9	7.4	96	553.37	127.21	101.9	23.0
Russians	196	272.40	52.40	48.6	9.1	175	592.21	151.35	107.8	26.3

Table 14. Static endurance and manual dexterity (two-plate test) in different ethnic groups.

	Static endurance (sec)			Two-plate test (hits/ 15sec)		
Ethnic group	n	Mean	SD	n	Mean	SD
Males, 20-35 yrs						
Mansi	39	38.22	13.28	39	62.05	8.77
Komi	30	38.37	14.01	23	65.90	9.21
Buryats	75	41.20	15.30	59	73.24	10.26
Russians	165	42.78	15.65	138	66.82	10.44
Females, 19-35 yrs						
Mansi	22	34.74	19.41	21	65.54	9.71
Komi	20	41.55	26.41	20	71.80	8.84
Buryats	97	32.66	14.48	95	70.80	9.64
Russians	176	27.07	9.97	191	70.31	9.79

Table 15. Total cholesterol content (mmol/l) in different age-sex groups of various populations.

Ethnic group, age	Males			Females			Source
Khanty	n	Mean	SD	n	Mean	SD	
20-29	86	4.52	1.11	111	4.39	0.98	
30-39	45	5.14	1.25	69	4.99	1.03	Vasilyev et al., 1987
40-49	49	5.02	0.95	59	4.82	1.27	
50-59	38	5.09	1.00	44	5.63	0.90	
60+	9	5.21	1.11	21	5.25	1.11	
Nganasans							
18-29	16	3.26	1.01	22	4.04	0.91	
30-39	7	4.12	0.91	16	4.27	1.22	Rode, Shephard, 1994
40-49	4	4.12	0.54	8	4.04	0.78	
50-59	--	--	--	13	4.20	1.19	
Chukchi*							
25-34	46	4.53	0.10	42	4.63	0.12	
35-44	35	4.90	0.15	46	4.77	0.12	Young et al., 1995
45-54	43	4.94	0.11	48	4.98	0.09	
55-64	25	5.09	0.17	42	5.53	0.14	
Buryats							Kozlov,
19-25	35	4.34	0.93	--	--	--	Vershubsy, 1999

* The sample consist of 65% Chukchi, 20% Eskimos, 15% mixed ancestry

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